A.6 The *strange* 2012 revision of Salby's 1996 book

Via *Google Books*, it possible to see some pages in:

Salby, M, 1996: *Fundamentals of Atmospheric Physics* . International Geophysics Series, Academic Press, 628 pp. 2nd Printing (2005)

From Salby's 2008 MQ website, he intended to write:

Salby, M, 2009: Fundamentals of Atmospheric Physics . International Geophysics Series, Academic Press, 2nd Edition (In Preparation)'

That became the following, whose Kindle version I have browsed:[223]

Murry L. Salby, 2012.
Physics of the Atmosphere ***and Climate****, 2nd Edn*. (2012) [224]
Cambridge University Press.

1996: The Preface mentions help from Callaghan, Gratix and ASA.

'This book has benefited by my interaction with a number of individuals. Constructive criticism on earlier versions of the text was selflessly provided by David G. Andrews, **Rolando G. Garcia**, Dennis L. Hartmann, Raymond Hide, David J. Hoffman, Brian Hoskins, James R. Holton, Julius London, Roland A. Madden, John A. McKinley, and Gerald R. North. Thanks also go to those who supplied data and illustrations. **Figures and the supporting calculations[225] were skillfully prepared by Patrick Callaghan, Jacqueline Gratix**, and **Kenneth Tanaka**, several of which were organized by **Harry Hendon** while I was away on sabbatical. Many of the problems evolved through interaction with **John Bergman**, **Patrick Callaghan**, Gil Campo, **Gene Francis**, and **Andrew Fusco**, from whom I learned a lot. I am grateful to the National Aeronautics and Space Administration for its continued support during the book's construction and to the Lady Davis Foundation at **Hebrew University**, which provided support when I began this exercise. I am also grateful to **Atmospheric Systems and Analysis[226]** for support to produce several of the illustrations. **Last, but surely not least, I am indebted to my wife Eva for enduring the last years, so that this project could be completed**.'

Others' interest in Salby's research decreased strongly after the 1990s.
It is rare for a senior climate scientist to suddenly leap into anti-science as Salby has, **but by 2011 he was openly contemptuous of climate science outside his specialty**, also echoed in **§C.3-20** *and in Salby(2012):*

2012: The Preface recorded Salby's contemptuous attitude

'Historically, students of the atmosphere and climate have had proficiency in one of the physical disciplines that underpin the topic, but not in the others. **Under the fashionable umbrella of climate science, many today do not have proficiency in even one. What is today labeled climate science includes everything from archaeology of the Earth to superficial statistics and a spate of social issues. Yet, many who embrace the label have little more than a veneer of insight into the physical processes that actually control the Earth-atmosphere system, let alone what is necessary to simulate its evolution reliably. Without such insight and its application to resolve major uncertainties, genuine progress is unlikely.**
The atmosphere is the heart of the climate system, driven by interaction with the sun, continents, and ocean. It is the one component that is comprehensively observed. For this reason, the atmosphere is the central feature against which climate simulations must ultimately be validated.
This book builds on a forerunner, *Fundamentals of Atmospheric Physics*. It **has been expanded to include climate**, while streamlining the presentation for undergraduates in science, mathematics and engineering. …
(casts some doubt on CO2-vs-temperature relationship)
This book has benefitted from interaction with numerous colleagues and students. In addition to those received earlier, contributions and feedback were generously provided by W. Bourke,[227] J. Frederikson, R. Madden,[228] **E.Titova**, D. Toohey, [229]and J. Wu. Figures were skillfully prepared by J. Davis and D. Oliver. Lastly, I am grateful for the **understanding** and encouragement of **my son**, without which much of this book would not have been completed.

Following is the ToC for Salby(2012), showing changes of page count for numbered sections, (2012) ← (1996). Obvious new material is highlighted Light blue (science) or Orange (problematic) the latter mostly Chapter 17 and Sections 1.6, 8.7, 15.5.
A few Chapter/Section titles changed without seeming to change content.
Despite climate claim above, ~85% of the book *seemed* ~same as in 1996, slightly edited, with 80-90 new pages focused on Salby's research since.
He spent 10-20 pages of error-prone material mostly casting doubt on climate topics far outside his specialties, truly strange for a textbook.

Within his specialties, Salby seems to have done fine work,
Outside, some of his text was demonstrably incompetent or worse.

[223] Kindle Search is a plus compared to paper, but it lacks page numbers.
[224] www.researchonline.mq.edu.au/vital/access/manager/Repository/mq:17904
[225] Salby supervised Bergman, Fusco and *likely* Callaghan and Francis.
[226] Salby claimed ASA was distinct.
[227] Australian Bureau of Meteorology
[228] NCAR
[229] CU, http://scholar.google.com/citations?user=duJo9BMAAAAJ&hl=en&oi=ao

1 The Earth-atmosphere system ← A Global View
1.1 Introduction ← Introduction to the Atmosphere
1.1.1 Descriptions of atmospheric behavior
1.1.2 Mechanisms influencing atmospheric behavior
1.2 Composition and structure
1.2.1 Description of air
1.2.2 Stratification of mass
1.2.3 Thermal and dynamical structure
1.2.4 Trace constituents (some new, part good, part not)
1.2.5 Cloud
1.3 Radiative equilibrium of the Earth
1.4 The global energy budget
1.4.1 Global-mean energy balance
1.4.2 Horizontal distribution of radiative transfer
1.5 The general circulation
1.6 Historical perspective: Global-mean temperature
1.6.1 The instrumental record
1.6.2 Proxy records
55←52 pages (for 1.1-1.5) +15 pages for 1.6

2 Thermodynamics of gases
2.1 Thermodynamic concepts
2.1.1 Thermodynamic properties
2.1.2 Expansion work
2.1.3 Heat transfer
2.1.4 State variables and thermodynamic processes
2.2 The First Law
2.2.1 Internal energy
2.2.2 Diabatic changes of state
2.3 Heat capacity
2.4 Adiabatic processes
2.4.1 Potential temperature
2.4.2 Thermodynamic behavior accompanying vertical motion
2.5 Diabatic processes
2.5.1 Polytropic processes
19←21 pages

3 The Second Law and its implications
3.1 Natural and reversible processes
3.1.1 The Carnot cycle
3.2 Entropy and the Second Law
3.3 Restricted forms of the Second Law
3.4 The fundamental relations
3.4.1 The Maxwell Relations
3.4.2 Noncompensated heat transfer
3.5 Conditions for thermodynamic equilibrium
3.6 Relationship of entropy to potential temperature
3.6.1 Implications for vertical motion
15←17 pages

4 Heterogeneous systems
4.1 Description of a heterogeneous system
4.2 Chemical equilibrium
4.3 Fundamental relations for a multi-component system
4.4 Thermodynamic degrees of freedom
4.5 Thermodynamic characteristics of water
4.6 Equilibrium phase transformations
4.6.1 Latent heat
4.6.2 Clausius-Clapeyron Equation
13←15 pages

5 Transformations of moist air
5.1 Description of moist air
5.1.1 Properties of the gas phase
5.1.2 Saturation properties
5.2 Implications for the distribution of water vapor
5.3 State variables of the two-component system
5.3.1 Unsaturated behavior
5.3.2 Saturated behavior
5.4 Thermodynamic behavior accompanying vertical motion
5.4.1 Condensation and the release of latent heat
5.4.2 The pseudo-adiabatic process
5.4.3 The Saturated Adiabatic Lapse Rate
5.5 The pseudo-adiabatic chart
19←21 pages

6 Hydrostatic equilibrium
6.1 Effective gravity
6.2 Geopotential coordinates
6.3 Hydrostatic balance (4←4 pages, likely just titles)
6.3.1 Hypsometric equation (~ new title for existing)
6.3.2 Meteorological Analyses (~ new title for existing)
6.4 Stratification
6.4.1 Idealized stratification
6.5 Lagrangian interpretation of stratification
6.5.1 Adiabatic stratification: A paradigm of the troposphere ← Adiabatic stratification
6.5.2 Diabatic stratification: A paradigm of the stratosphere ← Diabatic stratification
18←20 pages

7 Static stability ← Hydrostatic stability
7.1 Reaction to vertical displacement
7.2 Stability categories
7.2.1 Stability in terms of temperature
7.2.2 Stability in terms of potential temperature
7.2.3 Moisture dependence
7.3 Implications for vertical motion
7.4 Finite displacements
7.4.1 Conditional instability
7.4.2 Entrainment
7.4.3 Potential instability
7.4.4 Modification of stability under unsaturated conditions
7.5 Stabilizing and destabilizing influences
7.6 Turbulent dispersion
7.6.1 Convective mixing
7.6.2 Inversions
7.6.3 Life cycle of the nocturnal inversion
7.7 Relationship to observed thermal structure
29←28 pages

8 Radiative transfer ← Atmospheric Radiation
8.1 Shortwave and longwave radiation
8.1.1 Spectra of observed SW and LW radiation
8.2 Description of radiative transfer
8.2.1 Radiometric quantities
8.2.2 Absorption
8.2.3 Emission
8.2.4 Scattering
8.2.5 The Equation of Radiative Transfer
8.3 Absorption characteristics of gases
8.3.1 Interaction between radiation and molecules
8.3.2 Line broadening
8.4 Radiative transfer in a plane parallel atmosphere
8.4.1 Transmission function
8.4.2 Two-stream approximation
8.5 Thermal equilibrium
8.5.1 Radiative equilibrium in a gray atmosphere
8.5.2 Radiative-convective equilibrium
8.5.3 Radiative heating
8.6 Thermal relaxation
8.7 The greenhouse effect (15←4 pages, likely new)
8.7.1 Feedback in the climate system
8.7.2 Unchecked feedback
8.7.3 Simulation of climate (some not very good)
59←54 pages, mostly by expansion of 8.7

9 Aerosol and cloud
9.1 Morphology of atmospheric aerosol
9.1.1 Continental aerosol
9.1.2 Marine aerosol
9.1.3 Stratospheric aerosol
9.2 Microphysics of cloud
9.2.1 Droplet growth by condensation
9.2.2 Droplet growth by collision
9.2.3 Growth of ice particles
9.3 Macroscopic characteristics of cloud

9.3.1 Formation and classification of cloud
9.3.2 Microphysical properties of cloud
9.3.3 Cloud dissipation
9.3.4 Cumulus detrainment: Influence on the environment
9.4 Radiative transfer in aerosol and cloud
9.4.1 Scattering by molecules and particles
9.4.2 Radiative transfer in a cloudy atmosphere
9.5 Roles of cloud and aerosol in climate
9.5.1 Involvement in the global energy budget
9.5.2 Involvement in chemical processes

58←57 pages

10 Atmospheric motion
10.1 Description of atmospheric motion
10.2 Kinematics of fluid motion
10.3 The material derivative
10.4 Reynolds' transport theorem
10.5 Conservation of mass
10.6 The momentum budget
10.6.1 Cauchy's Equations of Motion
10.6.2 Momentum equations in a rotating reference frame
10.7 The first law of thermodynamics

15←17 pages

11 Atmospheric equations of motion
11.1 Curvilinear coordinates
11.2 Spherical coordinates
11.2.1 The traditional approximation
11.3 Special forms of motion
11.4 Prevailing balances
11.4.1 Motion-related stratification
11.4.2 Scale analysis
11.5 Thermodynamic coordinates
11.5.1 Isobaric coordinates
11.5.2 Log-pressure coordinates
11.5.3 Isentropic coordinates

24←27 pages

12 Large-scale motion
12.1 Geostrophic equilibrium
12.1.1 Motion on an f plane
12.2 Vertical shear of the geostrophic wind
12.2.1 Classes of stratification
12.2.2 Thermal wind balance
12.3 Frictional geostrophic motion
12.4 Curvilinear motion
12.4.1 Inertial motion
12.4.2 Cyclostrophic motion
12.4.3 Gradient motion
12.5 Weakly divergent motion
12.5.1 Barotropic nondivergent motion
12.5.2 Vorticity budget under baroclinic stratification
12.5.3 Quasi-geostrophic motion

24←26 pages

13 The planetary boundary layer
13.1 Description of turbulence
13.1.1 Reynolds decomposition
13.1.2 Turbulent diffusion
13.2 Structure of the boundary layer
13.2.1 The Ekman Layer
13.2.2 The surface layer
13.3 Influence of stratification
13.4 Ekman pumping

15←17 pages

14 Wave propagation ← Atmospheric waves
14.1 Description of wave propagation
14.1.1 Surface water waves
14.1.2 Fourier synthesis
14.1.3 Limiting behavior
14.1.4 Wave dispersion
14.2 Acoustic waves
14.3 Buoyancy waves
14.3.1 Shortwave limit
14.3.2 Propagation of gravity waves in an inhomogeneous medium
14.3.3 The WKB approximation
14.3.4 Method of geometric optics
14.4 The Lamb wave
14.5 Rossby waves (11 ← 9 pages, some new)
14.5.1 Barotropic nondivergent Rossby waves
14.5.2 Rossby wave propagation in three dimensions
14.5.3 Planetary wave propagation in sheared mean flow
14.5.4 Transmission of planetary wave activity
14.6 Wave absorption
14.7 Nonlinear considerations

50←53 pages

15 The general circulation
15.1 Forms of atmospheric energy
15.1.1 Moist static energy
15.1.2 Total potential energy
15.1.3 Available potential energy
15.2 Heat transfer in a zonally symmetric circulation
15.3 Heat transfer in a laboratory analogue
15.4 Quasi-permanent features (10 pages ← 7 tropical)
15.4.1 Thermal properties of the Earth's surface
15.4.2 Surface pressure and wind systems
15.4.3 Tropical circulations ← 15.4 Tropical circulations
15.5 Fluctuations of the circulation (13← 0 pages)
15.5.1 Interannual changes
15.5.2 Intraseasonal variations

42←26 pages

16 Dynamic stability ← Hydrodynamic instability
16.1 Inertial instability
16.2 Shear instability
16.2.1 Necessary conditions for instability
16.2.2 Barotropic and baroclinic instability
16.3 The Eady model
16.4 Nonlinear considerations

15←15 pages

17 Influence of the ocean apparently all new
17.1 Composition and structure
17.1.1 Stratification
17.1.2 Motion
17.2 Role in the heat budget
17.3 Role in the carbon cycle
17.4 The wind-driven circulation
17.4.1 The Ekman layer
17.4.2 Sverdrup balance
17.5 The buoyancy-driven circulation
17.6 Interannual changes

30←0 pages

18 Interaction with the stratosphere ← 17 The Middle Atmosphere (most same, just renumbered 18← 17)
18.1 Ozone photochemistry
18.1.1 The chemical family
18.1.2 Photochemical equilibrium
18.2 Involvement of other species
18.2.1 Nitrous oxide
18.2.2 Chlorofluorocarbons
18.2.3 Methane
18.3 Motion ← 17.3 Air Motion
18.3.1 The Brewer-Dobson circulation
18.3.2 Wave driving of mean meridional motion
18.3.3 Transformed Eulerian description
18.4 Sudden stratospheric warmings
18.5 The quasi-biennial oscillation
18.6 Direct interaction with the troposphere
18.7 Heterogeneous chemical reactions
18.8 Interannual changes

49←37 pages

Appendix A-F same.

Salby(2012)

‘**1.2.4 Trace constituents …**
The relationship of CO2 to temperature is documented in prehistorical records of the Earth’s climate. Glacial ice cores, drilled from great depths, provide a record of atmospheric composition dating far into the past. In concert with isotopic information on atmospheric temperature, that record suggests a link between atmospheric CO2 and global temperature. During previous climates of the Earth, these quantities varied in a systematically related fashion. Figure 1.12a compares records of CO2 and temperature, inferred from an Antarctic ice core that extends back 400,000 years. …

Close inspection of the records in Fig. 1.12a also indicates a small but repeated separation between contemporaneous features, **with CO2 lagging temperature by 500– 1000 years**. The implied relationship of CO2 to temperature is manifest even on much shorter time scales (Sec. 1.6.2). …

The veracity of proxy records like those in Fig. 1.12 is clouded by uncertainties (ibid). Notable is the long-term stability of gases that are trapped inside ice, along with their diffusion between layers. Those uncertainties limit temporal resolution, which hampers the discrimination to individual periods. They also act to homogenize properties, limiting excursions in older portions of the record. **Equally important is the issue of causality**. While illustrating the interdependence of CO2 and temperature, these proxies provide little insight into which property produced changes in the other. Perhaps relevant is that they also leave undocumented contemporaneous changes in the most important radiatively -active species , water vapor and cloud, which are far more influential (Chap. 8).

More recent records evidence a human contribution to the budget of CO2. Since the dawn of the industrial era (late eighteenth-century), the combustion of fossil fuel has steadily increased the rate at which carbon dioxide is introduced into the atmosphere. Augmenting that source is biomass destruction, notably, in connection with the clearing of dense tropical rainforest for timber and agriculture. … **Nevertheless, the involvement of human activities is strongly suggested by observed changes.**

Commentary on some relevant (orange) sections of Salby(2012).
A few pages of Salby(1996) were sampled via Google Books.[230]
pp.1-21: almost identical, modulo copy-edits, minor wording changes.[231]
Salby(1996) showed records going back 160,000 years, and p.14 had:

> ‘Although they illustrate the interdependence of CO2 and temperature, these geological records provide no information on which produced changes in the other.’

However, Salby(2012) substantially extended the discussion to cast doubt on the ice-core records and their interpretation, *without seeming to bother to study the topic in the slightest.*
It is curious that a 2012 book showed the 400,000-year history, without even mentioning the 800,000-year history by Luthi, et al (2008).

SkS#11 “CO2 lags temperature.”[232]
Years before the ice-core records were available, the ice-age temperature-CO2 lag was predicted in Lorius, et al(1990)[233] in *Nature*, cited 321 times according to *Google Scholar*. Salby either ignored or did not know this famous paper in one of the most visible journals, although he did cite Lorius, et al (1985).

Salby has never published papers on ice-core research, and his claims were strongly refuted by a well-published ice-core researcher, **§A.2.**

Here, Salby agrees with the IPCC and other climate scientists, but contradicts his own talks, as per **§A.2-§A.4.**

[230] http://books.google.com/books?id=sK1qTDhNBsYC&pg=PA1&dq=salby&source=gbs_toc_r&cad=4#v=onepage&q=salby&f=false
[231] This is unsurprising, as it covers basic physics, unlikely to have changed.
[232] http://www.skepticalscience.com/co2-lags-temperature.htm
[233] www.atmos.uw.edu/2003Q4/211/articles_required/Lorius90_ice-core.pdf

The upward trend of CO2 is commonly ascribed to emission by human activities. Support for this interpretation comes from isotopes of carbon. Carbon 13, like carbon 12, is stable **…**

The decrease of δ13C, together with the increase of , reflects the addition of CO2 that is 13C lean. This feature is consistent with the combustion of fossil fuel, as well as biomass destruction. It is equally consistent, however, with the decomposition of organic matter derived from vegetation. Thus, associating the decrease of δ13C to the combustion of fossil fuel requires the exclusion of other sources that are 13C lean. In particular, it relies on CO2 emission from the ocean, which overshadows other sources of CO2 (Sec. 17.3), having the same isotopic composition as the atmosphere (which would then be left unchanged). unchanged). Only then can the decrease of δ13C be isolated to continental sources, which are weaker and, in particular, to the combustion of fossil fuel, which is an order of magnitude weaker.'

'1.6.1 The instrumental record
Routine measurements of air temperature began in the nineteenth century. They eventually formed a network of ground-based weather observations, which contribute today to the operations of major weather centers to produce short-term forecasts. Beyond surface measurements, the operational network makes vertical soundings of temperature, humidity, and wind via rawinsonde. **Nonetheless, even collectively, the ground-based network suffers from the same nonuniform sampling that limits the rawinsonde network**. Because it is discriminated to continental regions, such sampling can introduce a systematic error or bias into the record of global-mean temperature. Changes over continental regions are inadvertently magnified relative to changes over maritime regions, which are left unaccounted for. …

In addition, many stations in the ground network are, for historical reasons, situated near population centers (Fig. 1.37). Over the course of the instrumental record, those centers expanded through urban development. With their expansion was an amplification of the **urban heat island effect**, wherein urban centers are distinctly warmer than their surroundings**.** The heat island effect is greatest at night, when rural areas cool faster and, therefore, achieve colder temperatures than urban centers. It emerges conspicuously in temperature trends. …

SkS#188 "Murry Salby finds CO2 rise is natural"[234]
SkS#189 "CO2 increase is natural, not human-caused"[235]

Of course land surface stations do not measure the middle of oceans, but by now, substantial ocean data has been accumulated.
SkS#6 "Temp record is unreliable"[236]

SkS#20 "It's Urban Heat Island effect."[237]
UHI is real, but temperature analyses have long used appropriate techniques to remove the effect.

[234] http://www.skepticalscience.com/Murry-Salby-CO2-rise-natural.htm
[235] www.skepticalscience.com/co2-increase-is-natural-not-human-caused.htm
[236] http://www.skepticalscience.com/surface-temperature-measurements.htm
[237] http://www.skepticalscience.com/urban-heat-island-effect.htm

Figure 1.38 (a) Record of annual -mean temperature in California, averaged over population centers exceeding 1,000,000 (upper) and of less than 100,000 (lower). Superimposed is the record of Global Mean Temperature (GMT) from the network of surface stations (dotted). (b) Record of annual-mean temperature over SE Australia (undiscriminated by population), a region at conjugate latitude, of comparable area, and proportionate population growth (solid), and GMT (dotted). (c) Histogram of observed temperature trend over California, as a function of population. Sources: Goodridge (1996); **Robinson et al. (1998).**

Figure 1.39 Both evidence a warming trend since 1982, of 0.19 K/ decade in the surface record and 0.16 K/ decade in the satellite record. (Over 1979–2009, the trend in MSU is ~ 0.125 K/ decade.) The satellite record derives from the retrieval by University of Alabama at Huntsville (Christy, Spencer, and Braswell, 2000), in association with National Aeronautics and Space Administration (NASA). A different retrieval of the same measurements has been performed by **Remote Sensing Systems** (Mears et al., 2003), in association with National Oceanic and Atmospheric Administration (NOAA) – (not shown). **It is very similar, albeit with a decadal trend closer to that of the surface record.** However, that **retrieval omits data from Antarctica**, which, during the same interval, exhibits a cooling trend. …
After declining for about 2 years, global temperature rebounded, increasing for about a decade. Global-mean temperature then leveled off around 2002, followed by several years of general decline. …
That warming continued until the close of the twentieth century, after which GMT plateaued, declining slightly. This evolution is mirrored in the satellite record (Fig. 1.39).'

'1.6.2 Proxy records
Instrumental records before the nineteenth century are not available. In place of temperature measurements is a host of proxies, geological and other evidence that is used to infer temperature through a variety of techniques. These records are relied upon by students of paleoclimate, for periods before written records were maintained. **Such records are limited by coverage and uncertainties, which cloud their interpretation**.'

(long section trying to prove temperature ➔ CO2 (only).)

Item (c) used Figure 15 from **Robinson, A, Baliunas, S, Soon, W, and Z Robinson, 1998: Environmental effects of increased atmospheric carbon dioxide. *Med Sent*, 3, 171– 178.** Robinson[238] has never published a climate paper in any credible peer-reviewed journal. This was published in a non-indexed journal of a group[239] organized to "fight socialized medicine and to fight the government takeover of medicine."
The Robinsons work in a barnlike structure in Cave Junction, OR.[240]
Real scientists did rebuttals long ago of this infamously-poor effort.[241]
Salby took this paper seriously and cited it in a textbook for students.

Salby had done satellite work *so should have known something about it.*
Why did he prefer the (often error-plagued) Christy, Spencer and Braswell over Mears et al?[242]: Why did he mention cooling in Antarctic and ignore the larger warming in the Arctic? Records clearly specify 80ºS to 80ºN.

SkS#38 "Satellites show no warming in the troposphere"[243]

SkS#7 "It hasn't warmed since 1998"[244].

Of course they have uncertainties, but paleoclimate scientists have worked long to extract signal from noise and quantify uncertainties.
Salby's discussion is simply not serious.
Students should read Ray Bradley's well-known *Paleoclimatology*(1999), for which Google Scholar gives 683 citations.

See rebuttals in **§A.2** of *temperature ➔ CO2 (only that direction).)*

[238] http://www.desmogblog.com/art-robinson
[239] en.wikipedia.org/wiki/Association_of_American_Physicians_and_Surgeons
[240] http://en.wikipedia.org/wiki/Oregon_Petition#cite_note-6
[241] http://www.realclimate.org/wiki/index.php?title=OISM
[242] http://en.wikipedia.org/wiki/Satellite_temperature_measurements
[243] www.skepticalscience.com/satellite-measurements-warming-troposphere.htm
[244] http://www.skepticalscience.com/global-warming-stopped-in-1998.htm

'Dating of tree rings, dendrochronology, also figures prominently in reconstructions of previous climate. … **It then diverges from the instrumental record – about the time that direct measurements of temperature became widespread . Why is not understood**. Regardless of its origin, this feature seriously complicates the inference of temperature from annual tree growth. Supporting tree-ring evidence are sedimentary records from lakes and rivers. Because they form differently under frozen and unfrozen conditions, they too are clouded by uncertainties.
'After about the year 600 , temperature warmed steadily, maximizing during the so-called Medieval Warm Period that prevailed during 1000– 1300 (**Lamb, 1965**). The period is well documented in anecdotal evidence from the North Atlantic and Europe, in Norse explorations that were unhindered by ice, in the Viking colonization of Greenland, and in the northward advance of agriculture that enabled a wine industry to flourish in England (see , e.g., **Lamb, 1982**) …

How much temperature was elevated during the Medieval Warm Period, like many features of temperature reconstructions, is a matter of debate. The reconstruction in Fig. 1.45 implies that temperature then was about 0.5 K warmer than previously. Other reconstructions place temperature then 1.0–2.0 K warmer (**Lamb, 1965**; **Keigwin, 1996**; **Huang and Pollack, 1997**; **Loehle, 2007**).

That would make the Medieval Warm Period as warm or warmer than temperature during the late twentieth century.

The Intergovernmental Panel Report on Climate Change (2007) provides an overview of the climate problem, numerical modeling of it, and historical evidence.

SkS#107 "Tree-rings diverge from temperature after 1960"[245]
Direct measurements of temperature were widespread long before 1960.

Other than for historical background, citing Lamb(1965) or Lamb(1982) in a 2012 textbook is at best seriously incompetent.[246]

SkS#26 "Greenland was green"[247]
England's vineyards are already in North Yorkshire, [248] further North than they were during Roman or Medieval Warm Periods
The MWP and LIA appear every reconstruction used by the IPCC, and they certainly occurred in the North Atlantic region. They just do not show the huge MWP of Lamb(1965), to which some cling, like a flat-Earth map.

Lamb(1965) had a temperature sketch for England, obsolete decades ago.
Keigwin was badly abused[249] by Robinson, et al(1998), who mangled the graph and did not seem to know that BP was relative to1950, not ~2000.
Huang and Pollack(1997) was misused by many, and by 1998 they had disavowed use of their borehole work for longer than 500 years, so said nothing about the MWP. They amplified that in 2008.[250]
Loehle(2007) had problems.[251]

Salby would have done far better to have studied IPCC AR4, instead of silly credibility-destroying sources.

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[245] http://www.skepticalscience.com/Tree-ring-proxies-divergence-problem.htm
en.wikipedia.org/wiki/Divergence_problem People are researching the alternates.
[246] http://scienceblogs.com/stoat/2012/10/10/adoration-of-the-lamb
[247] http://www.skepticalscience.com/greenland-used-to-be-green.htm
[248] http://www.winelandsofbritain.co.uk I own both books.
Richard Selley is probably the world's leading expert on history of UK vineyards.
[249] https://gsa.confex.com/gsa/2010AM/finalprogram/abstract_178248.htm
[250]www.desmogblog.com/sites/beta.desmogblog.com/files/STRANGE.SCHOLARSHIP.V1.02.pdf W.4.3, pp.138-139.
http://scienceblogs.com/stoat/2008/09/15/a-late-quaternary-climate-reco
[251] http://www.realclimate.org/index.php/archives/2007/12/past-reconstructions/

8.7.1 Feedback in the climate system …
Temperature – CO2 feedback
Like other trace species, CO2 is produced and destroyed at the Earth's surface. Involving a number of reservoirs and processes that are difficult to document, individual sources and sinks are poorly quantified. Net emission of CO2, however, is determined unambiguously in the instrumental record (Fig. 1.43). As discussed in Sec 1.6.2 , the net emission rate of CO2 varies coherently with Ts. …

8.7.3 Simulation of climate
The feedbacks developed in Sec 8.7.1 can amplify the response of the Earth-atmosphere system over its direct radiative response. In principle, those feedbacks are represented in global climate models. GCMs are, increasingly, coupled atmosphere-ocean models. The large heat capacity of the ocean, supported by transfers of latent heat, make climate simulations inherently sensitive to the ocean simulation (Sec. 17.2) **Yet, limited observations of the deep-ocean circulation leave those simulations largely unvalidated.**
GCMs predict that doubling CO2 over pre-industrial levels will lead to warming of GMT by 3– 7 K (IPCC, 2007). Those predictions are considerably greater than the warming anticipated by the observed feedback between temperature and water vapor (~ 2 K), which in turn is consistent with observed warming during the twentieth century. The magnified response represents an amplification of warming through feedback mechanisms inherent in GCMs. As climate projections rest on those internal feedbacks , which are poorly understood, the accuracy with which GCMs reproduce observed changes is pivotal.
Global climate models are sophisticated extensions of the idealized models considered above. Treatments of climate properties in different GCMs are as varied as they are complex. For some properties, like cloud cover, ice, and vegetation, they must resort to empirical relationships or simply ad hoc parameterization. For others, the governing equations cannot even be defined. Together with the ocean simulation, these limitations introduce errors, which can be substantial. Along with discrepancies between GCMs, they leave in question how faithfully climate feedbacks are represented (see, e.g., Tsushima and Manabe, 2001; **Lindzen and Choi, 2009**).

In this section, Salby does much math to claim that temperature controls CO2 at all time-scales, beyond the well-known feedbacks.

This was well-refuted by scientists, **§A.2.**
SkS#188 "Murry Salby finds CO2 rise is natural"[252]
SkS#189 "CO2 increase is natural, not human-caused"[253]

Observations are indeed limited, but have been improving rapidly with Argo,[254] at least down to 2000 meters.

This shallow discussion of modeling seems mostly designed to generate doubt among students.

SkS#5 "Models are unreliable"[255]

Lindzen and Choi (2009) was strongly refuted in early 2010, [256] and more followed.
SkS#90 "Lindzen and Choi find low climate sensitivity"[257]
This was totally debunked by 2011, but Salby missed that. Lindzen even admitted that the' 2009 paper contained "some stupid mistakes"'[258]

[252] http://www.skepticalscience.com/Murry-Salby-CO2-rise-natural.htm
[253] www.skepticalscience.com/co2-increase-is-natural-not-human-caused.htm
[254] http://en.wikipedia.org/wiki/Argo_%28oceanography%29
[255] http://www.skepticalscience.com/climate-models.htm
[256] www.realclimate.org/index.php/archives/2010/01/lindzen-and-choi-unraveled http://www.realclimate.org/index.php/archives/2010/01/first-published-response-to-lindzen-and-choi http://www.realclimate.org/index.php/archives/2010/01/lc-grl-comments-on-peer-review-and-peer-reviewed-comments
[257] www.skepticalscience.com/Lindzen-Choi-2009-low-climate-sensitivity.htm
[258] http://www.nytimes.com/2012/05/01/science/earth/clouds-effect-on-climate-change-is-last-bastion-for-dissenters.html?pagewanted=3&_r=3&

17.3 ROLE IN THE CARBON CYCLE

…

Equally significant are transfers of carbon into and out of the ocean. Of order 100 GtC/ yr, they exceed those into and out of land. **Together, emission from ocean and land sources (~ 150 GtC/ yr) is two orders of magnitude greater than CO2 emission from combustion of fossil fuel.** These natural sources are offset by natural sinks, of comparable strength. **However, because they are so much stronger, even a minor imbalance between natural sources and sinks can overshadow the anthropogenic component of CO2 emission** (cf Secs 1.6.2 , 8.7.1).

Most of this section seems normal science, but Salby again plays on the theme of CO2 exchanges with ocean dominating fossil fuel emissions.

This was well-refuted by scientists, **§A.2.**

SkS#29 "Human CO2 is a tiny % of CO2 emissions"[259]
SkS#58 "It's the ocean"[260]

Summary
Within 10-20 pages Salby repeats 13 well-known anti-science memes:
Sks # 5, 6, 7, 11, 20, 26, 29, 38, 58, 90, 107, 188, 189.

He cites as authoritative long-obsolete sources, such as Lamb(1965) and absurd ones like Robinson, A, Baliunas, S, Soon, W, and Z Robinson, (1998.)

He cherry-picks data or geographies favorable to doubt of mainstream climate science, ignoring the vast coherent evidence that contradicts him.

Within his expertise, the book seems fine, but elsewhere, it descends into anti-science, not even interesting or subtle, but of the shallow sort found on anti-science blogs and cataloged long ago at SkS.

Grad students can attend seminars and hear debates on contrarian ideas, but textbooks are supposed to present well-established, peer-reviewed science, not long-refuted error. Speculative material ought to be labeled as such, and claims contrary to well-established mainstream science ought to have giant warning signs.

This book is strange, as its predecessor was well-regarded, but the ~20 pages of shallow nonsense damage its credibility as a textbook.

An excerpt of this discussion was converted to a review at Amazon that generated hundreds of comments, discussed next.

[259] www.skepticalscience.com/human-co2-smaller-than-natural-emissions.htm
[260] http://www.skepticalscience.com/ocean-and-global-warming.htm

A.7 Amazon review and reactions to it

§A.6 was excerpted into a 1-star review[261] that drew 231 comments. **R.G. Reynolds,** an aerospace engineer, took exception, and argued with Gavin Cawley,[262] who demonstrably understood and patiently explained science. Reynolds was later joined by **Morgan Wright**, a retired optometrist who runs the Hyzer Creek Disk Golf Course. At one point he wrote:

> 'I'm going to put my college transcript at the following url in a few minutes, and **you put yours up or shut up**. http://www.hyzercreek.com/vassar.htm '

Amazon comments can always be edited, so were *WebCited*, as some combinations of originals and edits were instructive.
For instance, the original of #91, most edited away later was:

> 'R. G. Reynolds says:
> People back then were too busy trying to survive, and the doomsdayers of the age didn't have to think up complex arguments to scare people. They just told them God was unhappy. **Today, we have a new God, called Science**. And, if you are a **heretic, you will be cast into the pit of doom.**
> Of course, science, with a little "s", has greatly benefited our lives and, in doing so, gained enormous sway over peoples' opinions and motivations. It was inevitable that those who seek to control others would be drawn to use it as a means of doing so. These people are not practicing science. Just look at this thread - every logical fallacy in the book has been lobbed, from ad verecundiam, to ad populum, to ad ignorantiam, to petitio principii, and more. The edifice of scientific rigor has been taken to with a wrecking ball, in order to serve the interests of those with a yen for power.
> These guys here are little fish. **Computer jockeys who never studied a hard science in college, but now think they are little Einsteins**, because of the visages of those whom they would serve smiling down beneficently upon them, and conferring upon them the safety of the herd. I am so sick of seeing science perverted in this way**. I am so sick of mental pygmies strutting around and pontificating on matters they do not understand at even a basic level. It is absolutely surreal**, e.g., to have this phony "mass balance" argument trotted out as if it were some subtle and profound insight, rather than a trivial and inconsequential tautology. And, to add insult to injury, to have the name of a **truly gifted and accomplished scientist like Dr. Salby slimed and dragged through the mud by the likes of these**... it really is nearly too much to bear.'

[261] www.amazon.com/Physics-Atmosphere-Climate-Murry-Salby/dp/0521767180
Most of the book would have been 4-5, but a textbook should not be so wrong.
[262] http://theoval.cmp.uea.ac.uk

01-10	www.webcitation.org/6NDYonxbw	
11-20	www.webcitation.org/6NDYucngD	
21-30	www.webcitation.org/6NDZ8SU3v	
31-40	www.webcitation.org/6NDZCl8VI	
41-50	www.webcitation.org/6NDZGymiS	
51-60	www.webcitation.org/6NmrbJl1W	
61-70	www.webcitation.org/6NmrgbxK6	
71-80	www.webcitation.org/6NmrocRh4	
81-90	www.webcitation.org/6NmrvCgPe	
91 original	www.webcitation.org/6Nms82ogC	Reynolds comments
91-100 post edit	www.webcitation.org/6Nnnxb2fh	Reynolds edit
101-110	www.webcitation.org/6NoeoORIZ	#110 Wright transcript
111-120	www.webcitation.org/6NpNiJpaB	
121-130	www.webcitation.org/6NpYeGZth	
131-140	www.webcitation.org/6Npniropf	
141-150	www.webcitation.org/6NqwBLwAM	
151-160	www.webcitation.org/6Nr2bjwnN	
161-170	www.webcitation.org/6Nr2gNd3r	
171-180	www.webcitation.org/6NrPIaWDS	
181-190	www.webcitation.org/6NsViHs2z	
191-200	www.webcitation.org/6NsVo9u3a	
201-210	www.webcitation.org/6NySbQPWH	
211-220	www.webcitation.org/6NySfQWEn	
221-230	www.webcitation.org/6NySiw9PJ	#227-#230, on transcript
231	www.webcitation.org/6NyTUrtQD	

Morgan Wright's comment in #231 may also be instructive:

> Morgan Wright says: John, feel free to list me in the dismissive category. **It's the highest category of the 6, and I'm proud to belong to this group**. Your 6 categories of global warming concern in your cited study are:
> Alarmed
> Concerned
> Cautious
> Disengaged
> Doubtful
> Dismissive
> The first 4 of those categories can be seen to parallel the categories of the ICD-9 medical diagnosis codes of cognitive disability, as outlined here:
> ICD-9-318.2 Idiocy. IQ 0-20 profound cognitive disability - alarmed
> ICD-9-318.1 Imbecility low grade IQ -20-35 severe cognitive disability - concerned
> ICD-9-318.0 Imbecility high grade IQ 35-50 moderate cognitive disability - cautious
> ICD-9-317.0 Moron IQ 50 - 70 mild cognitive disability - disengaged
> Beyond these 4 categories you have 2 remaining: Normal, and **intelligent** - doubtful and **dismissive'**

In March/April 2014, Morgan Wright[263] and Lucy Skywalker[264] posted their own 5-star reviews, although hers was not really a review of the book. She also wrote a review at Amazon.uk, which had Verified Purchase.[265] Following are the 2 reviews at Amazon:

> **The bible of atmospheric physics By Morgan Wright on April 2, 2014**
> Format: Hardcover Verified Purchase
> This is the bible for all that is currently known about the atmosphere. **The math is a little over my head unless I study it carefully**,[266] but the way the information is organized, you can see the author has had a **lot of experience in teaching**, so reading this book is like taking a course in a classroom. **If I want to know something about the atmosphere, this book is my first source, not any of the politically charged blogs on the internet**, **most of which are government funded propaganda sites like Skeptical Science and Real Climate.** If you want to know the actual truth, get a text book. The graphs are brilliant and the color plates should be framed and hung on your wall. Textbooks like this cost a lot more, but you get what you pay for.

[263] www.amazon.com/gp/pdp/profile/AM6KZA0WVVPHT/ref=cm_cr_pr_pdp

[264] www.amazon.com/gp/pdp/profile/AIDA9H1BBQG5Y/ref=cm_cr_rdp_pdp
http://www.webcitation.org/6RLZvjdWA Wikipedia User Page
'Much of my life I've been in a sort of wilderness like Moses. Like Einstein, Newton, and many from Silicon Valley I have Asperger Syndrome. But now, thanks to a strict gluten-free-casein-free diet, I'm free of the root condition - though I cannot undo, nor would I wish to undo a lifetime of valuable experiences and lessons I would never have otherwise had. **I'm both artist and scientist by study and recreation**, I inherit excellent editing skills, and I am trained in spiritual counselling and life coaching. I care about the planet and humankind. I'm widely read, specializing in holistic material. And I'm a strong supporter of Jesus though I have my reservations about the Churches.
I stand firmly on both sides of the Creationist/Evolutionist fence. I passionately believe we each need to find our own inner "story" that speaks to the trusting child in each of us, yet also satisfies the adult sceptical scientist in each of us. I am saddened by the current low level of debate where people take "sides" and cannot entertain a "win-win" vision, a "both-and" version. **In 2008 I did a U-turn from climate warmist to climate sceptic.** I was so appalled at the disinformation I found everywhere that I wrote it all up on my own website, in the Science section.'

[265] www.amazon.co.uk/Physics-Atmosphere-Climate-Murry-Salby/dp/0521767180

[266] His transcript showed no trace of differential equations, which pervade Salby's book. Perhaps Wright studied those when earning his OD in optometry school. I suggested he might redact part of the image, his SSN. R G Reynolds wrote:
'I think it shows very poor form for you to be taking advantage of a youthful and inexperienced person in this manner.'
Wright's transcript showed he completed his undergraduate work in 1982.

'**Which way is the wind is blowing?**, March 22, 2014 By **Lucy Skywalker**
Format: Hardcover *(Verified Purchase @ Amazon.uk, where she also wrote)*
I acquired this textbook because it seemed to be the best of its kind.
Another reviewer says: "... it is unequalled in breadth, depth and lucidity. It is the single volume that I recommend to every one of my students in atmospheric science..." ([267]
Caveat Emptor. John Mashey is involved in the anti-climate-skeptics DeSmogBlog. **This murky fastness** cross-references with a rather more salubrious-looking blog Skeptical Science. Regarding climate skeptics' claim that "peer review has become pal review", SkS says "...while climate contrarians are never able to produce any evidence to support their conspiracy theory, John Mashey has thoroughly documented a real world example..." To their credit, SkS have identified 232 (and rising) claims of climate skeptics; and have done a hatchet job on each one. Every one of those 232 claims has been politely skewered. Google "skeptical science fixednum" and see for yourself.
What? Is it possible to have that many arguments against the prevailing wind? And nowhere, in the climate skeptics' world, can one find answers to all these claims put together so neatly and accessibly.
Mashey and friends are weighing in with ferocity against this magnum opus. But does it deserve such opprobrium? - 231 comments since last December is the most furiously concentrated commentary I've seen anywhere on Amazon - and I've seen a lot. Always a lot of comments signifies a sharp polarization of views into those who are strongly for and those who are strongly against. In such situations, **I look at the quality of responses on both sides. Which side appears to be the more courteous, the more comprehensible, the more factual, the more knowledgeable?** Which side appeals more to emotions? Which side is more concerned with putting people down? Are there shortcomings on both sides?
Salby has done the worst of all possible things, in the mind of anti-climate-skeptics. His very expertise as a climate scientist has led him to become an **apostate to the party line**. **He believes that the rise in carbon dioxide can be explained in purely natural terms, invoking Henry's Law and the thermohaline current outgassing from the legacy of the Medieval Warm Period as well as the recent warm spells**.
While being chased towards oblivion by his own University, he still found time to update this prodigious legacy. Draw your own conclusions. Check the evidence on all sides, as per Scientific Method. Don't assume anyone's word is trustworthy. **Remember Marcel Leroux who also wrote firstrate textbooks on Climate Science.**'

[267] Professor Yuk Yung wrote: "The **first** edition is a classic. …it is unequalled…"

B. Earlier history

B.1 Overview of earlier history

Professors at research universities combine employment contracts and personal preferences. Salby's CU history offers context:

- **Supervising graduate students in related research**.
  Salby did relatively little. Many professors get grants and run projects with constant flows of grad students or post-docs. Salby supervised 2 ATOC PhDs, 1996 /1997, plus *very likely* 2 in Physics, in 1997 / 1999. New PhDs and their supervisors are often (not always) quite close, perhaps collaborating for years thereafter. Only one fit that model. *Either Salby did not often want many PhD students, vice-versa, or both*.

- **Publishing one's research in journals, writing books**, **§B.4, §A.6.**
  Here, Salby did well, especially through 1996, then citations dropped,

- **Teaching scheduled classes**, **§B.5**
  Salby was usually rated poor by CU students, especially those in introductory courses. Some senior faculty love teaching introductory courses, but many prefer advanced courses. Salby most often taught lower-level course, despite poor ratings, especially for accessibility. *Salby seemed to dislike teaching students and vice-versa*.

- **Service to university and profession**.
  Referee papers, edit journals, work on course development, perhaps spend some time on administration.[268] *I could not find much evidence of this, except for contributing to IPCC SAR Chapter 4 in 1995.*

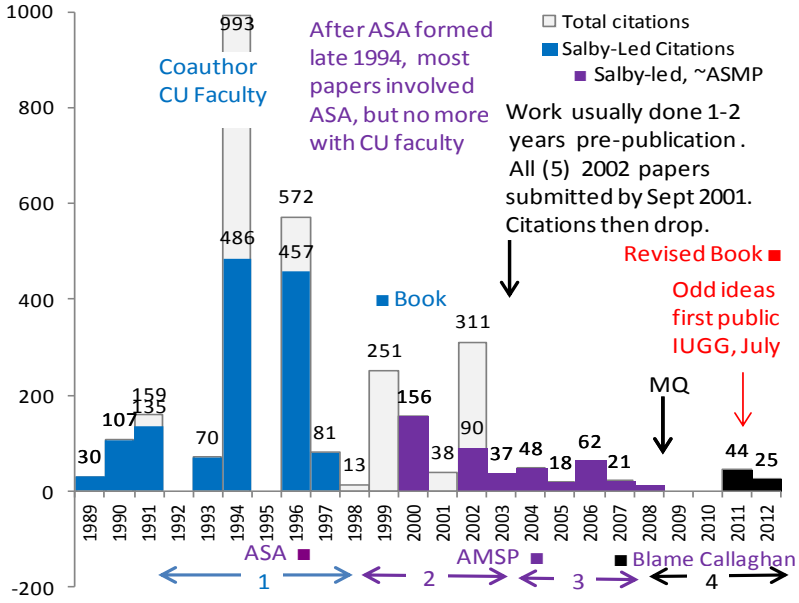
- **External consulting**
  Professors are allowed by contract and encouraged to do this, given care to avoid appearance or reality of Conflict of Interest (COI).[269]
  Both CU and NSF had serious problems with Salby's off-campus work, *for good reason*, especially as the ASA→AMSP relationship emerged.

Throughout **§B,** various conventions are used to clarify affiliations, grant sponsorships and obscured COI problems.
Blue: CU (with CU CATA group underlined), Green: NCAR,
Purple: ASA/AMSP, proven or plausible COI/$ problems,
Black: other affiliations
Red: Salby-initiated legal actions or other problems

Salby's history from 1989-onward can be roughly split into 4 phases:
1 1989-1996 Well-cited work with CU CATA colleagues, NCAR.
2 1997-2003 Focus on ASA, no CU faculty, less well-cited. COI issues.
3 2004-2007 Work only with ASA, fewer citations. Serious COI issues.
4 2008-2013 MQ: ASA support gone, unproductive, then dismissed.

Salby's mid-1990s and earlier work earned a good reputation, **but his career had waned years before the move to MQ**, summarized here. Citation counts were estimated via Google Scholar on 08/18/14, with usual caveats about accuracy and changeability, but the pattern is clear.

Fig B.1-1 Total citations and Salby-led citations by year



[268] Some want to be Department Head or Dean. Others avoid administration. Most online faculty C.V.s list service, but I've never found one for Salby. Many such activities are unlikely to be well-documented, *so this is not strong data.*
[269] Many professors do this carefully and openly, avoiding COI issues with grants.

Abstracts usually list affiliations and dates, but one must actually look at each paper to find the grant Acknowledgements (Acks). The annotated paper list in **§B.4** started with Salby's 2008 MQ website, then more were found via *Google Scholar*. Then, most of the grant final reports were found in the NASA/ NSF databases, including Principal Investigator(s), some date information, and Claims of work done, to compare versus Acks. Such need not match perfectly, but should not be careless.
Papers 29, 32, 34, 36, 43 and 45 mixed NASA and NSF. **Salby said ASA and CU work were totally different, but grants for both were Ack'd or claimed together by papers 12, 30, 31,33, 35, 37, 38, 39 and 43.**

Salby gave ASA affiliations to NSF in 4 grant proposals, but even for the 3 CU-sponsored NSF grants, used an ASA email not as subject to FOIA. *The reverse PI order for grant (U) possibly tried to obscure Salby's role, as he was far more senior than Callaghan, who did not yet have his PhD.*

Salby gave ASA affiliation on none of the papers listed here, ***hiding the relationship.*** Readers would never know that unless they tracked down grant reports, some of which become easily available only when final reports were later published online. CU would not see ASA-sponsored grants unless someone specifically looked. ASA would appear as an independent consulting company run by Callaghan, but it was not. [NSF2009] mentioned a 15-year history of deception, but focused on the last 2 grants, which also used AMSP to further hide money flows. Unlike accepted proposals, rejected ones are not public, so the [NSF2009] discussion cannot easily be fact-checked.
On following pages, **Fig. §B.1-3** summarizes the papers and coauthors on one (dense) page, then **Fig §B.1-4** gathers grants, teaching, lawsuits and other activities into a single chronology. *During the last decade, Salby seemed to spend more time on lawsuits than writing impactful papers.* **Only financial misconduct is alleged here, not poor science.**

Fig. B.1-2 Federal grant summary

Estimated from papers			Federal grant details and sources					Official sponsor: blue: CU, purple: ASA, but (*) for all NSF grants, both Salby and Callaghan gave only asac.org email addresses.
Start Date	**Est. End**	**Cd**	**NASA Award**	**Org**	**PI**	**Co-PI**	**$**	**Report**	**Title, found at http://ntrs.nasa.gov/search.jsp?R= *yyyynnnnnn i.e. Final Report #s***
	1990	a	NAGW-772	CU	O'Sullivan	Salby		19900041768	Coupling of the quasi-biennial oscillation and the extratropical circulation in the stratosphere through planetary w
1992?	1993.01.01	b	NAG8-787	CU	Salby	Garcia		19930010882	Planetary Circulations in the Presence of Transient and Self-Induced Heating (odd: Garcia only mentioned once)
1989	1991	c	NAGW-1138	CU	Hendon, *very likely*			not found	*Hendon only author on all NAGW-1138, only paper found at NASA: http://ntrs.nasa.gov/search.jsp?R=199100496*
1993?	1998	d	NAG1-1355	CU	Salby			19980036936	Observational and Modeling Studies of Radiative, Chemical, and Dynamical Interactions in the Earth's Atmosphere
	1998.08.01	e	NAGW-1658	CU?	Salby?	?		19980036936	EOS Interdisciplinary Investigation: Observational and Modeling Studies of Radiative, Chemical, and Dynamical Int
?	1999.01.01	f	NAG5-2852	ASA	Salby			19990064430	Synoptic Mapping of Chemical Composition, Thermal Structure, and Air Motion from UARS Observations
1993?	1999.01.01	g	NAGW-3485	CU	Salby			19990025898	Dynamical and Chemical Behavior of the Lower Stratosphere and Interactions with the Troposphere (11 items, in
1993?	2000	g	NAGW-3485	CU	Salby			20000029580	Dynamical and Chemical Behavior of the Lower Stratosphere and Interactions with the Troposphere (9 items, no
	2001.03.01	h	NAG5-6692	ASA	Salby			20010088171	Structure and Variability of Water Vapor in the Upper Troposphere and Lower Stratosphere (ASA 2003 Form 990:
1999.03.12	2002.02.28	i	NAG5-8311	CU	Salby		$159,769	20020078416	Diurnal Cycle of Convection and Interaction with the Large-Scale Circulation *(claimed fight with Webster and CU)*
2004.07.01	2007.06.30	j	NNG04GP52G	ASA	Salby	Callaghan		(none found)	Interannual changes of stratospheric chemical and dynamical structure … satellite measurements. $36K 2005 ASA
Salby used email mls@asac.org for all 7 NSF final reports									**The 7 NSF final reports can be found at this URL, sort by date to get same order:**
Start Date	**Est. End**		**NSF Award**	**Org**	**PI***	**Co-PI**			www.nsf.gov/awardsearch/simpleSearchResult?queryText=salby
1990.02.15	1994.01.31	T	8913729	CU	Salby	-	$297,868		The Interaction of Horizontal Transport and Photochemistry in the Stratosphere
1995.03.15	1999.03.15	U	9410277	ASA	Callaghan	Salby**	$345,674		Interdecadal Variability in the Stratosphere: Its Relationship to QBO, Solar Activity, and Biennial Variability in the Troposphere
1998.08.01	2002.07.31	V	9732542	CU	Salby	-	$379,660		Interannual Variations of Ozone and Their Relationship to Variations of Tropospheric Structure
1998.09.15	2002.08.31	W	9810498	ASA	Salby	Callaghan	$342,238		Interannual Variations in the Stratosphere and Their Relationship to Variations of Solar Activity
2001.09.15	2006.08.31	X	0121853	CU	Salby	Callaghan	$444,360		Interannual Changes of Stratospheric Dynamical and Chemical Structure and Their Relationship to Changes of the Residual Cir
2002.01.01	2006.12.31	Y	0120512	ASA	Salby	Callaghan	$331,361		Structure, Amplification and Nonlinearity of the 2-Day Wave
2002.03.01	2006.02.28	Z	0127671	ASA	Salby	Callaghan	$392,491		Influence of the Solar Cycle on the General Circulation of the Stratosphere and Troposphere
**Callaghan was then			NSF2009 Grants 1,2 , major COI, $				$2,533,652		$ NSF →ASA → (AMSP →Salby) (…) shows obscured transfers, ? Shows possible, not investigated cl
4 years before PhD,			NAG5-8311, fight with CU *(CU - ASA issue?)*						$NASA→CU→Salby→ASA?→(Salby) *Very likely COI issue with CU, perhaps noticed*
Salby wrote abstract,			Any others with explicit ASA involvement						$ Either→ASA?→(Salby) Potential problems, bad governance and accounting. Old records unavailable, not NS
led both papers.			*Odd Ack-vs-Claim combinations, retroactives*						Those above show real or easily-possible $-flow problems. *This might be COI problem, retroactive claims or carele*

Fig B.1-3 Salby publications, grants, coauthors - colored Paper# are or may be problems (dense, full-size spreadsheet attached)

Events, sabbaticals approximate	Ack'd grants	Claimed	Paper#	Received	Published	Citations	Salby Lead	Salby	Callaghan 99	Matrosova	Sassi	Garcia	Tribbia	Shea	Gettleman	Solomon	O'Sullivan	Hendon	Tanaka	Woodberry	Juckes	Bergman 96	Fusco 97	Francis 97	Wu	Hauchecorne	Keckhut	Read	Pumphrey	Titova	Deschamps
Phase 1			1		1989	30	30	CU									Other CU CATA staff					CU CATA PhDs, Francis + Callaghan PhDs in Physics									
CU CATA affiliation			2		1990	22	22	1 CU			2 NCAR																				
P.I. O'Sullivan(a)	a		3	1988.10.14	1990	34	34	1 CU			2 NCAR 4 NCAR						3 CU														
No problem	a		4	1988.12.15	1990	18	18	1 CU	4 CU		3 NCAR+CU						2 CU														
	a		5	1989.06.07	1990	18	18	1 CU	4 CU		3 NCAR+CU						2 CU														
			6	1989.11.02	1990	15	15	1 CU	2 CU		3 NCAR+CU				3 NOAA+CU																
P.I. very *likely*	c		7		1991	78	78	1 CU										2 CU	4 CU	3 CU											
Hendon(c)	c		8	1990.10.24	1991	20		4 CU										3 CU	1 CU	2 CU											
No problem	c		9	1990.03.26	1991	4		4 CU										3 CU	2 CU	1 CU											
Also Hebrew U			10	1991.04.11	1991	57	57	1 CU					2 NCAR																		
	a	g	11	1991.10.28	1993	70	70	1 CU	2 CU		1 1993	Garcia was on Sassi's committee and published 17+ papers with him. Salby published 2 1987 papers with Garcia, and 9 with Sassi later. ASA Board was hardly independent.																				
Discussion @ #12		f, g	12	1992.11.16	1994	3		1 CU			1 1994										2 CU										
(f) claim odd,	d	b	13	1993.03.19	1994	255	255	1 CU										2 CU													
most early (g)	d	b	14	1993.03.19	1994	501		2 CU										1 CU													
claims odd,	d	d, g	15	1993.07.09	1994	134	134	1 CU			3 NCAR+CU							3 CU													
seem retroactive	d	g	16	1993.08.26	1994	97	97	2 CU														1 CU									
over-claims (?)	-	g	17	1993.10.07	1994	3		2 CU															1 CU								
	-	-	18	Book	1996	457	457	CU			1 1996						Other CATA staff gone by 1995														
	-	g	19	1995.06.14	1996	80		2 CU														1 CU									
	-	g	20	1996.04.17	1996	35		2 CU														1 CU									
Phase 2	d	i	21	1995.10.24	1997	52	49	1 CU	2 ASA		1 1997					←	First paper for CU-sponsored NASA grant with explicit ASA coauthor, implying NASA$→CU→Salby→ASA.														
CATA ~gone	U	?	22	1997.09.14	1997	29	29	1 CU	2 ASA				3 NCAR																		
	f	f	23	1998.08.13	1998	11		2 CU		1 ASA																					
	f	f	24	1997.08.26	1998	2		2 CU		1 ASA																					
Sabbatical-1997	f	f	25	1998.08.17	1999	4		2 CU		1 ASA																					
CNRS, Paris		d, g	26	1997.05.30	1999	18		4 CU	1 CU		1 1999											2 CU	3 CU								
Sabbatical-1998		d, g	27	1998.03.09	1999	229		2 BuMet+CU														1 CU									
Melbourne	U	?	28	1998.06.23	2000	156	156	1 CNRS	2 ASA																						
	d, V	g	29	2000.01.03	2001	*17*		2 CU								←	Odd Ack vs Claim; NASA-vs-NSF						1 NCAR								
	h,i	h,i	30	1999.10.15	2001	*6*		2 CU		1 ASA																					
	h	h,i	31	2000.09.13	2001	*15*		2 CU		1 ASA																					
	V	g	32	2001.04.23	2002	*22*		2 CU	1 CU							←	Odd Ack vs Claim; NASA to NSF														
AMSP accruals	h	i	33	2001.06.25	2002	*188*		3 CU		2 NCAR				1 NCAR																	
start 2001.12	V	g	34	2001.06.21	2002	*66*	66	1 CU	2 CU		1 2002					←	Odd Ack vs Claim; NASA to NSF														
	h	h,i	35	2001.02.25	2002	*11*		2 CU		1 ASA																					
		i, X	36	2001.04.23	2002	*24*	24	1 CU	3 ASA	2 ASA																					
	v, w, x, y, z		37	Chapter	2003			CU																							
	v, w, x, y, z		38	Chapter	2003			CU																							
	X, Z		39	Chapter	2003			CU																							
	X		40	Chapter	2003			CU																							
	Z		41	Chapter	2003			CU																							
	X		42	2001.12.21	2003	*11*	11	1 CU	2 CU																						
AMSP 2003.09.23	h,X	i	43	2002.03.27	2003	*26*	26	1 CU	3 ASA	2 ASA																					
Phase 3	X	X	44	2003.10.25	2004	22	22	1 CU	2 CU							←															
ASA only	X,Z	i,X	45	2003.04.03	2004	12	12	1 CU	2 CU		1 2004		Sassi was affiliated with NCAR whole time, working at ASA part-time. That ended after 2001, but he joined ASA Board.			←	2 CU authors Ack ASA grant, but mostly, both gave CU affiliations. CU said in Salby-vs-CU court case, 2009, that Callaghan's vita had CU Research Associate 1998-2001, consistent with Phase 2 CU affiliations, but not Phase 3.														
	X	X	46	2003.11.21	2004	*14*	14	1 CU	2 CU							←															
	Z		47	2005.03.28	2005	*18*	18	1 CU	2 ASA		2 2005					←															
	X	X	48	2006.01.04	2006	*3*	3	1 CU	2 CU																						
	Z		49	2006.01.04	2006	*9*	9	1 CU	2 ASA																						
	Z		50	2005.03.23	2006	*36*	36	1 CU	2 ASA																						
chapter		Z	51	2005.04.24	2006	*9*	9	1 CU	2 ASA																						
	X	X	52	2005.10.14	2006	*5*	5	1 CU	2 CU							←															
	j	?	53	2006.08.22	2007	*9*	9	1 CU	2 ASA																						
	X		54	2006.05.01	2007	*9*	9	1 CU	2 CU							←															
Sabbatical -AU	Y		55	2006.10.24	2007	*3*	3	1 CU	2 ASA	3 ASA	7 2007					←	Last submission with Callaghan in 2006, just before Salby left for Australia sabbatical, and by 2008 was blaming Callaghan for														
	Y		56	2007.02.01	2007	0	0	1 CU		2 ASA																					
2006.12-2007.08	Y		57	2006.08.06	2008	*10*	10	1 CU	2 ASA																						
Phase 4			58	2011.02.28	2011	*40*	40	1 MQ																							
MQ			59	2010.09.13	2011	*4*	4	MQ																							
			60	Book, 2nd Ed	2012	*12*	12	MQ																							
			61	2011.05.25	2012	*13*	13	1 MQ																							
					Totals	3046	1874	61	25	2	9	6	1	2	1	1	3	6	3	3	1	3	3	2	1	1	1	3	2	2	2

Phase 1 1988-1996 *productive*
1989-1993 well-cited work, varied coauthors
Early, Salby wrote often with NCAR, especially Garcia, then mostly CU CATA faculty colleagues, although last paper with them was submitted in 1993, after which CATA sharnk to Salby plus some grad students.

This seemed a productive period, 17 papers submitted, some very well-cited, with a variety of authors, some quite distinguished.

1994-1996 productive, good book
Salby wrote with PhD students, plus major book.

Phase 2 - 1997-2003
Salby's focus moved to ASA., became visible.

NSF2009 Grants 1,2 , major COI, $
$NSF →ASA → (AMSP →Salby)
NAG5-8311, fight with CU, CU-ASA
$NASA→CU→Salby→ASA?→(Salby)
Other ASA issues ,bad accounting, etc
$Either→ASA?→(Salby)
Odd Ack-vs-Claim, other combinations

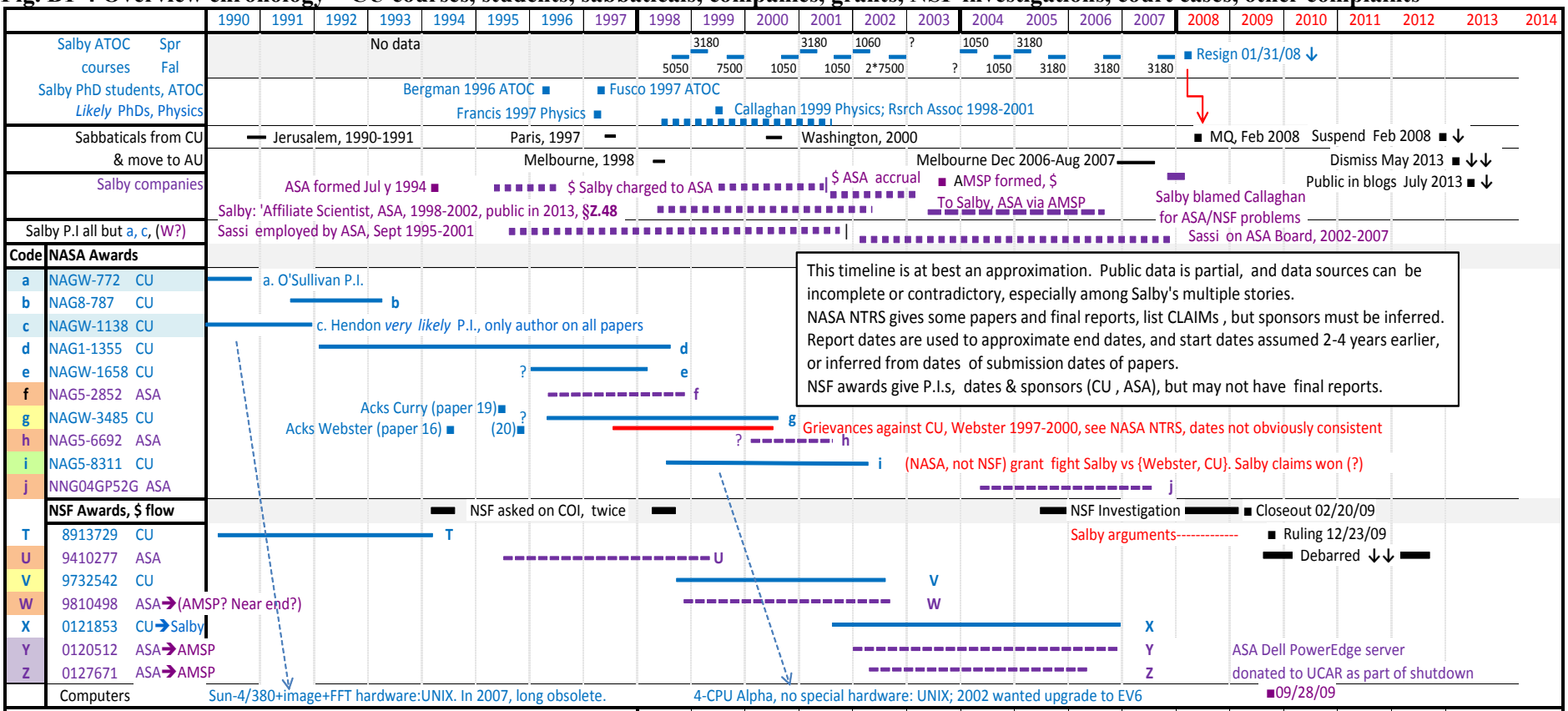
3 JPL
4 JPL 3 Edinburgh
4 JPL 5 CNRS 6 CNRS
4 JPL 3 Edinburgh

Phase 3 - 2004-2007 only ASA
All but one paper was coauthored by Callaghan , split ASA / CU .
Again, Salby always used CU affiliation.

Compared to influential 1990s work, far fewer people cited these papers.
Google Scholar counts from August 2014, had not changed much from October 2013.

Phase 4- 2008-2012 ASA gone, MQ
2 MQ 3 CAWCR
2 MQ 3 CAWCR

Fig. B1-4 Overview chronology – CU courses, students, sabbaticals, companies, grants, NSF investigations, court cases, other complaints



	~End	Venue	Red initiated by Salby (or son)	Result for Salby(↓,↑,?)
1	2008.04.29	CO Court	2001DR1458(District), Divorce	?
2	2005.10.06	CO Court	03CA0806, appeal of 01DR1458	↓↑,?
3	2009.02.09	NSF/OIG	Closeout Report of investigation	↓↓
4	2007.05.29	Federal Ct	1:07-cv-00225 Salby v. State of CO over DR1458	↓
5	2009.03.19	Federal Ct	1:08-cv-02517-RPM Salby v. U of CO, et al	↓
6	2010.02.01	CO Court	2009CV3789 Salby v. U of CO, et al	↓↓
7	2011.05.12	CO Court	2011CV801625(District), distraint, for $5398	↑?
8	2011.04.05	Federal Ct	1:11-cv-00068 Alon Salby v. State of CO	↓
9	2013.05.xx	MQ	MQ dismissal of Salby	↓↓
10	?	*Court?*	THE.AUST.2: *Salby says cannot talk, going to court*	?
11	2013.07.12	Blogs	Salby.email vs MQ	↓↓
12	2013.07.28	THE.AUST.2	DeSmogBlog.3 ends attempt to enlist scientist	↓
13	2013.08.11	NOVA.3	Try to discredit NSF, CU. More contradictions.	↓
14	2014.08.13	CITYJ.1	Rupert Darwall, Joanne Nova try again	↓

Phases 1-4 Narrative

1. 1989-1996 Well-cited work with CU CATA colleagues, NCAR.

Salby wrote papers and a well-regarded book. He wrote some with PhD students. A unit within Astrophysical, Physical and Planetary Sciences (APAS),[270] CATA had 3 faculty in 1988.[271] In1992-1993APAS reorganized into Astrophysics (11 faculty) and Planetary and Atmospheric Physics (22), most affiliated with labs, institutes, centers or programs.
By 1995 Salby was the only remaining CATA faculty member:[272]

> **p.9** 'CATA. This center, with **only one rostered faculty** member, has the designated purpose of outreach to the active atmospheric community (e.g., NOAA and NCAR) outside of the University. **The IRC was concerned with the lack of other faculty involvement in the center.** …
> **p.13** 'The Department should reexamine the rationale for the existence of CATA.'

The 7-faculty Program for Atmospheric and Ocean Sciences (PAOS), was then directed by Peter Webster, whose CV shows:

> '2000-2002: Professor, Program in Atmospheric and Oceanic Sciences, University of Colorado, Boulder, Colorado;
> 1992-2000: Director and Professor, Program in Atmospheric and Oceanic Sciences, University of Colorado, Boulder, Colorado'

Salby claimed to be Director of CATA, 1986-1999,[273], *plausible, but not very meaningful*, as Salby was the only faculty member for years.

In 2001, PAOS reported progress and challenges,[274] had evolved its emphasis and missions and at some point became the Department of Atmospheric and Ocean Sciences (ATOC).[275]
Various reports often complained of space constraints and low salaries for faculty, which might be relevant to the 1994 formation of ASA.[276]

2. 1997-2003 Focus on ASA, no CU faculty, less well-cited. COI issues.

Salby wrote a few more papers with PhD students and a few non-Boulder others, but collaboration with CU faculty and **NCAR** had stopped.
Most work involved ASA, with Patrick Callaghan or Fabrizzio Sassi.
According to the Salby.vs.Colorado court case, pp.2-3:[277]

> '4. **Between 1997 and 2000, Professor Salby brought grievances involving the departmental chair, Peter Webster**. The grievances stated that, among other offenses, the University had on separate occasions diverted from Professor Salby's federal research projects some $42,000 and some $56,000, which monies were required to meet the responsibilities of those grants. Those funds were contractually committed to Professor Salby's federal research, for which he held primary responsibility. **These funds were diverted from federal research projects during 1997** when Professor Salby was on sabbatical leave overseas. The University ignored Professor Salby's grievances for years, leaving the diversion of federal research funds uncorrected. Consequently, Professor Salby's responsibilities to the respective federal grants could not be met. Through normal reporting procedures, Professor Salby eventually advised the **National Science Foundation** of the circumstances and the matter was forwarded to the United States Inspector General's Office, who opened a **criminal**[278] investigation of the University. **The investigation resulted in the above-referenced funds being released to the research projects overseen by Professor Salby**. …
> 6. During 2001, Peter Webster resigned as departmental chair and, a year later, he announced his departure from the University as well. At nearly the same time, Webster, who figured centrally in Professor Salby's grievances, lodged with the University false allegations of research misconduct against Professor Salby. …'

It is difficult to assess the merits of these claims, which may or may not be accurate. Only NSF 9732542(V) was CU-sponsored in that period, but it started August 1998.
Excerpts from NASA grant NAG5-8311 *(i)* [279] on next page seem more relevant, but of course, had nothing to do with NSF OIG, which has no publicly-available records of Salby's claimed complaint.[280]

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[270] http://www.colorado.edu/FacultyAffairs/PRP-Archive.htm
[271] www.colorado.edu/FacultyAffairs/PRP%20Final%20Reports/APAS/APAS_cycle2.pdf
[272] http://www.colorado.edu/FacultyAffairs/PRP%20Final%20Reports/APAS/APAS_cycle3.pdf 1995 report: reorganized on trial basis 2 years ago.
[273] http://scef.org.uk/attachments/article/531/Flyer1.pdf, for more see **§Z.50**
[274] http://www.colorado.edu/FacultyAffairs/PRP%20Final%20Reports/PAOS/paos_cycle4.pdf
[275] http://paos.colorado.edu
[276] Of course, these might just be normal complaints about salaries in universities.

[277] http://www.desmogblog.com/sites/beta.desmogblog.com/files/1-MAIN.pdf http://www.desmogblog.com/sites/beta.desmogblog.com/files/Salby.vs_.CU_.highlight.pdf Complaint carried forward to the Colorado court
[278] This is possible, but quite unusual. OIG asks DoJ to do that, but rarely.
[279] http://ntrs.nasa.gov/search.jsp?R=20020078416
[280] That does not rule out the possible existence of records withheld for privacy reasons. One can only say there is neither closeout report nor anything else public.

Report to NASA on NAG5-8311(i) (fight with Webster and CU)
Diurnal Cycle of Convection and Interaction with the Large-Scale Circulation Final report to NASA. **June 25, 2002**.

> **p.1** 'The science in this effort was scheduled in the project's 3rd and 4th years, after a long record of high-resolution Global Cloud Imagery (GCI) had been produced. Unfortunately, **political disruptions that interfered with this project led to its funding being terminated after only two years of support**. …'
>
> **p.2** 'many of these studies rely on the Image Analysis Systems (IAS) that we developed to analyze space-time behavior in the GCI. The IAS provides a suite of space-time analyses to diagnose unsteady convective behavior. And it performs those analyses fast enough to be interactive. **This system is accessed remotely by off-site collaborators (e.g., at COLA, BMRC, and NCAR**.) Toward this end, the IAS has been **converted from its single-user hardware platform to a software platform that can simultaneously accomodate multiple users.** Until now, the formidable operations behind analyses like those in Figs. 2-6 could be performed efficiently only on specialzied hardware, in which FFT and image functionality are hardwired. However, rapid advances in RISC computer architecture make it now feasible to perform those operations on the new generation Alpha CPU. **The IAS has been installed on a workstation with 4 Alpha CPUs, where it can support multiple users**.[281] The conversion entirely to software also enable the IAS to be installed locally at the sites of collaborators.
>
> **Outlook:**…
>
> **14 years of GCI** has been produced, providing a continuous record of 3-hourly global imagery that spans a decade and a half. … These errors occur sporadically due to instrumental errors in the individual satellites, They must be treated *manually* for each of the ~45,000 images. … this final state of GCI processing is being done by half a dozen undergraduate students … enables an individual image to be corrected in a couple of minutes. …
>
> **Regrettably, support for this important work has expired**. Owing to the political disruptions that it experienced earlier, this project received only 2 of its 4 years of funding, **The individual who obstructed this project has since resigned.** His replacement has restored a stable environment in which this project can be pursued. As several researchers have expressed keen interest in the final record of GCI, we hope to establish support for the work to complete the final processing of the 14-yr record, to extend it to 2 full decades, and to perform the scientific component of this study that originally was to have been undertaken in years 3 and 4. That work with be proposed to an upocming NRA for this program, the release of which we are awaiting.

[281] See **§B.2**, the Alpha workstation seemed to be installed at ASA, not CU.

Commentary
This seems to have caused the fight with Peter Webster, [SAL2009, NSF2009], although some details differ. Papers claimed for this {21, 30, 31, 33, 35, 36 43} gave Callaghan or Sassi as ASA, **Fig. §B.1-3**.
Later, paper#45 was claimed as CU for both Salby and Callaghan., although it Ack'd a different combination of grants.
Paper#21 (1997) was the first public appearance of the **CU / ASA** pair.

CU *may have noticed at some point and withheld funds*.
Salby's court case claimed he got the money restored, but if so, it had not happened when the report at left was written. Following that report Salby got just one more NASA grant and no new NSF grants.
ATM-0121853(X) continued for a few years, almost always Ack'd only with CU affiliations. Callaghan's vita claimed a CU Research Associate job 1998-2001, **§B.3,** somewhat inconsistent with his 6 CU affiliations 2003-2006. Perhaps that job continued longer, but he was at ASA, too.

Earlier work was done on a Sun-4/180 (circa 1989) with special hardware via CATA, Paper#9, located at CU. Much-faster Alphas supported a standard environment*, almost certainly running a UNIX variant, not VMS*.
Papers 21, 30, 31, 35, 36 and 43 were ASA-coauthored, but omitted from list of off-site users. *Who owned the computer and where was it?*

Owned	Where	Issue
1 CU	CU	Why should ASA been allowed to use it?
2 CU	ASA	Why would it have been off-campus?
3 ASA	ASA	Why would ASA not have been mentioned to NASA?
4 ASA	CU	Why on-campus, hooked to network without approval?

[NSF2009] has following, perhaps referencing different equipment:

> '**p.14** 'Statement 2: The subject stated: "Equipment loaned by [Company 1] has made it possible for the university program to explore computational advances .... " {Redacted] stated in our interview with him that, without University knowledge and not as part of a mutual-benefit loan arrangement, Company 1 equipment was sited on the University campus and attached to University computing systems.' *This seems to be case 4 above.*

The individual was Peter Webster, from [SAL2009 pp.2-3].

3 2004-2007 Work only with ASA coauthors, few citations. COI.
Although still on the Board, Sassi had stopped working at ASA in 2002, but remained affiliated with NCAR throughout.

Salby had long-standing connections in Boulder outside CU, via NCAR, NOAA, NASA. *Most likely* he especially contributed mathematical theory, while others did more programming,[282] a common arrangement wherein the senior scientist tends to be the lead author. Salby's Phd was:

> 'Planetary waves in the upper atmosphere'[283] May 1978 at GA Tech.

Perhaps by 2007, Salby was far less familiar with the code than Callaghan, and really needed dedicated programming support to replace him, which may not have occurred until Titova started in late 2009.[284] If a researcher mainly wants to publish papers, it is helpful to have dedicated programming support not supplied by PhD students, who come and go, require more supervision and need to get some lead-author papers, **§D.3.**

According to [NSF2009, p.20]:

> 'When these conflicts were uncovered during the investigation, the Subject's response was to continue and expand his pattern of deception and obfuscation, and **to begin personal attacks on his former colleagues**.
> (fn) [Redacted] stated in an interview in April 2008 that the Subject blames him for the University and Federal investigation, even though the Subject directed all actions of Company 1 and Company 2, and received the financial benefits of the malfeasance. [Redacted] **asserted that the Subject's actions have made it difficult for** [redacted] **to find other employment in the area.**'[285]

Callaghan had supported Salby from 1988-onward, but given this rift, Salby was unlikely to get any further help from him.

[282] Callaghan and once, Matrosova.
[283] smartech.gatech.edu/handle/1853/11759, Aeronatical Engineering. www.grady69.org/class_profile_empty.cfm?member_id=988129 high school From divorce case, 2001DR1458, he was born in 1951.
[284] It is nontrivial to inherit code maintained for years by a few researchers for their own use, as opposed to software engineered as a program product.
[285] *Fortunately, I think he later landed at NCAR, hopefully a good outcome*.

4 2008-2013 ASA support gone, unproductive, dismissed for cause
Salby claims that MQ was the cause for low productivity, **§C.3-1, §C.3-2, §C.3-3**, but his career was already waning by 2002.

Salby filed many legal complaints, most fruitless, accomplishing little but distraction and lawyers' fees. Sometimes he failed to pursue cases, and **courts often had difficulty contacting him**.
Complaints followed a common pattern: all problems were someone else's fault and he was owed recompense.
Whether true or not, he was unsuccessful in court.
Most court records are attached at[MAS2013g] and the others can be found via the legal search engines mentioned there. Had Salby remained in the US, he may have had more serious problems than NSF debarment, **§D.4.** Had ASA and AMSP remained in operation, Salby's associates might also easily have been exposed to legal issues.

The evidence here not only strongly supports allegations against Salby by NSF and CU, but is quite consistent with MQ's explanations.[286]

Salby's research had little impact in climate change research, IPCC
FAR: 1990: no references to Salby
SAR: 1995: Chapter 4: Contributor, no references
TAR: 2001: no mention
AR4: 2007: one reference, to Salby and Callaghan(2004)[287]

Salby's specific work was not found especially relevant for climate change although work by others in the area was cited.[288] That is no criticism. Climate science is a large interdisciplinary field, and Salby's atmospheric fluid dynamics work was really more related to shorter-time-period meteorology than longer-term climate change. *Salby became quite dismissive of most other areas of climate science,* **§A.6.**

In any case, by 2008, the field did not seem to care much about Salby's work, he faced serious trouble at CU, and then left.

[286] Of course, it does not prove MQ is correct, but Salby's behavior is clear.
[287] http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-7-1-3.html
[288] For instance, AR4 cited famous researcher in this area, J.R. Holton ~7 times.

B.2 NASA and NSF grants to CU and ASA

B.2.1 Federal grant summary (matches §B.1-2)

Estimated from papers			Federal grant details and sources					Official sponsor: blue: CU, purple: ASA, but (*) for all NSF grants, both Salby and Callaghan gave only asac.org email addresses.
Start Date	**Est. End**	**Cd**	**NASA Award**	**Org**	**PI**	**Co-PI**	**$**	**Report**	**Title, found at http://ntrs.nasa.gov/search.jsp?R= *yyyynnnnnn i.e. Final Report #s***
	1990	a	NAGW-772	CU	O'Sullivan	Salby		19900041768	Coupling of the quasi-biennial oscillation and the extratropical circulation in the stratosphere through planetary w
1992?	1993.01.01	b	NAG8-787	CU	Salby	Garcia		19930010882	Planetary Circulations in the Presence of Transient and Self-Induced Heating (odd: Garcia only mentioned once)
1989	1991	c	NAGW-1138	CU	Hendon, *very likely*			not found	*Hendon only author on all NAGW-1138, only paper found at NASA: http://ntrs.nasa.gov/search.jsp?R=199100496*
1993?	1998	d	NAG1-1355	CU	Salby			19980036936	Observational and Modeling Studies of Radiative, Chemical, and Dynamical Interactions in the Earth's Atmosphere
	1998.08.01	e	NAGW-1658	CU?	Salby?	?		19980036936	EOS Interdisciplinary Investigation: Observational and Modeling Studies of Radiative, Chemical, and Dynamical Int
?	1999.01.01	f	NAG5-2852	ASA	Salby			19990064430	Synoptic Mapping of Chemical Composition, Thermal Structure, and Air Motion from UARS Observations
1993?	1999.01.01	g	NAGW-3485	CU	Salby			19990025898	Dynamical and Chemical Behavior of the Lower Stratosphere and Interactions with the Troposphere (11 items, in
1993?	2000	g	NAGW-3485	CU	Salby			20000029580	Dynamical and Chemical Behavior of the Lower Stratosphere and Interactions with the Troposphere (9 items, no
	2001.03.01	h	NAG5-6692	ASA	Salby			20010088171	Structure and Variability of Water Vapor in the Upper Troposphere and Lower Stratosphere (ASA 2003 Form 990:
1999.03.12	2002.02.28	i	NAG5-8311	CU	Salby		$159,769	20020078416	Diurnal Cycle of Convection and Interaction with the Large-Scale Circulation *(claimed fight with Webster and CU)*
2004.07.01	2007.06.30	j	NNG04GP52G	ASA	Salby	Callaghan		(none found)	Interannual changes of stratospheric chemical and dynamical structure … satellite measurements. $36K 2005 ASA
Salby used email mls@asac.org for all 7 NSF final reports									**The 7 NSF final reports can be found at this URL, sort by date to get same order:**
Start Date	**Est. End**		**NSF Award**	**Org**	**PI***	**Co-PI**			www.nsf.gov/awardsearch/simpleSearchResult?queryText=salby
1990.02.15	1994.01.31	T	8913729	CU	Salby	-	$297,868		The Interaction of Horizontal Transport and Photochemistry in the Stratosphere
1995.03.15	1999.03.15	U	9410277	ASA	Callaghan	Salby**	$345,674		Interdecadal Variability in the Stratosphere: Its Relationship to QBO, Solar Activity, and Biennial Variability in the Troposphere
1998.08.01	2002.07.31	V	9732542	CU	Salby	-	$379,660		Interannual Variations of Ozone and Their Relationship to Variations of Tropospheric Structure
1998.09.15	2002.08.31	W	9810498	ASA	Salby	Callaghan	$342,238		Interannual Variations in the Stratosphere and Their Relationship to Variations of Solar Activity
2001.09.15	2006.08.31	X	0121853	CU	Salby	Callaghan	$444,360		Interannual Changes of Stratospheric Dynamical and Chemical Structure and Their Relationship to Changes of the Residual Cir
2002.01.01	2006.12.31	Y	0120512	ASA	Salby	Callaghan	$331,361		Structure, Amplification and Nonlinearity of the 2-Day Wave
2002.03.01	2006.02.28	Z	0127671	ASA	Salby	Callaghan	$392,491		Influence of the Solar Cycle on the General Circulation of the Stratosphere and Troposphere
**Callaghan was then			NSF2009 Grants 1,2 , major COI, $				$2,533,652		$ NSF →ASA → (ASMP →Salby) (…) shows obscured transfers, ? Shows possible, not investigated cl
4 years before PhD,			NAG5-8311, fight with CU *(CU - ASA issue?)*						$NASA→CU→Salby→ASA?→(Salby) *Very likely COI issue with CU, perhaps noticed*
Salby wrote abstract,			Any others with explicit ASA involvement						$ Either→ASA?→(Salby) Potential problems, bad governance and accounting. Old records unavailable, not NS
led both papers.			*Odd Ack-vs-Claim combinations, retroactives*						Those above show real or easily-possible $-flow problems. *This might be COI problem, retroactive claims or carele*

[NSF2009] ruled that Salby had hidden the extent of his ASA involvement from CU and NSF, raising concerns on anything involving ASA.
This section analyzes Salby's reports to NASA[289] and NSF[290] and the next covers his publications, rife with chances for COI and deceptive practices.
The additional details strongly support CU and NSF:

- He gave his ASA affiliation to funders for the 7 known ASA grants above, but **that affiliation appeared nowhere in papers listed in §B.4.** He always gave his CU affiliation and physical mailing address.
- Salby provided all unshaded NASA final reports above, CU or ASA.
- He was PI on 3 of 4 NSF ASA grants, *almost certainly* led the other:[291] 'Abstract ATM-9410277 Salby, Murry Atmospheric Systems and Analysis…
- He gave 7 reports to the NSF, always with email mls@asac.org, even on the 3 sponsored by CU.
- Salby claimed credit for 3 book chapters on both CU and ASA grants, and several mixed CU and ASA grants,[292] clearly refuting Salby's claim that ASA work was separate and could not be done at CU.
- An Alpha workstation seemed to be used for both ASA and CU grants.

[289] http://ntrs.nasa.gov/search.jsp
[290] www.nsf.gov/awardsearch/simpleSearchResult?queryText=salby

[291] http://www.nsf.gov/awardsearch/showAward?AWD_ID=9410277
Only a single paper (#27) has been found for this grant and Salby led. The award started in 1995, ~4 years before Callaghan got his PhD.
[292] That could be legitimate, but in this context, it raises concerns.

B.2.2 NASA Grant NNG04GP252 (j)

The NSF closeout [NSF2009 p.4] states:

> 'In the period 2002-2005, Company 1 received funds through two NSF awards (Awards 1 and 2) and one award (Award 3) from NASA. … **Award 3 is a NASA award** to Company 1 based on proposal [redacted], submitted by the Subject and [redacted] on May 12,2003, and awarded in 2004. In that proposal, Subject presented himself as an employee of Company 1, even though funds from this award to the Subject were all routed through Company 2, and had been for two years prior to the proposal submission. There is no mention in the NASA proposal of Company 2, nor are funds requested for a subcontract to Company 2. The proposal was awarded based on a revised budget submitted March 22,2004, with a **start date of July 1,2004**, and an **expiration date of June 30,2007**.'
>
> It also shows $30,499+$90,480+$20,328 = $141,30 in salaries, reasonably consistent with the $177,997 total of the Form 990s.

Unlike the other NASA grants, no final report could be found,[293] but a FOIA request yielded a 45-page PDF that effectively confirmed this as Award 1:[294]

Progress Report, 08/01/05, **pp.1-2**, for Year 1:
This claims 4 papers in **§B.4.** Although an ASA contract, CU was given as Salby's affiliation for all 4 papers and Callaghan's on #44 and #46.
The Claims contradicted the Acknowledgements in 3 of the papers and the first 2 were already in final form well before this grant started:

#44 Ack'd only NSF ATM-0121853(X) and was claimed for it.
> 'Received 25 October 2002, in final form **31 March 2003**'

#46 Ack'd only NSF ATM-0121853(X) and was claimed for it.
> 'Received: November 21, 2003; Final Form: **March 15, 2004**'

#47 Ack'd only NSF ATM-0127671(Z), but no such claim was found.
> 'Received: March 28, 2005; Final Form: April 15, 2005'

#53 Ack'd NASA contract (j) and was claimed for it, as expected.
> 'Received: 22 AUG 2006, Revised: 6 OCT 2006'

Statement of Work, NNG-04GP52G, p.3.
> 'During year 2 of this project, interannual changes of stratospheric dynamical and chemical structure will be studied in relation to contemporaneous …'

Proposal, submitted to NASA 05/15/02, received 05/21/02,pp.4-45,
by Murry Salby, Patrick Callaghan, ASA.

> **p.20** 'Atmospheric Systems and Analysis (ASA) is a nonprofit corporation that performs applied research surrounding the processing and interpretation of global data. It provides an effective working environment, in which the Pis have been fruitful. Data products generated at ASA are made available to the scientific community, free of charge, and involve collaborations with other researchers in the area and in the US at large.
> **ASA operates a RISC computing facility to support such research. The budget of this proposal includes funds for a CPU upgrade and for additional disk storage to accommodate the extensive data and calculations required for this project.** Also included are funds for a video editing card, with which the composite life cycle of dynamical and chemical structure will be animated.'
>
> **p.35** 'CPU upgrade to Alpha EV6/1GHz'[295]
>
> **p.36** '51.5 % of Modified Direct Costs'[296]
>
> **p.42** '1400 W. 122nd Ave. #101 Westminster CO 80234'[297]

No ASA grant-funded paper was found in which Salby gave an ASA affiliation. Claims and acknowledgements often failed to match.
Sometimes work completed before a grant started was claimed for it.
Funds and equipment certainly seem to have been commingled, and location of ASA-owned equipment was unknown, with hints that it may have been in Salby's lab on-campus. Every additional detail found here corroborates [NSF2009] and CU court statements.
COI seems to have pervaded Salby's actions for more than a decade.

[293] It may have been written and not found by NASA, but Salby was in Australia during the last 6 months of this grant, and when he returned may well have been focused on the oncoming investigations, so it may never have been written.
[294] www.desmogblog.com/sites/beta.desmogblog.com/files/NNG04GP52G.pdf

[295] http://en.wikipedia.org/wiki/DEC_Alpha This must have been a 1GHz EV68CB. This was a powerful chip for its time, but within a few years, Intel and AMD CPUs were substantially faster, given 3-4X higher clock rates. They had gained the 64-bit capabilities of Alpha. At some point, ASA must have switched to a Dell PowerEdge server based on such chips. See **Report to NASA on NAG5-8311, §B.4.**
[296] This seems a bit high for 3 people, at least 2 part-time, working from small office.
[297] The earlier ASA Form 990s gave address 1299 Sheridan Blvd, Broomfield, CO' This address did not seem to appear in any Form 990s.

B.2.3 Reports to the NSF on 7 grants[298]

All claims have been copied into the list in **§B.4,** but are repeated here for ease of comparison.

An author can be supported by several different grants and fairly claim credit, but Salby claimed the highlighted chapters 37-39 for both CU and ASA, again disproving his claims of minimal involvement with ASA. It is plausible that several grants get acknowledged, especially for an authorship team with different affiliations, but most were sole-authored.

The book chapters/one-time proceedings are summarized below, followed by extracts of the reports, in which erroneous elements are underlined.[299]

NSF Final Reports, Books/One-Time

Cd	Award#	Spon	PI	Co-PI	37	38	39	40	41	51		Papers
T	8913729	CU	Salby	-								-
U	9410277	ASA	Callaghan	Salby								-
V	9732542	CU	Salby	-	V	V	-	-	-	-	-	
W	9810498	ASA	Salby	Callaghan	W	W	-	-	-	-		-
X	0121853	CU	Salby	Callaghan	X	X	X	X	-	-		8
Y	0120512	ASA	Salby	Callaghan	Y	Y	-	-	-	-		-
Z	0127671	ASA	Salby	Callaghan	Z	Z	Z	-	Z	Z		-

37 **M. Salby, 2002**: "Planetary Waves" in Robert E. Myers, Ed. *Encyclopedia of Physical Science and Technology (Volume 12 Phot-Pol),* January 1, 2002, (Academic Press).[300] Paul Crutzen was section editor, pp.357-371.[301]
CLAIM: **NSF 9732542(V), 9810498(W), 0121853(X), 0120512(Y), 0127671(Z)**

38 **Salby, M, 2003**: (Chapter 2, various titles),. inThomas D. Potter and Bradley R. Colman, Eds *Handbook of Weather, Climate and Water: Dynamics, Climate, Physical Meteorology, Weather Systems, and Measurements*, Wiley, August 2003.[302] This was the only edition found at Wiley, Amazon or Google Books. The 13 CLAIMS were slightly different, but title was usually wrong.
CLAIM: **NSF 9732542(V), 9810498(W), 0121853(X), 0120512(Y), 0127671(Z)**

39 **M. Salby, 2003:** "Gridding of global cloud structure from asynoptic satellite measurements." ,,,[303]
CLAIM: **NSF 0121853(X), 0127671(Z)**

40 **M. Salby, 2003:** "Synoptic mapping of global precipitation from asynoptic satellite measurements", 08/01/2003-08/01/2004, , A. Gruber and M. Kanamitsu"GEWEX-WCRP Report on Global Precipitation Climatology", 2003, "GEWEX".
CLAIM: **NSF 0121853(X)**

41 **M. Salby, 2003:** "Gridding of global precipitation from asynoptic satellite measurements", 03/01/2003-03/01/2004, "WCRP/GEWEX Report on Precipitation Analysis", 2003, "pp. 47-52.".
CLAIM: **NSF 0127671(Z)**

51 **M. Salby, 2003:** "Influence of the solar cycle on the general circulation of the stratosphere and upper troposphere," in "Solar Influence on Climate, ISSI Monograph", "Springer Verlag".
This seems to be this paper[304] *by Salby and Callaghan.*
Received 24 August 2005; Accepted in final form 31January 2006. *(7).*
CLAIM: **NSF 0120512(Y), 0127671(Z)**

[298] www.nsf.gov/awardsearch/simpleSearchResult?queryText=salby
Sort on date to get same ordering as here.
[299] People make errors, but readers may wonder about the sloppiness on such reports, compared to the detailed care in writing complex technical papers.
[300] www.amazon.com/Encyclopedia-Physical-Science-Technology-Phot-Pol/dp/B002I7JC2K The previous edition was in 1992: www.amazon.com/Encyclopedia-Physical-Science-Technology-Eighteen-Volume/dp/0122269292 First page preview is: www.sciencedirect.com/science/article/pii/B012227410500581O#PDFExcerpt
[301] books.google.com/books?id=lo1UAAAAMAAJ Previous edition was 1992
[302] www.wiley.com/WileyCDA/WileyTitle/productCd-0471214906.html http://books.google.com/books/about/Handbook_of_weather_climate_and_water.html?id=HIVUAAAAMAAJ Salby section starts at p.7.
[303] books.google.com/books?id=NA52QgAACAAJ www.amazon.com/Remote-Sensing-Clouds-Atmosphere-Proceedings/dp/0819446645
[304] link.springer.com/article/10.1007/s11214-006-9064-3
Space Science Reviews, August 2006, Volume 125, Issue 1-4, pp 287-303

Papers appear only once, but chapters accumulate from year to year for a grant, so appear multiple times. This is confusing, but is not Salby's problem, as it is seen in others' grant reports. Citation variations seem *odd*.

T 8913729[305] CU Salby - -
No papers or book chapters listed in report.

U 9410277[306] ASA Callaghan Salby
No papers or book chapters listed in report.

V 9732542[307] CU Salby
38-1 'Salby, M.. "Handbook of Weather, Water and Climate; Fundamental Equations, Chapter 2.", 08/01/1999-07/01/2000, , J. Tribbia 2000, "McGraw-Hill, New York".

37-1 Salby, M.. "Encylopedia of Science and Technology; Planetary Waves", 08/01/1999-07/01/2000, , P. Crutzen 2000, "Academic Press, New York".

38-2 M. Salby. "Handbook of Weather, Water and Climate; Fundamental Equations, Chapter 2.", 08/01/1998-07/31/2002, , J. Tribbia 2003, "Wiley".

37-2 M. Salby. "Planetary Waves", 08/01/1998-07/31/2002, , P. Crutzen" *Encylopedia of Science and Technology;"*, 2002, "Academic Press, New York".'

W 9810498[308] ASA Salby Callaghan
38-3 Salby, M.. "Fundamental Equations", 09/01/1999-08/01/2000, , J. Tribbia "Handbook of Water, Air, and Climate", 1999, "McGraw-Hill, New York.".

37-3 Salby, M.. "Planetary Waves", 09/01/1999-08/01/2000, , P. Crutzen "Encyclopedia of Science and Technology", 2000, "Academic Press, San Diego".

38-4 Salby, M.. "Fundamental Forces and Governing Equations", 09/15/1998-08/31/2002, , J. Tribbia "Handbook of Water, Air, and Climate", 2002, "Wiley, New York.".

37-4 Salby, M.. "Planetary Waves", 09/15/1998-08/31/2002, , P. Crutzen "Encyclopedia of Science and Technology", 2002, "Academic Press, San Diego".'

X 0121853[309] CU Salby Callaghan
This included claims for 8 papers listed in §B.4.

37-5 Salby, M.. "Planetary Waves.", 08/01/2002-08/01/2003, , P. Crutzen "Encyclopedia of Physical Science and Technology Vol. 12", 2002, "Academic Press, 357-371.".

37-6 Salby, M.. "Planetary Waves.", 08/01/2003-08/01/2004, P. Crutzen "Encyclopedia of Physical Science and Technology Vol. 12", 2002, "Academic Press, 357-371.".

39-1 M. Salby. "Gridding of global cloud structure from asynoptic satellite measurements.", 08/01/2003-08/01/2004, , K. Schafer, O. Lado-Bordowsky, A. Comeron, and R. Picard "Remote Sensing of Clouds and the Atmosphere VII", 2003, "SPIE, Bellingham WA. 232-239".

38-5 M. Salby. "Fundamental Forces and Governing Equations, Chapter~2,", 08/01/2003-08/01/2004, , J. Tribbia" {\it Handbook of Weather, Water, and Climate: Dynamics, Climate, Physical Meteorology, Weather Systems, and Measurements", 2003, "Wiley-Interscience, 7-20.".

40-1 M. Salby. "Synoptic mapping of global precipitation from asynoptic satellite measurements", 08/01/2003-08/01/2004, , A. Gruber and M. Kanamitsu"GEWEX-WCRP Report on Global Precipitation Climatology", 2003, "GEWEX".

37-7 Salby, M.. "Planetary Waves.", 08/01/2006-08/31/2006, , P. Crutzen "Encyclopedia of Physical Science and Technology Vol. 12", 2002, "Academic Press, 357-371.".

39-2 M. Salby. "Gridding of global cloud structure from asynoptic satellite measurements.", 08/01/2006-08/31/2006, , K. Schafer, O. Lado-Bordowsky, A. Comeron, and R. Picard"Remote Sensing of Clouds and the Atmosphere VII", 2003, "SPIE, Bellingham WA. 232-239".

38-6 M. Salby. "Fundamental Forces and Governing Equations, Chapter~2,", 08/01/2006-08/31/2006, , J. Tribbia" {\it Handbook of Weather, Water, and Climate: Dynamics, Climate, Physical Meteorology, Weather Systems, and Measurements", 2003, "Wiley-Interscience, 7-20.".

40-2 M. Salby. "Synoptic mapping of global precipitation from asynoptic satellite measurements", 08/01/2006-08/31/2006, , A. Gruber and M. Kanamitsu"GEWEX-WCRP Report on Global Precipitation Climatology", 2003, "GEWEX".'

[305] http://www.nsf.gov/awardsearch/showAward?AWD_ID=8913729
[306] http://www.nsf.gov/awardsearch/showAward?AWD_ID=9410277
[307] http://www.nsf.gov/awardsearch/showAward?AWD_ID=9732542
[308] http://www.nsf.gov/awardsearch/showAward?AWD_ID=9810498
[309] http://www.nsf.gov/awardsearch/showAward?AWD_ID=0121853

Y 0120512[310] **ASA Salby Callaghan**

38-7 'M. Salby. "Fundamental Forces and Governing Equations. ", 01/01/2002-12/01/2002, , J. Tribiia "Handbook of Weather, Water, and Climate", 2002, "John Wiley".

37-8 M. Salby. "Planetary Waves", 01/01/2002-12/01/2002, , P. Crutzen "Encyclopedia of Physical Science and Technology", 2002, "Academic Press, Volume 12, 357-371.".

38-8 M. Salby. "Fundamental Forces and Governing Equations.", 12/01/2002-12/01/2003, , T. Potter and B. Colman "Handbook of Weather, Water, and Climate", 2003, "Wiley-Interscience,Hoboken NJ,pp.7-20.

37-9 M. Salby. "Planetary Waves", 12/01/2002-12/01/2003, , P. Crutzen "Encyclopedia of Physical Science and Technology", 2002, "Academic Press, Volume 12, 357-371.".

38-9 M. Salby. "Fundamental Forces and Governing Equations. ", 12/01/2004-12/01/2005, , T. Potter and B. Colman "Handbook of Weather, Water, and Climate", 2003,"Wiley-Interscience,Hoboken NJ,pp.7-20.".

37-10 M. Salby. "Planetary Waves", 12/01/2004-12/01/2005, , P. Crutzen "Encyclopedia of Physical Science and Technology", 2002, "Academic Press, Volume 12, 357-371.".

38-10 M. Salby. "Fundamental Forces and Governing Equations. ", 01/01/2006-12/31/2006, , T. Potter and B. Colman"Handbook of Weather, Water, and Climate", 2003, "Wiley-Interscience, Hoboken NJ, pp. 7-20.".

37-11 M. Salby. "Planetary Waves", 01/01/2006-12/31/2006, , P. Crutzen "Encyclopedia of Physical Science and Technology", 2002, "Academic Press, Volume 12, 357-371.".'

Z 0127671[311] **ASA Salby Callaghan**

37-12 M. Salby. "Planetary Waves", 03/01/2002-03/01/2003, , P. Crutzen "Encylopedia of Physical and Technology", 2002, "Academic Press, Vol. 12, 357.371.".

38-11 M. Salby. "Fundamental Forces and Governing Equations.", 03/01/2002-03/01/2003, , J. Tribbia "In Handbook of Weather, Water, and Climate", 2003, "John Wylie".

37-13 M. Salby. "Planetary Waves", 03/01/2003-03/01/2004, , P. Crutzen "Encylopedia of Physical and Technology", 2002, "Academic Press, Vol. 12, 357.371.".

38-12 M. Salby. "Chapter 2: Fundamental Forces and Governing Equations.", 03/01/2003-03/01/2004, , T. Potter and B. Colman "In Handbook of Weather, Water, and Climate", 2003, "Wylie-Intescience".

39-3 M. Salby. "Gridding of global cloud structure from asynoptic satellite measurements.", 03/01/2003-03/01/2004, , K. Schafer, O. Lado-Bordowsky, A. Comeron, and R. Picard"Remote Sensing of Clouds and the Atmosphere.", 2003, "SPIE, Bellingham WA, 232-239".

41-1 M. Salby. "Gridding of global precipitation from asynoptic satellite measurements", 03/01/2003-03/01/2004, "WCRP/GEWEX Report on Precipitation Analysis", 2003, "pp. 47-52.".

37-14 M. Salby. "Planetary Waves", 03/01/2002-02/28/2006, , P. Crutzen "Encylopedia of Physical and Technology", 2002, "Academic Press, Vol. 12, 357.371.".

38-13 M. Salby. "Chapter 2: Fundamental Forces and Governing Equations.", 03/01/2002 02/28/2006, , T. Potter and B. Colman "In Handbook of Weather, Water, and Climate", 2003, "Wylie-Intescience". *(sic)*

39-4 M. Salby. "Gridding of global cloud structure from asynoptic satellite measurements.", 03/01/2002-02/28/2006, , K. Schafer, O. Lado-Bordowsky, A. Comeron, and R. Picard"Remote Sensing of Clouds and the Atmosphere.", 2003, "SPIE, Bellingham WA, 232-239".

41-2 M. Salby. "Gridding of global precipitation from asynoptic satellite measurements", 03/01/2002-02/28/2006, "WCRP/GEWEX Report on Precipitation Analysis", 2003, "pp. 47-52.".

51-1 M. Salby. "Influence of the solar cycle on the general circulation of the stratosphere and upper troposphere.", 03/01/2002-02/28/2006, "Solar Influence on Climate, ISSI Monograph", "Springer Verlag".

[310] www.nsf.gov/awardsearch/showAward?AWD_ID=0120512

[311] www.nsf.gov/awardsearch/showAward?AWD_ID=0127671

B.3 ASA's poor governance and COI

Salby's ASA was at the heart of his problems with CU and the NSF.

[NSF2009 p.4] wrote of ASA:

> **p.1** 'In 1994,the Subject created an outside, on-profit company (Company 1) with his [redacted], to receive federal funds from NSF and other agencies for research that paralleled his research at the University …
> '**The Subject never fully disclosed to either NSF or his University his association with Company 1, his dominant role in its activities and operations, or the extent of outside compensation received through it, instead minimizing his relationship with the company**.'
> **p.13** ***(Salby)***"First the organization which is referred to as 'your company' is, in fact, not. [Company 1] is not a private firm, **nor one in which I am even an officer**.[312] It is one of three firms with which I interact."
> **NSF:** By any reasonable standard, the Subject's statement was intentionally devised to deceive the NSF program officer." See **18USC§1001.**[313]

Salby-vs-CU case 1:08-cv-02517, document 19-2 [MAS2013g] has:

> **p.11** 'Salby's vitas during this time do not list any affiliation with ASA, other than "F. Sassi, Atmospheric Systems and Analysis" under Recent Collaborators. Patrick Callaghan's vitas list his current positions as "**Research Associate at CU, 1998-2001 and Scientist, at ASA, 1987-present**.[314] He is president of the company.'
>
> **p.12** 'Atmospheric Systems and Analysis (ASA) was formed in July, 1994 as a non-profit 501(c)(3) corporation in Colorado, although Salby was submitting proposals to NSF though the company in late 1993. **Jacquelyn Gratrix was the incorporattor, and there were three Board members: Salby, Callaghan and Rolando Garcia**, who apparently had no relationship to CU. Until 1996, the address of the company was Gratrix's home address. In 1996, the company moved to its current local in Broomfield, CO.'

CU, NSF, NASA and *Google Scholar* all had revealing information, but unless someone spent extra effort to cross-check, contradictions could evade detection, especially before the relevant databases appeared on the World Wide Web. NSF focused on the last contracts, 0120512(Y) and 0127671(Z), but clearly possessed other records, some still not public. This report gathers and analyzes additional public data.

Very few commenters showed the slightest understanding of US Federal grant rules that try to spend precious research money carefully and deter fraud, but try to avoid unnecessary paperwork. One who did understand was *Eli Rabett*,[315] whose succinct[316] comment is reproduced:

> 'To better understand what happened to Salby @ Colorado a bunny needs to know about the most complicated thing in science, the Institutional Base Salary. Briefly put this is the salary a university swears to the granting agencies that it will pay a faculty member each year, whether that faculty member gets grants or not. For tenure track faculty this is a nine month salary, for research faculty it is a twelve month salary. A grant or contract cannot provide more than the IBS rate (in the case of TT[317] faculty, they can pay summer salary in addition).
>
> Further, faculty can consult (usually on a 1 day a week basis), or be paid any amount by a non-federal source (Howard Hughes Medical Institution for example) which is not bound by the IBS.
>
> **Salby put himself on both sides of the transaction in order to exceed his IBS. First he was PI for the NSF/NASA grants** and directed that the money be sent to his company, ASA which he controlled, to pay him salary above his IBS rate. **Second, he was owner/creator of ASA** which accepted the subcontract from Colorado, and paid him. **Worse, when that got too hot he created a third company[318] which subed to ASA and paid him the money**. As the final straw, ASA charged it's full overhead rate on the sub to the third company, which **defrauded** (yes, a strong word) the government which limits overhead on subcontracts to the rate on the first $25K (to cover accounting costs).'

[312] This was a carefully-worded misleading statement. Officers bear legal responsibilities and this setup placed them on his junior helpers.
[313] codes.lp.findlaw.com/uscode/18/I/47/1001 potential felony, fines, up to 3 years
[314] The 1987 date cannot be right, but 1997 could make sense.

[315] http://rabett.blogspot.com A university professor experienced with NSF grants.
[316] bishophill.squarespace.com/blog/2013/7/9/climate-of-fear.html?currentPage=5. BISHOP.1, http://www.webcitation.org/6PDNVZu2V, also in **§Z.04.**
[317] Tenure-Track, which includes Tenured faculty such as Salby.
[318] AMSP. The timing of AMSP's creation was interesting.

The IRS expects tax-exempt 501(c)(3) entities to have good boards:[319]

> 'Irrespective of size, a governing board should include independent members and **should not be dominated by employees or others who are not, by their very nature, independent individuals because** of family **or business relationships**. The Internal Revenue Service reviews the board composition of charities to determine whether the board represents a broad public interest, and to **identify the potential for insider transactions that could result in misuse of charitable assets**. …
> B. *Conflicts of interest*…. In particular, the duty of loyalty requires a director **to avoid conflicts of interest that are detrimental to the charity**.'

ASA board composition almost guaranteed poor governance: [320]
The original Board was Salby, Callaghan and Garcia. Sassi switched from employee to Board in 2002. Gratrix was added, *likely* earlier.

Rolando Garcia, a senior NCAR scientist, whose 2011 C.V. [321] listed 10 papers with Salby, 1987-1994, and other relevant relationships:

> 'Graduate: *(PhD)* Atmospheric Science, 1974. University of Miami …
> 'Dissertation committees …
> Fabrizio **Sassi**, D.Sci., Universita degli Studi Bologna, 1991.
> Andrew **Fusco**, PhD., University of Colorado, 1997. *ATOC, Salby supervised*
> Gene **Francis**, PhD., University of Colorado, 1997.' *Physics, Salby likely sup.*

Murry Salby (PhD 1978)
Fabrizzio Sassi (PhD 1991), NCAR, and sometimes ASA as side job

> *Project Scientist*, NCAR, October 1999 - present
> ***Scientist*, ASA, September 1995-2001**
> *Associate Scientist*, NCAR, August 1994 – September 1999. …
> ***Community Services – Board of Directors of ASA, 2002-2007***

Patrick Callaghan, President (PhD 1999)[322]
Jackie Gratrix, Secty-Treasurer, Research Assistant, also worked at CU.

Salby clearly controlled ASA, contrary to his claims of non-involvement [NSF2009 pp.12-14.] He:

- was by far the most senior person actively involved
- was PI on almost all ASA grants, wrote the reports
- was usually lead and corresponding author
- created AMSP
- managed communication, contact and affiliation information so that normal procedures might not discover the contradictions.[323]

Salby-vs-CU case 1:08-cv-02517, document 1-MAIN [MAS2013g] gives text from Salby's complaint:

> **p.3** 'From December, 2006, through August, 2007, Professor Salby was on a second sabbatical leave outside the United States. This leave was approved by the University and conducted pursuant to University policy. Prior to leaving, Professor Salby filed a proposal to continue the funding of his research staff who would remain at the University to meet the responsibilities of Professor Salby's federal research projects. The proposal's submission was, without cause, blocked by the University. While Professor Salby was overseas, the University gave his research staff two weeks notice that they would be terminated. The University's actions resulted in the resignation of Professor Salby's research assistant, who Professor Salby had developed with federal research funds and who, for two decades, had overseen the operation of Professor Salby's laboratory, his computers, and his federal research projects.'

Unlike Callaghan and likely Gratrix**, Salby was not a company officer,** subject to additional reporting requirements and legal responsibilities.

The last 3 Form 990s listed him on Board, but with address unknown. They had worked for Salby for 15+ years, but he blamed Callaghan and left him and Gratrix to shut down ASA and deal with NSF.[324]

---

[319] www.irs.gov/pub/irs-tege/governance_practices.pdf
[320] [NSF2009] mentioned poor ASA financial controls. *I agree*. I have been a Trustee of a real 501(c)(3) (museum) for a decade, and have studied hundreds of Form 990s of different organizations. NSF wrote that Callaghan cooperated well. ***Salby was the clear driver. NSF assigned no culpability to anyone else, especially the junior people who were Salby's assistants. None is implied here.***
[321] acd.ucar.edu/~rgarcia/resume.pdf distinguished NCAR scientist
[322] Callaghan published 4 papers with Salby 1988-1991, showing CU CATA affiliation. So he seemed to be a grad student and/or research associate then, but in any case, ASA was formed July 1994, ~5 years before his PhD.

[323] As per **§D.3,** it easy for a large organization to possess all needed information, but distributed in such a way that no one person naturally puts it all together. This is even worse when multiple large organizations are involved.
When NSF started looking seriously, some of this came to light, but connections among people easily might not be so obvious to someone at the IRS receiving Form 990s. They cannot do serious research on every line of every filing. Instead, 501(c)(3) status often gets revoked from odd financials or complaints.
[324] *His treatment of Evgenia Titova seems similar.*

Fig. B.3-1 ASA Form 990 summary

IRS Year at ERI website								2002	2002	2003	2004	2005	2006	2007	2008
ASA FY end-dates:	1995.09	1996.09	1997.09	1998.09	1999.09	2000.09	2001.09	2002.09	2003.09	2004.09	2005.09	2006.09	2007.09	2008.09	2009.09
EIN 84-1274750		Early 990s no longer available.				Form 990 filing dates:		2003.08	2004.10	2005.05	2006.08	2007.08	2008.08	2009.07	2010.03
Callaghan, President* *'Among the consulting firm's founders, he was its President' (**§C.5**)*									1: $0	.1: $0	.1: $0	0: $0		?: $0	1: $0
Callaghan, Scientist								*List of*	25: $37,581	.25: $47,944	25: $58,747	26: $48,079	?: $32,746		1: $108
Gratrix, Secty-Treas*								*officers,*	0:$0	.2: $0	.2: $0	0: $0		?: $0	1: $0
Grattrix, Resrch Asst								*etc blank*	22: $19,939	20: $24,621	20: $24,194	22: $25,677	?: $16,403	? $ 291	
Salby, Board		*Salby later claimed to be Affiilated Scientist, 1998-2002, **(§Z.48)***							1: $0	.1: $0	1: $0	0: $0	?: $0 (unk)	?: $0 (unk)	1: $0 (unk)
Sassi, Board		*First Board: just Salby, Callaghan, Garcia*							1: $0	.1: $0	.1: $0	0: $0	?: $0	?: $0	
Garcia, Board									1: $0	.1: $0	1: $0	0: $0	?: $0	?: $0	
# employees, March								5	5	N/A	N/A	2			
Compensation of five highest paid employees other than officers, directors…								None	None	None	None	None	None	None	None
Compensation of five highest paid independent contractors for professional svcs								None	None	None	AMSP	None	None	None	None
** Callaghan and Gratrix must have been the **officers** of the company*									Tax preparer changed, Form 990s improved						
Programming services		*2006.08: "Murry Salby in a Board member and key employee at AMSP"*							$34,063	$13,373	$50,738			shutting	
Scientific support		*2006.08: "Murry Salby in a Board member and key employee at AMSP"*							$60,375	$41,625	$21,875	$38,489	$1,563	down	ended
Other salaries								$64,035	$59,887	$75,431	$75,687	$80,331	$58,998		
Mgmt/General								$14,750	$11,904	$25,060	$25,421	$34,122	$13,409		
Mgmt % of other salaries		*Some seem high for 2-employee company, a few grants*						23%	20%	33%	34%	42%	23%		
Accounts payable, accruals								$20,645	$28,994	$26,645	$94,304	$44,307	$69,874		
Gifts, grants, contribs			$216,287	$208,090	$199,020	$241,031		$138,785	$225,105	$204,185	$224,547	$185,382	$95,071	$5,088	
Form 990s are supposed to give concrete accomplishments, not just code names like these.															
NASA-uars		*NAG5-6692(h), apparently*						$84,929							
NSF-Basu		*Perhaps 9610498 (Pgm Manager: Anjuli S. Bamzi)*						$14,213							
NSF-Fein2		*Jay S. Fein was Pgm Mgr: 9410277, 0121853 , 0127671*						$10,714							
NSF-Fein3								$29,430							
NASA NAG4-6692(h)									$73,090						
NASA NNG04GP52G(j)											$53,656	$54,467	$69,874		
NSF 0120512(Y)									$43,149	$85,805	$85,611	$43,166	$24,418		
NSF 0127671(Z)		*Likely Fein2 or Fein3*							$49,884	$118,379	$85,281	$87,748	$780		

Tax-exempt ASA had to file IRS Form 990s.[325] Its financial year ended in September and only the more recent are still publicly available.
The first report was quite sloppy, listing no Board and giving nothing but vague codes for the research grants. With a new tax preparer, reports improved somewhat, but this raises serious concerns on the handling of earlier years. Troublesome numbers and concerns are shown in red.
Two years crucially show the AMSP connection.[326]

The IRS requires explicit "Compensation of five highest…" to avoid overpaying employees or funneling money to insiders as contractors. ASA never gave these, despite claiming 5 employees in early years. N/A for number of employees *seems especially strange*. Management/General expenses as 30-40% of "Other salaries" as overhead *seemed high*

No later than 2004.10, Salby should have been identified as both Director and high-paid contractor, a serious red flag for the IRS, but instead he formed AMSP, hiding this until the NSF investigated.
At best, ASA governance was poor. *At worst, it was designed that way*.

[325] www.eri-nonprofit-salaries.com/index.cfm?FuseAction=NPO.Summary&EIN=841274750
www.npccny.org/Form_990/990.htm helpful intro for those new to Form 990s
[326] Year 2005 filed 2006.08 p.22, Year 2006 filed 2007.08 p.22

B.4 Publications, coauthors and PhD students

This includes all found in Salby's 2008 MQ webpage, plus others from search, ~1991 onward.[327] Grant Acknowledgments and CLAIMs in NASA reports are shown when findable. This list is summarized in **Fig. §B.1-2.**

The same typographic conventions are used here as in rest of **§B:**
Blue: CU (with CU CATA group underlined),
Green: NCAR,
Purple: ASA/AMSP, proven or plausible COI/$ problems,
Black: other affiliations
Shaded light blue: publications not authored by Salby, given for context.

Paper #s are highlighted for clear or plausible COI problems:

[NSF2009] grants 1 and 2, serious COI

NAG5-8311, fight with CU, CU-ASA issue
Exact history still unknown.

Any others with explicit ASA involvement
Likely COI, but NSF did not closely investigate.

Odd Ack-vs-Claim combinations, retroactive(?) claims
These may indicate problems, such as retroactive claims, or just reporting carelessness. Some combinations seemed odd. Given submission-publication lags, people might submit a paper with one Ack, and spend effort from a later related grant to do revisions, and then claim that in a grant report. Following is a seeming retroactive case:

Grant	First Claim	First Ack	Report done	
2852(f)	**1992(#12)**	**1997 (#23)**	**1999**	**ASA 07/94**
3485(g)	1991 (#11)	None	1999 and 2000	

ASA started more than a year after the 1992 submission date of the first paper that Claimed **2852(f)**, but Acks only appeared years much later. No Acks were found for **3485(g)**, but Salby Claimed many papers for it. *This suggests that Salby Claimed old or other papers for credit on these grants when he wrote the reports in 1999-2000.*

[327] A few may have been missed, but not many.

2011.02.20 Archived, annotated version of his MQ website.[328]
Before CU, just listed with no analysis.

'Selected Articles

Salby, M, 1981*:* Rossby normal modes in nonuniform background configurations. Part I: Simple fields. *J. Atm. Sci*., 38 , 1803–1826.

Salby, M, 1981: Rossby normal modes in nonuniform background configurations. Part II: Equinox and solstice conditions. *J. Atmos. Sci*., 38,1827–1840.

Salby, M, 1982: Sampling theory for asynoptic satellite observations. Part I: Spectra, resolution, and aliasing. *J. Atm. Sci*., 39, 2577–2600.

Salby, M, 1982: Sampling theory for asynoptic satellite observations. Part II: Fast Fourier synoptic mapping. *J. Atm. Sci*., 39, 2601–2614.

Salby, M,[329] **Hartmann, D.,**[330] **Bailey, P., and J. Gille 1984**: Evidence for equatorial Kelvin waves in Nimbus-7 LIMS. *J. Atm. Sci*., 41, 220–235.

Salby, M, **1984**: Survey of planetary-scale traveling waves: The state of theory and observations. *Rev. Geophys. Space Phys*., 22 , 209–236. (Invited review).

Move *from GFDL to CU CATA. These are not included in the tables.*

Salby, M,[331] **and R. Garcia**, **1987**: Transient response to localized episodic heating in the tropics. Part I: Excitation and short-time near-field behavior. *J. Atm. Sci*., 44 , 458–498.[332] *(232)*

Garcia, R., and M. Salby, **1987**: Transient response to localized episodic heating in the tropics. Part II: Far-field behavior. *J. Atmos. Sci*., 44 , 499–530.

[328] http://web.archive.org/web/20110220013934/http://www.envsci.mq.edu.au/staff/ms/pubs.html
[329] GFDL, Princeton (a top climate modeling laboratory)
[330] Department of Atmospheric Sciences, University of Washington,
[331] GFDL Princeton, but current affiliation: CU CATA, so he had arrived at CU no later than 1986/1987.
[332] http://journals.ametsoc.org/doi/abs/10.1175/1520-0469%281987%29044%3C0458:TRTLEH%3E2.0.CO;2

Phase 1 1989-1996
Salby wrote with NCAR and then CU faculty colleagues, but their last papers together were submitted in 1993. This was a productive time, with some distinguished coauthors.

1 Salby, M,[333] **1989:** Climate monitoring from space: Asynoptic sampling considerations. *J. Climate* , 2 , 1091-1105, (Invited). *(29)*

Harry H. Hendon, and Brant Liebmann[334] **1990:** A Composite Study of Onset of the Australian Summer Monsoon *J. Atmos Sci* 47, 18 2227-2240, Sept 1990.

Received: September 1, 1989; Final Form: April 10, 1990 *(160)*

'*Acknowledgments.* Greg Holland kindly supplied the Australian station data. We are grateful to **Jackie Gratrix**[335] for preparing the manuscript and to the two reviewers for their critical comments. This work was supported in part by **NASA Grant NAGW-1138(c).**'

Hendon was the only author on all discoverable NAGW-1138(c) papers, including this and another in 1991. Grant must have started in 1988 or 1989.

2 **Salby, M.L., R.R. Garcia, 1990**: Dynamical perturbations to the ozone layer. *Physics Today*, 43, 38-46.[336]

Received: December 15, 1988; Final Form: November 6, 1989 *(22)*

3 **Salby, M.L., R.R. Garcia, D. O'Sullivan, and J. Tribbia,**[337] **1990**: Global transport calculations with an equivalent barotropic system. *J. Atmos. Sci*., 47, 188-214.[338]

Received: October 14, 1988; Final Form: August 21, 1989 *(30)*

'*Acknowledgments.* The authors are grateful to M. Juckes, M. Mcintyre, and an anonymous reviewer for providing comments on an earlier version of the manuscript. This work was supported, in part, under **NASA Grant NAGW-772 (a) (a).** Calculations were performed on the **NCAR Cray-XMP** with graphics support at the Center for Atmospheric Theory and Analysis.'

4 **Salby, M.L., D. O'Sullivan, R.R. Garcia, and P. Callaghan 1990**: Air motions accompanying the development of a planetary wave critical layer. *J. Atmos. Sci*., 47, 1179-1204.[339]

Received 15 December 1988, in final form 6 November 1989 *(18)*

'*Acknowledgments.* The authors are grateful for constructive comments provided during review. This work was supported in part by **NASA Grant NAGW-772 (a)**. Calculations were performed in the **NCAR Cray-XMP** and figures were composited by the NCAR graphics department.'

5 **Salby, M.L., D. O'Sullivan, R.R. Garcia, and P. Callaghan 1990**: The interaction of horizontal eddy transport and thermal drive in the stratosphere. *J. Atmos. Sci.*, 47, 1647-1665.[340]

Received: June 7, 1989; Final Form: January 5, 1990 *(18)*

'Acknowledgments. This work was supported in part by **NASA Grant NAGW-772 (a)**. The authors are grateful to M. Juckes and A. Smith for comments provided on an earlier version of the manuscript. Calculations were performed on **the Cray-XMP** at NCAR. Figures were composited at the NCAR Graphics Department.'

6 **Salby, M, P. Callaghan, S. Solomon**[341] **and R. Garcia, 1990**, Chemical fluctuations associated with vertically propagating equatorial Kelvin waves. *J. Geophys. Res*., 95, 20491-20505. [342]

Received: 2 NOV 1989. Accepted: 18 JUN 1990 *(15)*

'*Acknowledgments.* We would like to thank C. Leovy and M. Hitchman for their assistance with the LIMS V4 data. We are also grateful for comments provided during review. Observational calculations were performed on the Pyramid-90X[343] at the Center for Atmospheric Theory and Analysis at the University of Colorado. Numerical integrations were performed on the Cray-XMP at NCAR.'

[333] Department of Astrophysical, planetary, and Atmospheric Sciences, CU
[334] Hendon (corresponding author) @ CU CATA, Lebmann @ CU CIRES.
[335] Google: Jackie Gratrix yields many acknowledgements of her work in preparing manuscripts for various authors at CU. ASA work was later.
[336] scitation.aip.org/content/aip/magazine/physicstoday/article/43/3/10.1063/1.881228 '
[337] https://staff.ucar.edu/users/tribbia NCAR since 1978, distinguished
[338] http://journals.ametsoc.org/doi/abs/10.1175/1520-0469%281990%29047%3C0188%3AGTCWAE%3E2.0.CO%3B2
[339] http://journals.ametsoc.org/doi/abs/10.1175/1520-0469%281990%29047%3C1179%3AAMATDO%3E2.0.CO%3B2
[340] http://journals.ametsoc.org/doi/abs/10.1175/1520-0469%281990%29047%3C1647:TIOHET%3E2.0.CO;2
[341] Aeronomy Lab/NOAA, CU CATA), very distinguished scientist now at M.I.T.
[342] onlinelibrary.wiley.com/doi/10.1029/JD095iD12p20491/abstract *(paywall)*
[343] This was early 1980s computer, about 2X performance of VAX-11/780, UNIX.

Harry H. Hendon, and Brant Liebmann[344] **1991:** The Structure and Annual Variation of Antisymmetric Fluctuations of Tropical Convection and Their Association with Rossby–Gravity Waves. *J.Atmos Sci* 48, 2127-2140, Oct 1991. (Received: **September 20, 1990**; Final Form: April 4, 1991 *(61)*
'Acknowledgments. Discussions with Professors M. Yanai and M. Ghil and comments on an earlier version of the manuscript by Professor D. Hartmann, Dr. R. Madden, and the anonymous reviewer are gratefully acknowledged. Thanks also go to **Jackie Gratrix** for preparation of the manuscript. This work was supported in part by **NASA Grant NAGW-1138(c)**.' *Hendon likely PI*

7 **Salby, M, H. Hendon, K. Woodberry, and K. Tanaka, 1991**:
Analysis of global cloud imagery from multiple satellites. Bull. Amer. Meteor. Soc., 4, 467–479 (cover) (April 1991)[345] *(78)*
'Acknowledgments. The authors wish to thank Jeff Kiehl and anonymous reviewers for comments provided on earlier versions of the manuscript. Calculations and figures were prepared at the Center for Atmospheric Theory and Analysis. This work was supported by **NASA Grant NAGW-1138(c)**.'

8 **Ken Tanaka, Karen Woodberry, Harry Hendon, Murry Salby, 1991**:
Assimilation of global cloud imagery from multiple satellites.
J. Atmos. Ocean. Tech., **8,** 5 (Oct 1991), 613-626.[346]
Received 24 October 1990, in final form 10 March 1991 *(21)*
'Acknowledgments. The assimilation procedure described here was developed as part of the lead author's senior thesis under the supervision of Profs. M. Salby and E. Nemeth. The comments by R. Madden and the two anonymous reviewers led to improvements in the manuscript. This work was supported by **NASA Grant NAGW-1138(c)**.' *Closely related to previous paper, but not the same.*

9 **Karen Woodberry, Ken Tanaka, Harry Hendon, Murry Salby, 1991:**
An Interactive System for Analysis of Global Cloud Imagery,
J. Atmos. Ocean. Tech., **8,** 5 (Oct 1991), 627-638.[347]
Received 26 March 1990, in final form 10 March 1991 (4)
'*Acknowledgments.* This work was supported by **NASA Grant NAGW-1138(c)**. The authors extend their thanks to **Rolando Garcia** and anonymous reviewers ….'

This paper helps understand the evolution of computing behind some of Salby's research. Their interactive analysis system (IAS) must have been in operation by late 1989. By author ordering, the computer implementation was *very likely* done mostly by Woodberry and Tanaka.
The paper says:
'…the global cloud imagery (GCI)…
The hardware of the image analysis system (Fig. 4) consists of four components:
1) a central processing unit,
2) an image processing subsystem,
3) an array processor, and
4) storage devices,
which have all been integrated into a single unit. Together, these components permit the GCI to be accessed and a variety of covariance space-time properties to be calculated very efficiently.

a. Central processor
The .IAS is implemented on a **SUN 4 / 380 file server**[348] running UNIX. This system's CPU is rated at **16 MIPS** (million instructions per second) and is accompanied by **32 MB of memory**. In addition to general computiing capabilities, the SUN provides telecommunication to remote sites. The network file system operated by the SUN allows large data volumes to be transferred reliably to other sites over the ethernet**. Remote access to the IAS is possible across the ethernet**.
b. Image processing subsystem
Operating in tandem with the SUN is an Image Technologies, Inc. **(ITI)**
ITEX 151 image processing subsystem. The ITI performs a variety of two-dimensional image processing functions, such as image arithmetic, convolution, and contrast enhancement. …
c. *Array processor*
For computationally intensive operations and, in
particular, for calculating covariance quantities, the IAS
relies on the vector processing capabilities of a **SKY Computers, Inc. Warrior** array processor. …
d. Storage
The volume of information represented in the GCI makes storage and data transfer a critical factor. …
Image and Hovmoller archives are stored by season on optical disk cartridges. These cartridges hold approximately 270 MB per side and allow multiple writes. A full seasonal archive can be stored on one of the two sides. …. Four optical disk cartridges can store an entire year of the GCI, including both image and Hovmoller archives.[349]

[344] Hendon (corresponding author) @ CU CATA, Liebmann @ CU CIRES.
[345] http://journals.ametsoc.org/doi/abs/10.1175/1520-0477%281991%29072%3C0467%3AAOGCIF%3E2.0.CO%3B2
http://150.229.66.66/staff/hhh/pubs/gci.pdf
[346] http://journals.ametsoc.org/doi/abs/10.1175/1520-0426%281991%29008%3C0613%3AAOGCIF%3E2.0.CO%3B2
[347] http://journals.ametsoc.org/doi/pdf/10.1175/1520-0426%281991%29008%3C0627%3AAISFAO%3E2.0.CO%3B2

[348] This used 25MHz SPARC, available ~1989, likely as 4/280 upgrade.
[349] Thus, 1 year of GCI 4 disks x 270MB/side x 2 sides → = 2.16GB. In his NASA NAG5-8311 report, he wrote "14 years of GCI" or ~30GB, easily held in a mid-2000 laptop. This Sun-4/380 may well have been sitting in Salby's CU lab.

10 **Murry L. Salby,**[350] **Dennis J. Shea, 1991:** Correlations between solar activity and the atmosphere: An unphysical explanation . *JGR: Atmospheres*, Volume 96, Issue D12, pages 22579–22595, 20 December 1991.[351]
Manuscript Received: 11 APR 1991. *(57)*
'*Acknowledgments.* We are grateful to H. van Loon, K. Labitzke, **R. Garcia**, and J. Tribbia for comments provided on an earlier version of the manuscript. The National Center for Atmospheric Research is sponsored by the National Science Foundation.'

11 **Salby, M, and P. Callaghan, 1993**: Fluctuations in total ozone and their relationship to stratospheric air motions. *J. Geophys. Res*., 98, 2716–2727.[352]
Received: 28 OCT 1991, Accepted: 27 JUL 1992, Published Feb 20 1993.*(65)*
'*Acknowledgments.* We are grateful to Adrian Tuck for helpful discussions, to Bill Randall for providing some of the NMC analyses used in this study, and for constructive comments provided during review. Calculations and graphics were performed on the tracer analysis system in CATA. This work was supported by **NASA grant NAGW-772 (a)**.'
CLAIM: NAGW-3485(g){1999}[353]

12 **Salby, M and M. Juckes,**[354] **1994:** An algorithm for retrieving the circulation from satellite measurements of tracer behavior.
J. Geophys. Res.,99, 1403-1417.[355]
Received: 16 NOV 1992 Accepted: 8 JUL 1993 *(3)*
CLAIM: NAGW-3485(g){1999, 2000} and **NAG5-2852(f)**. *No Ack in paper.*

13 **Salby, M, and Hendon, H., 1994**: Intraseasonal behavior of clouds, temperature, and motion in the tropics. *J. Atmos. Sci* , 51 , 2207-2224.[356]
Received: March 19, 1993; Final Form: October 11, 1993. *(235)*
'Acknowledgments. The authors are indebted to Roland Madden, Klaus Weickmann, and anonymous reviewer who provided comments on earlier versions of the manuscript. We are also grateful to Brant Liebmann for providing the OLR data and EC analyses and to **John Christy** for providing the MSU data. Calculations were performed at the Center for Atmospheric Theory …. This work was supported by **NASA Grant NAG-1-1355(d)** and NOAA Grant NA16RC0-422.'
CLAIM: NAG8-787(b), shown as 1992, to be submitted.

14 **Hendon, H. and M Salby, 1994**: The life cycle of the Madden-Julian Oscillation. *J. Atmos. Sci.* , 51 , 2225-2237.[357]
Received: March 19, 1993; Final Form: October 11, 1993 *(501)*
'Acknowledgments. The MSU data were kindly provided by J. Christy and the OLR and wind analyses by B. Liebmann. Programming assistance was provided by K. Dedrick, K. **Tanaka**, and K. **Woodberry**. The comments of Roi Madden, Klaus W eickmann, and the reviewers are gratefully acknowledged. Calculations were performed at CAT A. Support for this work was provided by NASA Grant NAG-1-1355(d) and by NOAA Grant NA16RC0-422.'
CLAIM**: NAG8-787(b),** shown as 1992, to be submitted, with slightly different title: 'The structure and evolution of the Madden-Julian oscillation.'

15 **Salby, M,**[358] **Garcia, R., Hendon, H., 1994**: Planetary-Scale Circulations in the Presence of Climatological and Wave-Induced Heating. *J. Atmos. Sci.*, **51**, 2344–2367..[359]
Received: March 19, 1993; Final Form: Oct 11, 1993. *(134)*
'*Acknowledgments.* This paper follows from material that was presented at the *NCAR Colloquium on LowFrequency Variability in the Atmosphere* in Boulder, Colorado, during August 1987. The authors are grateful to Klaus Weidemann and to anonymous reviewers for comments provided on earlier versions of the manuscript. This work was supported by **NASA Grant NAG8-787(b)** and completed, in part, through the generosity generosity of W. Carpenter during difficult times. Calculations were performed on the NCAR Cray-YMP.'
CLAIM: NAG8-787(b), shown as 1992, to be submitted. CLAIM: NAG1-1355(d).

16 **Bergman, J and M Salby, 1994**: Equatorial wave activity derived from fluctuations in observed convection. *J. Atmos. Sci*., 51, 3791-3806.[360]
Received: August 26, 1993; Final Form: March 21, 1994 *(98)*
'Acknowledgments. The authors are indebted to **Harry Hendon** for numerous discussions that aided in the completion of this research. We wish also to thank Rolando Garcia, David Fritts, **Peter Webster**, and anonymous reviewers for their helpful comments. This work was supported by NASA Grant **NAG-1-1355(d).**
CLAIM: NAGW-3485(g){1999, 2000}

[350] Also Lady Davis Foundation Visiting Professor at Hebrew University.
[351] http://onlinelibrary.wiley.com/doi/10.1029/91JD02530/abstract
[352] http://onlinelibrary.wiley.com/doi/10.1029/92JD01814/abstract
http://ntrs.nasa.gov/search.jsp?R=19930044344
[353] Two slightly-different final reports were found, {1999} and {2000},
[354] http://cat.inist.fr/?aModele=afficheN&cpsidt=3978867, but @ CU for this
[355] http://onlinelibrary.wiley.com/doi/10.1029/93JD01860/abstract
[356] http://journals.ametsoc.org/doi/abs/10.1175/1520-0469%281994%29051%3C2207%3AIBOCTA%3E2.0.CO%3B2
[357] http://journals.ametsoc.org/doi/abs/10.1175/1520-0469%281994%29051%3C2225%3ATLCOTM%3E2.0.CO%3B2
[358] Also Lady Davis Foundation Visiting Professor at Hebrew University.
[359] http://journals.ametsoc.org/doi/abs/10.1175/1520-0469%281994%29051%3C2344%3APSCITP%3E2.0.CO%3B2
[360] http://journals.ametsoc.org/doi/abs/10.1175/1520-0469%281994%29051%3C3791%3AEWADFF%3E2.0.CO%3B2

17 Fusco, A and M Salby,**1994**: Relationship of horizontal eddy displacements to mean meridional motions in the stratosphere, *J. Geophys. Res.,* 99(D10), 20633–20645.[361] Received: 7 OCT 1993, Accepted: 24 MAY 1994 *(3)*
No acknowledgements in paper.
CLAIM: NAGW-3485(g){1999, 2000}

18 Salby, M, **1996**: *Fundamentals of Atmospheric Physics* . International Geophysics Series, Academic Press, 628 pp. 2nd Printing (2005) ***(457)***
CLAIM: NAGW-3485(g){1999, 2000} **§A.6** compares with 2012 edition.

Bergman, J., 1996: The diurnal cycle of clouds and its role in Time-Mean Energetics. PhD Dissertation, U. Colorado, Boulder CO. ATOC, Salby.
CLAIM: NAGW-3485(g){1999}

19 Bergman, J. and M. Salby, **1996**: Diurnal variations of cloud cover and their relationship to climatological conditions. *J. Climate,* 9, 2802-2820.[362]
Received: June 14, 1995; Final Form: April 22, 1996 *(80)*
'*Acknowledgments.* This work owes its success, in part, to discussions with and/ or contributing ideas from: J. Coakley, **J. Curry**, A. Del Genio, H. Hendon, J. Kiehl, J. London, B. Mapes, W. Rossow, M. Rozendaal, P. Zuidema, and an anonymous reviewer.'
CLAIM: NAGW-3485(g){1999}

20 Bergman, J. and M. Salby, **1996**: The role of cloud diurnal variations in time-mean energetics. *J. Climate,* 10, 1114-1124.[363] *(35)*
Received 17 April 1996, in final form 19 August 1996
Acknowledgments. This work owes its success, in part, to discussions with and contributing ideas by Bruce Briegleb, **Judith Curry**, Harry Hendon, **Peter Webster**, Charles Zender, and anonymous reviewers.
CLAIM: NAGW-3485(g){1999}

[361] http://onlinelibrary.wiley.com/doi/10.1029/94JD01806/abstract
[362] http://journals.ametsoc.org/doi/abs/10.1175/1520-0442%281996%29009%3C2802:DVOCCA%3E2.0.CO%3B2
[363] http://journals.ametsoc.org/doi/full/10.1175/1520-0442%281997%29010%3C1114:TROCDV%3E2.0.CO%3B2

Phase 2 1997-2003

CU-faculty coauthorship ended. Salby's focus moved to ASA, although he never gave that affiliation. Almost all papers included Callaghan or Sassi, but other coauthors appeared as well. Citations dropped.

21 Salby, M and P. Callaghan,[364] **1997**: Sampling error in climate properties derived from satellite measurements: Consequences of undersampled diurnal variability. *J. Climate* , 10 18-36 [365].
Received: October 24, 1995; Revised: April 1, 1996 *(52)*
'Acknowledgments. The authors are grateful to anonymous referees for constructive comments provided during review. This work was supported by **NASA Grant NAG-1-1355(d).**'
CLAIM: NAG5-8311(i).

22 Salby, M and P. Callaghan, Shea, D. **1997** Interdependence of the tropical and extratropical QBO: Relationship to the solar cycle versus a biennial oscillation in the stratosphere. *J. Geophys. Res*., 102(D25), 29789-29798 Dec 1997..[366].
Received: 24 APR 1997, Accepted 14 SEP 1997 *(29)*
'Acknowledgments. The monthly record of 30 hPa polar temperature was kindly supplied by Barbara Naujokat. Constructive comments on the manuscript were provided by anonymous reviewers. This work was supported by **NSF grant ATM-9410277(U).**'
CLAIM: ??

***Fusco, A.*, 1997**: The Horizontal Distribution of Total Ozone and its Relationship to Stratospheric Dynamics and Photochemistry. PhD Dissertation, U. Colorado, Boulder CO. ATOC, Salby.
CLAIM: NAGW-3485(g){1999}

***Gene Leonard Francis*, 1997**: Polar Stratospheric Circulations: Interhemispheric Differences and Their Relationship to Dynamical and Radiative Forcing, PhD Dissertation, CU, Physics.*Assume Salby advised*.
CLAIM: NAGW-3485(g){1999}.

[364] First published mention of ASA.
[365] http://journals.ametsoc.org/doi/abs/10.1175/1520-0442%281997%29010%3C0018%3ASEICPD%3E2.0.CO%3B2
[366] http://onlinelibrary.wiley.com/doi/10.1029/97JD02606/abstract

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Received: 26 AUG 1997; Accepted: 5 JAN 1998 *(11)*
'Acknowledgments. The authors would like to thank J. Waters and an anonymous reviewer for comments provided on the original manuscript. This study was supported by **NASA grant NAG 5-2852(f)**.
CLAIM: NAG5-2852(f).

24 **Sassi, F. and M. Salby**, **1998**: Impact of diurnal variability on UARS synoptic products. *Geophys. Res. Lett*. 25, 4349-4352.[368]
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CLAIM: NAG5-2852(f).

25 **Sassi, F. and M. Salby**, **1999**: Diurnal variations in the middle atmosphere observed by UARS. *J. Geophys. Res*. 104, 3729-3739.[369]
'Acknowledgments. The authors are grateful for constructive comments provided during review. This work was supported by **NASA grant NAG5-2852(f)**.'
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CLAIM: NAG5-2852(f).

26 **Patrick Callaghan, Andrew Fusco,* Gene Francis,+ Murry Salby,[370] 1999:** A Hough Spectral Model for Three-Dimensional Studies of the Middle Atmosphere, *J. Atmos. Sci.*, **56**, 1461–1480.[371] *(18)*
'*Acknowledgments.* This work benefited from interactions with J. **Tribbia**. Constructive comments were provided on an earlier version of the manuscript by **R. Garcia** and **F. Sassi** and on the final version during review.'
CLAIM: NAG5-1355(d) (submitted), NAGW-3485(g){1999, 2000}.

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27 **Fusco, A[373]. and M Salby,[374] 1999**: Interannual variations of total ozone and their relationship to variations of planetary wave activity. *J. Climate*,12, 1619-1629.[375]
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'*Acknowledgments:* The authors are grateful for constructive comments provided during review.'
CLAIM: NAG5-1355(d) (submitted, different title/journal), NAGW-3485(g){2000}

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Received: June 23, 1998; Revised: January 5, 1999 ***(156)***
'*Acknowledgments.* Data used in this study were kindly supplied by Dennis Shea of NCAR and B. Naujokat of the Free University of Berlin. The authors are grateful for input provided by **M. L. Chanin**,[378] K. Hamilton, and the referees. This work was supported by **NSF Grant ATM-94-10277(U)** and completed while MLS was hosted by CNRS.'

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'Acknowledgments. The authors thank the anonymous reviewers for their comments and suggestions. An early version of the manuscript benefitted from comments by R. **R. Garcia** and A. K. Smith of the Atmospheric Chemistry Division at NCAR. Support for this work was provided by **NASA Award NAG1-1355(d)** and **NSF Award ATM-9732542(V)**. The National Center for Atmospheric Research is sponsored by the National Science Foundation.
CLAIM: NAGW-3485(g){2000}

[367] http://onlinelibrary.wiley.com/doi/10.1029/98JD00108/abstract
[368] http://onlinelibrary.wiley.com/doi/10.1029/1998GL900170/abstract
[369] http://onlinelibrary.wiley.com/doi/10.1029/1998JD100068/abstract
[370] CU CATA affiliation for all. Salby was corresponding author.
* Current affiliation: Harvard,.+ Current affiliation: NCAR.
[371] http://journals.ametsoc.org/doi/abs/10.1175/1520-0469%281999%29056%3C1461%3AAHSMFT%3E2.0.CO%3B2 Salby:APAS
[372] books.google.com/books/about/A_Numerical_Study_of_the_3_dimensional_S.html?id=JYPdtgAACAAJ Salby seems *likely* to have supervised: paper#32,
[373] Salby student, PhD 1997, from ATOC Alumni list
[374] Bureau of Meteorology Research Centre, Melbourne, Permanent affiliation: CU
[375] http://journals.ametsoc.org/doi/abs/10.1175/1520-0442%281999%29012%3C1619:IVOTOA%3E2.0.CO%3B2
[376] Service d'Aeronomie/CNRS, Verrieres-le-Buisson, France. *(Sabbatical)*
[377] http://journals.ametsoc.org/doi/abs/10.1175/1520-0442%281999%29012%3C2652:CBTSCA%3E2.0.CO%3B2
[378] See **§Z.43**. Salby had known Dr. Chanin for at least 15 years. She was the Director @ CNRS, where Salby had done a sabbatical.
[379] National Center for Atmospheric Research (NCAR) Boulder
[380] http://journals.ametsoc.org/doi/abs/10.1175/1520-0469%282001%29058%3C1300%3ARIOAOT%3E2.0.CO%3B2

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CLAIM: NAG5-6692(h), NAG5-8311(i).

31 **Sassi, F., Salby, M., *and W. Read*,**[382] **2001:** Relationship between upper tropospheric humidity and deep convection.
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CLAIM: NAGW-6692(h), NAG5-8311(i).

32 **Patrick F. Callaghan and Murry L. Salby,**[383] **2002.** Three-Dimensionality and Forcing of the Brewer–Dobson Circulation.[384] *J. Atmos. Sci.*, 59, 976–991.
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CLAIM: NAGW-3485(g){2000}, as submitted, slightly different title.

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'Acknowledgments. Thanks to J. Kelly for assistance with high resolution GCI data. We would also like to thank J. McGinley, A. Heymsfield, A. Crook, and M. Moncrieff for their insights into the organization of tropical convection and its radiative properties, and **R. Garcia** and B. Boville for their comments. The National Center for Atmospheric Research is operated by the University Corporation for Atmospheric Research under the sponsorship of the National Science Foundation. A. Gettelman was supported at NCAR by the Advanced Study Program, the Atmospheric Chemistry Division and the Climate and Global Dynamics Division.'
CLAIM: **NAGW-6692(h)**, at that point, submitted, but with an unfound title: "Relationship of the tropical tropopause to changes of convection."
CLAIM: NAG5-8311(i)

34 **Salby, M. and P. Callaghan, 2002**: Interannual changes of the stratospheric circulation: Relationship to Ozone and tropospheric structure. *J. Climate*, 15 , 3673-3685.[387]
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CLAIM: NAGW-3846{2000}, at that point was submitted.

35 **F. Sassi, M Salby, H Pumphrey**[388]**, W Read,**[389] **2002**:Influence of the Madden-Julian Oscillation on upper tropospheric humidity.*JGR Atmos.* 107 D23[390] Received: 25 SEP 2001; Accepted: 5 FEB 2002. *(10)*
'Acknowledgments. This work was supported by **NASA Grant NAG5-6692(h)**.'
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36 **Salby, M., F. Sassi, P. Callaghan, Dong Wu,**[391] **Philippe Keckhut,**[392] ***Alain Hauchecorne, 2002:***
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No acknowledgments in paper.
CLAIM: NAG5-8311(i), NSF 0121853(X)

[381] journals.ametsoc.org/doi/full/10.1175/1520-0442%282001%29014%3C2281:SMOCSF%3E2.0.CO%3B2
[382] JPL, Pasadena, CA
[383] Salby was Corresponding Author, but Callaghan led (dissertation topic).
[384] http://journals.ametsoc.org/doi/abs/10.1175/1520-0469%282002%29059%3C0976%3ATDAFOT%3E2.0.CO%3B2
[385] Sassi had been affiliated at NCAR the entire time, but worked at ASA as a side-job for a few years. That ended, but he remained on the ASA Board. http://207.153.189.83/EINS/841274750/841274750_2002_01309F2E.PDF
[386] Sassi's C.V. also listed 'Gettleman, Salby, Randel and Sassi' for an earlier note in *SPARC Newsletter* 17, 22-25, 2001, which seemed redundant to catalog.

[387] http://journals.ametsoc.org/doi/abs/10.1175/1520-0442%282003%29015%3C3673:ICOTSC%3E2.0.CO%3B2
[388] U Edinburgh
[389] JPL, Pasadena, CA
[390] http://onlinelibrary.wiley.com/doi/10.1029/2001JD00133
[391] JPL, Caltech, Pasadena
[392] Service d'Aeronomie, CNRS,France:**Keckhut (§A.4-2013.04.1), Hauchecorne**
[393] http://onlinelibrary.wiley.com/doi/10.1029/2001JD000756/abstract

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37 **M. Salby, 2002**: "Planetary Waves" in Robert E. Myers, Ed. *Encyclopedia of Physical Science and Technology (Volume 12 Phot-Pol),* January 1, 2002, (Academic Press).[394] Paul Crutzen was section editor, pp.357-371.[395]
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38 **Salby, M, 2003**: Fundamental Forces and Governing Equations, Chapter 2, in *Handbook of Weather, Water, and Climate:*[396] *Dynamics , Cliimate, Physical Meteorology, Weather Systems, and Measurements* , T. Potter and B. Colman, eds. (Wiley-Interscience, Hoboken NJ, 2003), 7-20.[397]
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1. Overview-Atmospheric Dynamics (Joseph Tribbia).
2. Fundamental Forces and Governing Equations (Murry Salby).'
CLAIM: NSF 9732542(V), 9810498, 0121853(X), 0120512(Y), 0127671(Z)
(Chapter)

39 **Salby, M., 2003**: "Gridding of global cloud structure from asynoptic satellite measurements." In K. Schafer, O. Lado-Bordowsky, A. Comeron, and R. Picard "Remote Sensing of Clouds and the Atmosphere VII", 2003, "SPIE, Bellingham WA. 232-239. *Not found*.
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40 **Salby, M., 2003**: "Synoptic mapping of global precipitation from asynoptic satellite measurements", 08/01/2003-08/01/2004, , A. Gruber and M. Kanamitsu"GEWEX-WCRP Report on Global Precipitation Climatology", 2003, "GEWEX".
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41 **Salby, M., 2003**: "Gridding of global precipitation from asynoptic satellite measurements", 03/01/2003-03/01/2004, "WCRP/GEWEX Report on Precipitation Analysis", 2003, "pp. 47-52.".
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42 **Salby, M. L., and P. F. Callaghan, 2003**:Systematic changes of stratospheric temperature: Relationship between the tropics and extratropics, *J. Geophys. Res.*, 108, 4101.[398]
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CLAIM: NSF 0121853(X)

43 **Salby, M., F. Sassi, P. Callaghan, W. Read,[399] and H. Pumphrey,[400] 2003:** Fluctuations of cloud, humidity, and thermal structure near the tropical tropopause. *J. Climate* , 15 , 3428-3446.[401]
Received: March 27, 2002; Final Form: April 10, 2003 *(26)*
'*Acknowledgments.* The authors are grateful for constructive comments provided by a reviewer. This work was performed while the authors were supported by **NASA Grant NAG5-6692(h)** and **NSF Grant ATM- 0121853(X**'[402]
CLAIM: NAG5-8311(i), maybe, as 2 submitted papers may have been combined into this one, and neither were found.

[394] www.amazon.com/Encyclopedia-Physical-Science-Technology-Phot-Pol/dp/B002I7JC2K The previous edition was in 1992: www.amazon.com/Encyclopedia-Physical-Science-Technology-Eighteen-Volume/dp/0122269292 First page preview is: www.sciencedirect.com/science/article/pii/B0122274105005810#PDFExcerpt
[395] books.google.com/books?id=lo1UAAAAMAAJ Previous edition was 1992
[396] As seen shortly, the title was (slightly) in error.
[397] http://onlinelibrary.wiley.com/doi/10.1002/0471721603.ch2/summary
[398] http://onlinelibrary.wiley.com/doi/10.1029/2001JD002034/abstract
[399] NASA JPL, Pasadena
[400] University of Edinburgh, Edinburgh, United Kingdom
[401] http://journals.ametsoc.org/doi/full/10.1175/1520-0442%282003%29016%3C3428:FOCHAT%3E2.0.CO%3B2
[402] This is an example of funding issues of concern to NSF. Salby was PI on the NSF grant, via CU, Callaghan was co-PI, and he and Sassi gave ASA affiliations.

Phase 3 2004-2007

All papers were written with Matrosova (ASA) and/or Callaghan (usually ASA, sometimes CU). Citation counts dropped further.

44 **Salby, M. and P. Callaghan, 2004**: Interannual Changes of the Stratospheric Circulation: Influence on the Tropics and Southern Hemisphere. *J. Climate*, 17, 2003, p. 952[403].
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CLAIM: NSF 0121853(X), NASA NNG04GP52G(j)

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CLAIM: **NAG5-8311(i)** (2002.06.25) as submitted, 10 months before received.
It seems they finished it on NSF money, perhaps.
CLAIM: NSF 0121853(X)

46 **Salby, M. L., and P. F. Callaghan, 2004***:* Systematic Changes of Northern Hemisphere Ozone and Their Relationship to Random Interannual Changes *J. Climate*, 17, 965-985[405]
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47 **Salby, M. and P. Callaghan, 2005**: Interaction between the Brewer-Dobson circulation and the Hadley circulation. *J. Climate* , 18 , 4303-4316.[406]
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NO NSF CLAIM, but NASA NNG04GP52G(j)

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'Acknowledgments. The authors are grateful for constructive remarks provided during review. This work was supported by **NSF grant ATM-0121853(X).** '
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49 **Salby, M. L., and P. F. Callaghan, 2006:** Evidence of the solar cycle in the tropical troposphere. *J. Geophys. Res*. 111, D21113, doi:10.1029/2006JD007133.[408]
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'Acknowledgments. The authors are grateful for constructive remarks provided during review. Figures were produced by Jackie Gratrix. This work was supported by **NSF grant ATM-0127671(Z)**.'
NO CLAIM

50 **Salby, M. L., and P. F. Callaghan, 2006:** Relationship of the quasi-biennial oscillation to the stratospheric signature of the solar cycle. *JGR Volume 111, Issue D6,* 27 March 2006. [409]
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'Acknowledgments. The authors are grateful for constructive remarks provided during review. Figures were produced by Jackie Gratrix. This work was supported by **NSF grant ATM-0127671(Z)**.'
NO CLAIM

[403] http://journals.ametsoc.org/doi/abs/10.1175/1520-0442%282004%29017%3C0952:ICOTSC%3E2.0.CO%3B2
Final report to NSF mis-specified the year as 2003.
[404] http://journals.ametsoc.org/doi/abs/10.1175/1520-0442%282004%29017%3C0965%3ACOTTTA%3E2.0.CO%3B2
[405] http://journals.ametsoc.org/doi/abs/10.1175/3206.1
[406] http://journals.ametsoc.org/doi/abs/10.1175/JCLI3509.1
[407] http://onlinelibrary.wiley.com/doi/10.1029/2006JD007051/abstract
[408] http://onlinelibrary.wiley.com/doi/10.1029/2006JD007133/abstract
[409] http://onlinelibrary.wiley.com/doi/10.1029/2005JD006012/abstract

51 **Salby, M. and P. Callaghan, 2006:** Influence of the Solar Cycle on the General Circulation of the Stratosphere and Upper Troposphere, *Space Science Reviews* August 2006, Volume 125, Issue 1-4, pp 287-303 [410]
Received 24 August 2005; Accepted in final form 31January 2006. *(9)*
Correspondence: Salby, but via gratrix@icarus.colorado.edu
CLAIM: **NSF 0127671(Z)** (chapter, claimed for Salby alone)

52 **Salby, M. and P. Callaghan, 2006:** Residual mean transport in the stratosphere: Contributions from wave driving and seasonal transience, *J. Geophys. Res*., 111, D22304. [411]
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Email: Murry L. Salby (gratrix@icarus.colorado.edu)
'Acknowledgments. Figures were kindly produced by Jackie Gratrix.
This work was supported by **NSF grant ATM-0121853(X)**. '
CLAIM: **NSF 0121853(X)**.
P. F. Callaghan and M. L. Salby, Atmospheric and Oceanic Sciences, …, University of Colorado, Boulder, CO 80309, USA
(gratrix@icarus.colorado.edu)

53 **Salby, M. and P. Callaghan, 2007**: On the Wintertime Increase of Arctic Ozone: Relationship to Changes of the Polar-Night Vortex. *J. Geophys. Res.* 112 , D06116, doi:10.1029/2006JD007948. [412]
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'Acknowledgments. The authors are grateful for constructive suggestions provided during review. This work was performed while the authors were supported by NASA grant **NNG-04GP52G(j).**'
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54 **Salby, M. and P. Callaghan, 2007**: Influence of planetary wave activity on the stratospheric final warming and spring ozone. *J. Geophys. Res*. 112 , DOI: 10.1029/2006JD007536. [413]
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55 **Salby, M. Ludmila Matrosova,** [414] **and P. Callaghan, 2007**: Global Kelvin waves in the upper atmosphere excited by tropospheric forcing at midlatitudes, *J. Geophys. Res*. 112 , *Volume 112, Issue D6,* 27 March 2007 [415]
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56 **Salby, M. Ludmila Matrosova, 2007**: Anomalous thermal structure introduced during solar proton events, *Geophys. Res. Lett*., 34, L23702, doi:10.1029/2007GL029586, December 2007 [416]
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57 **Salby, M. and P. Callaghan, 2008**: Interaction of the 2-day wave with solar tides, *J. Geophys. Res*., 113, D14121, doi:10.1029/2006JD007892. [417]
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[411] http://onlinelibrary.wiley.com/doi/10.1029/2005JD006767/abstract
[412] http://onlinelibrary.wiley.com/doi/10.1029/2006JD007948/abstract
[413] http://onlinelibrary.wiley.com/doi/10.1029/2006JD007536/abstract

[414] http://www.esrl.noaa.gov/psd/people/ludmila.e.matrosova/vitae.html
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[415] http://onlinelibrary.wiley.com/doi/10.1029/2006JD007235/abstract
[416] http://onlinelibrary.wiley.com/doi/10.1029/2007GL029586/abstract
[417] http://onlinelibrary.wiley.com/doi/10.1029/2006JD007892/abstract

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18 Salby, M, 1996: *Fundamentals of Atmospheric Physics* . International Geophysics Series, Academic Press, 628 pp. 2nd Printing (2005) ***(457)***
CLAIM: NAGW-3485(g){1999, 2000} See **§A.6.**

37 Salby, M, 2002: Planetary Waves. in *Encyclopedia of Physical Science and Technology* , P. Crutzen Ed. Academic Press, 12 , 357-371.
CLAIM: NSF 9732542(V), 9810498(W), 0121853(X), 0120512(Y), 0127671(Z)

38 Salby, M, 2003: Fundamental Forces and Governing Equations, Chapter 2, in *Handbook of Weather, Water, and Climate:*[418] *Dynamics , Climate, Physical Meteorology, Weather Systems, and Measurements* , T. Potter and B. Colman, eds. (Wiley-Interscience, Hoboken NJ, 2003), 7-20.
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1. Overview-Atmospheric Dynamics (Joseph Tribbia).
2. Fundamental Forces and Governing Equations (Murry Salby).'
CLAIM: NSF 9732542(V), 9810498(W), 0121853(X), 0120512(Y), 0127671(Z)

39 Salby, M., 2003: "Gridding of global cloud structure from asynoptic satellite measurements." In K. Schafer, O. Lado-Bordowsky, A. Comeron, and R. Picard "Remote Sensing of Clouds and the Atmosphere VII", 2003, "SPIE, Bellingham WA. 232-239
CLAIM: NSF 0121853(X), 0127671(Z)

40 Salby, M., 2003: "Synoptic mapping of global precipitation from asynoptic satellite measurements", 08/01/2003-08/01/2004, , A. Gruber and M. Kanamitsu"GEWEX-WCRP Report on Global Precipitation Climatology", 2003, "GEWEX".
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41 Salby, M., 2003: "Gridding of global precipitation from asynoptic satellite measurements", 03/01/2003-03/01/2004, "WCRP/GEWEX Report on Precipitation Analysis", 2003, "pp. 47-52.".
CLAIM: NSF 0120512(Y), 0127671(Z)

[418] As seen shortly, the title was (slightly) in error.

46 Salby, M., 2006: "Influence of the solar cycle on the general circulation of the stratosphere and upper troposphere," in "Solar Influence on Climate, ISSI Monograph", "Springer Verlag".
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Received 24 August 2005; Accepted in final form 31January 2006. *(7).*
CLAIM: NSF 0127671(Z)

Salby, M, 2009: *Fundamentals of Atmospheric Physics* . International Geophysics Series, Academic Press, 2nd Edition (In Preparation)[420]
This became #18.

Phase 4 2008-2012
Salby moved to MQ, discussion in §A.3.

58 Murry L. Salby, Evgenia A. Titova, Lilia Deschamps, 2011:
"Rebound of Antarctic ozone", [421] *GRL* (05/16/11) *(40)*
Recvd: 2011.02.28, Revised: 2011.03.14, Accepted: 2011.03.27.

59 Murry L. Salby, 2011: "Atmospheric Temperature and Ozone: Forcing by Anomalous Wave Driving and the QBO", [422] *J. Atmos. Sci 68, 7 (July 2011).*
Recvd 2010.09.14, Final Form: 2011.02.07. *(4)*

60 Murry L. Salby, 2012:
Physics of the Atmosphere and Climate, 2nd Edn. (2012) [423]
Cambridge University Press, 718 pages. *(12) (Revision of above, §A.6.)*

61 Murry L. Salby, Evgenia A. Titova, Lilia Deschamps, 2012:
"Changes of the Antarctic ozone hole: Controlling mechanisms, seasonal predictability, and evolution", [424] *JGR* (05/26/12)
Recvd 2011.05.25, Revised 2012.04.08, Accepted 2012.04.10. *(13)*
'Acknowledgments. The authors are grateful for values of EEASC that were provided by NASA GSFC and for constructive comments that were provided during review.'
NOTE: Salby seems to have gotten no Australian grants.

[419] http://link.springer.com/article/10.1007/s11214-006-9064-3
Space Science Reviews August 2006, Volume 125, Issue 1-4, pp 287-303
[420] Salby's 2008 MQ list contradicts **§C.3-06** –he expected to publish in 2009.
[421] onlinelibrary.wiley.com/doi/10.1029/2011GL047266/abstract
[422] journals.ametsoc.org/doi/abs/10.1175/2011JAS3671.1
[423] www.researchonline.mq.edu.au/vital/access/manager/Repository/mq:17904
[424] onlinelibrary.wiley.com/doi/10.1029/2011JD016285/abstract

B.5 Teaching at CU – often rated poor

RateMyProfessors

Several commenters quickly found *RateMyProfessors*.[425] Since these ratings are anonymous and self-selected, they must not be over-interpreted. Here, the 7 ratings were useful, as they helped search in CU's own extensive internal ratings system. If the lowest rating, #5, is omitted, *helpfulness* and *clarity* rise only to 2.3. If (outlier) #4 is omitted, they drop to 1.4 on the 1-5 scale (poor-good).

Thus, of 7 ratings total, we find:
ATOC 1050: 4 poor, 1 average, for the entry course
ATOC 3180: 1 poor, 1 good ("upper div"), a later course[426]

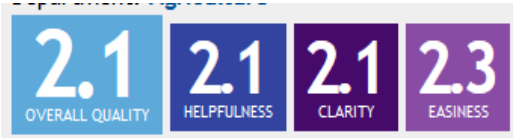
Much more extensive ratings results by CU were quite consistent with the comments here, albeit less colorful.

Salby did not seem to enjoy teaching, at least, many students did not enjoy his classes. He supervised ~4 PhD students, all in late 1990s.

Not all professors enjoy teaching, and even fine researchers can be poor lecturers, but some remedy that by being accessible to students. This analysis helps assess claims by MQ that Salby repeatedly refused to teach. The results also offer consistent evidence in support of CU, which wrote in the court case, p.118:[427]

> 'Attempts to communicate with Salby were impossible, and he often failed to attend his scheduled classes.'

Such results prove nothing about the MQ history, but its claims about Salby certainly resembled the CU history.[428]



DATE	CLASS	RATING	COMMENT
8/30/05	ATOC 1050	Poor Quality	Worst class I've taken at CU. Very unapproachable, rude, didn't explain diagrams he drew, uninteresting. If you're going to take this class, make sure you get the other teacher.
8/5/05	ATOC 1050	Poor Quality	One of the worst professors I've encountered. The class could have been interesting and clear but he made it complicated and completely unclear. Terrible instructor.
3/1/05	ATOC 3180	Poor Quality	Lectures very boring and dull...notes taken right out of the textbook so why bother going?
12/2/04	ATOC upper div.	Good Quality	Very knowledgable and posessed technical mastery of the material. Course was as interesting as the prof. Superb.
7/20/04	ATOC1050	Poor Quality	Very boring and unclear lectures.
5/20/04	ATOC	Poor Quality	I hated going to his classes. Boring!
3/13/04	ATOC 1050	Average Quality	Straightforward class, but a bit of a tightwad with policies, no curves on tests, and also has bad habit of totally stopping class for people talking the slightest bit...needs to loosen up there a bit IMO

[425] www.ratemyprofessors.com/ShowRatings.jsp?tid=365852
I bookmarked this site years ago, as it is handy for quickly locating an academic, even if results need care, but it was quickly discovered by others as well. Finding the extensive CU results took much more work.

[426] I have seen this pattern before: many poor ratings, one good outlier.

[427] www.desmogblog.com/sites/beta.desmogblog.com/files/Salby.vs_.CU_.highlight.pdf

[428] I could not find equivalent kinds of ratings at MQ.