Jerry Schubert Fest

Dr. Martin Ross Class of 1988
The Aerospace Corporation

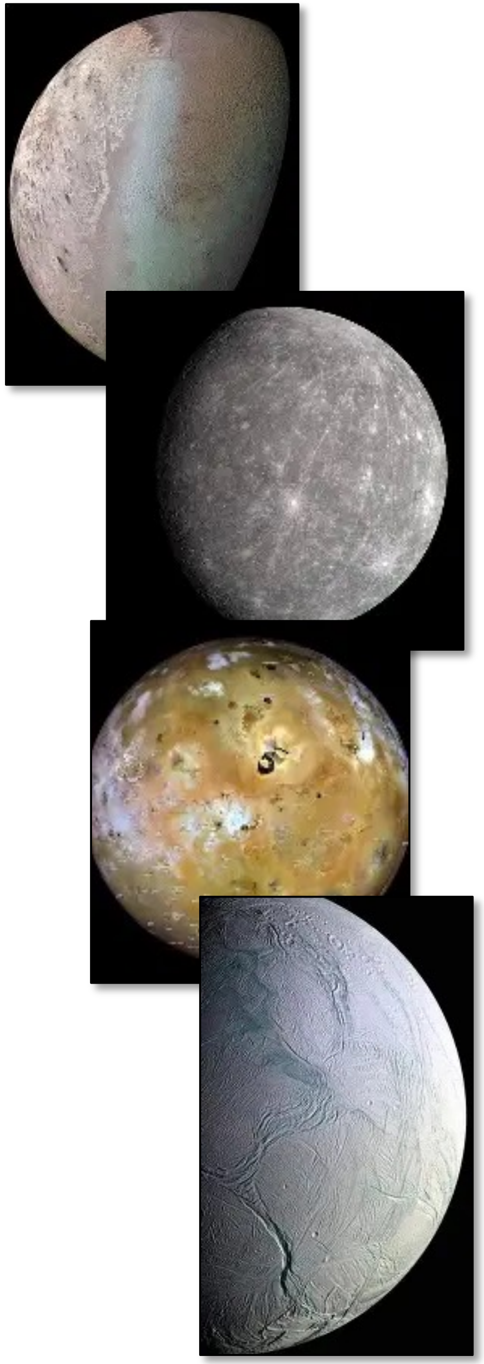
May 08 2026

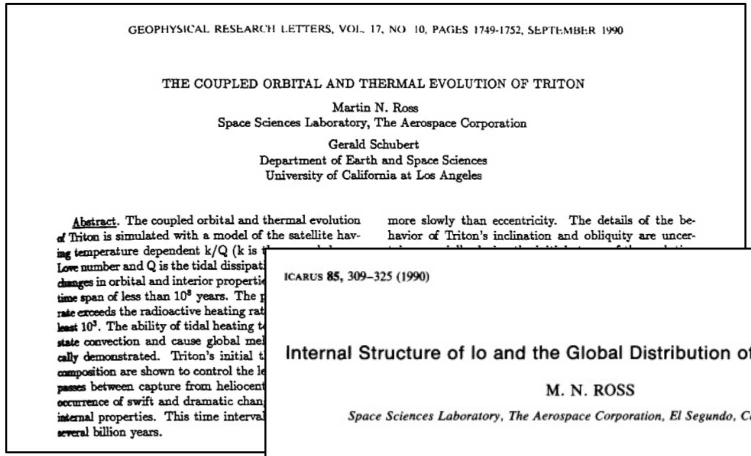
Me

- UM Aerospace Engineering 1981
- Met Jerry at 1981 AGU meeting
- Graduate student 1982 – 1988
- The Aerospace Corporation since 1988
- Continued to work with Jerry into 1990s

Grad School Years

- Internal Structure and Orbital Evolution of Planets and Satellites
- Tidal dissipation + thermal and dynamical evolution
- GRL and Icarus
- Enceladus paper second most referenced
- Always encouraged to work out ideas no matter how crazy
- Jerry was always out front in the Golden Age of Solar System exploration





GEOPHYSICAL RESEARCH LETTERS, VOL. 17, NO. 10, PAGES 1749-1752, SEPTEMBER 1990

THE COUPLED ORBITAL AND THERMAL EVOLUTION OF TRITON

Martin N. Ross
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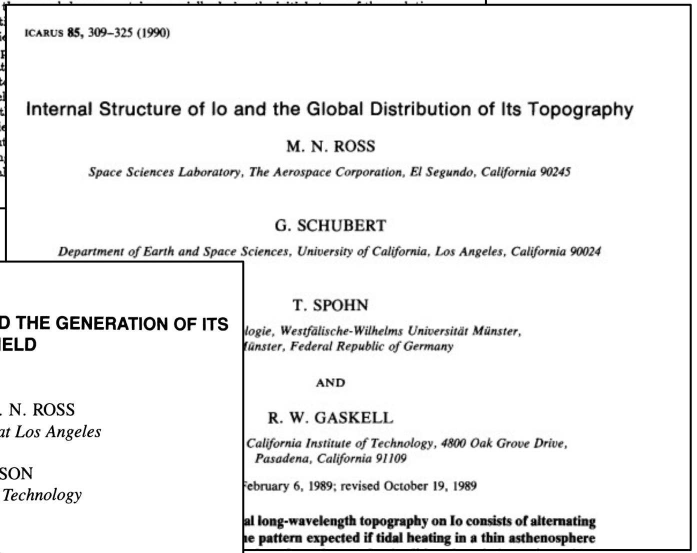
Gerald Schubert
Department of Earth and Space Sciences
University of California at Los Angeles

Abstract. The coupled orbital and thermal evolution of Triton is simulated with a model of the satellite hav- ing temperature dependent k/Q (k is ... Love number and Q is the tidal dissipat... changes in orbital and interior properti... time span of less than 10^8 years. The ... rate exceeds the radioactive heating rat... least 10^3. The ability of tidal heating t... state convection and cause global mel... cally demonstrated. Triton's initial t... composition are shown to control the le... passes between capture from heliocent... occurrence of swift and dramatic chan... internal properties. This time interval... several billion years.

more slowly than eccentricity. The details of the be- havior of Triton's inclination and obliquity are uncer-



ICARUS 85, 309–325 (1990)

Internal Structure of Io and the Global Distribution of Its Topography

M. N. ROSS

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G. SCHUBERT

Department of Earth and Space Sciences, University of California, Los Angeles, California 90024

T. SPOHN

...logie, Westfälische-Wilhelms Universität Münster, ...ünster, Federal Republic of Germany

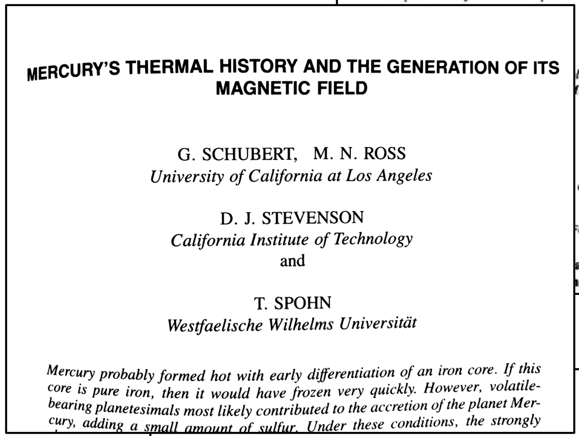
AND

R. W. GASKELL

...California Institute of Technology, 4800 Oak Grove Drive, Pasadena, California 91109

...ebruary 6, 1989; revised October 19, 1989

...al long-wavelength topography on Io consists of alternating ...e pattern expected if tidal heating in a thin asthenosphere



MERCURY'S THERMAL HISTORY AND THE GENERATION OF ITS MAGNETIC FIELD

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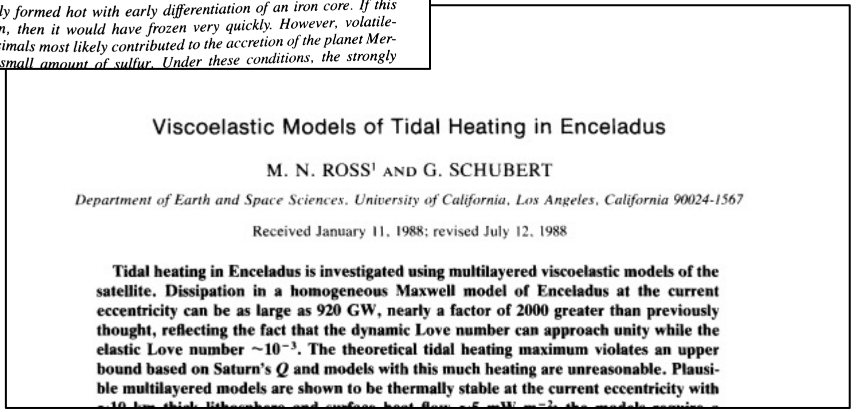
University of California at Los Angeles

D. J. STEVENSON
California Institute of Technology
and

T. SPOHN
Westfaelische Wilhelms Universität

Mercury probably formed hot with early differentiation of an iron core. If this core is pure iron, then it would have frozen very quickly. However, volatile-bearing planetesimals most likely contributed to the accretion of the planet Mercury, adding a small amount of sulfur. Under these conditions, the strongly



Viscoelastic Models of Tidal Heating in Enceladus

M. N. ROSS[1] AND G. SCHUBERT

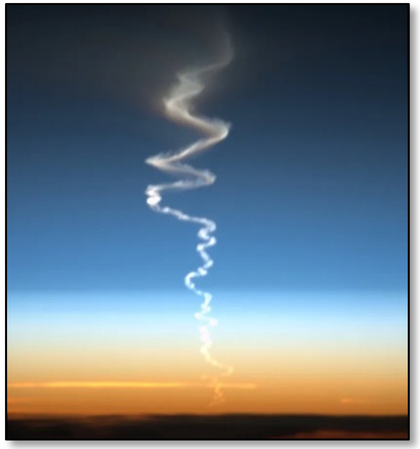
Department of Earth and Space Sciences, University of California, Los Angeles, California 90024-1567

Received January 11, 1988; revised July 12, 1988

Tidal heating in Enceladus is investigated using multilayered viscoelastic models of the satellite. Dissipation in a homogeneous Maxwell model of Enceladus at the current eccentricity can be as large as 920 GW, nearly a factor of 2000 greater than previously thought, reflecting the fact that the dynamic Love number can approach unity while the elastic Love number $\sim 10^{-3}$. The theoretical tidal heating maximum violates an upper bound based on Saturn's Q and models with this much heating are unreasonable. Plausible multilayered models are shown to be thermally stable at the current eccentricity with

THE AEROSPACE CORPORATION Connection

- Jerry consulted at Aerospace and brought me in
- Amazing place: Aerospace was like Bell Labs until the mid-1990s
- Jerry helped me move into atmosphere work
- Mentor: Richard Walterscheid
- Jerry and Richard were very productive at Aerospace
- Claim to Fame: invented the idea that gas and aerosol emissions from rockets and reentries could affect climate and stratospheric ozone



JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 92, NO. A8, PAGES 8775–8780, AUGUST 1, 1987

A Dynamical-Chemical Model of Tidally Driven Fluctuations in the OH Nightglow

R. L. WALTERSCHEID AND G. SCHUBERT

Space Sciences Laboratory, The Aerospace Corporation, Los Angeles, California

A theory is presented to explain tidally induced oscillations in the emission intensity I and rotational

Gravity Wave Propagation in Titan's Atmosphere

M.N. Ross, G. Schubert, and R.L. Walterscheid (The Aerospace Corporation, El Segundo, CA)

Observations of gravity wave activity in Titan's atmosphere can be used in conjunction with

Atmospheric dynamics and coupling

Show affiliations

Walterscheid, R. L. ; Lyons, L. R. ; Ross, M. N. ; Schubert, G.

This project is a component of a long-standing program of research into the dynamics and structure of the upper atmosphere. ...bjective of the ...rce and Space

GEOPHYSICAL RESEARCH LETTERS, VOL. 18, NO. 3, PAGES 420-423, MARCH 1991

CHANGES IN THE SOLAR FORCED TIDES CAUSED BY STRATOSPHERIC OZONE DEPLETION

Martin N. Ross and Richard L. Walterscheid

Abstract. ...thropogenic tra... the solar-driven... that have occu... ward propagati... ozone depletio... tudes since cir... but are genera... rate measure c...

AGU PUBLICATIONS

...h's Future

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Radiative forcing caused by rocket engine emissions

Martin N. Ross[1] and Patti M. Sheaffer[2]

[1]Civil and Commercial Launch Projects, The Aerospace Corporation, Los Angeles, California, USA, [2]Remote Se... Department, The Aerospace Corporation, Los Angeles, California, USA

...gine exhaust exerts

ELSEVIER

Journal of Space Safety Engineering

Volume 9, Issue 3, September 2022, Pages 469-477

Implications of a growing spaceflight industry: Climate change

Martin N. Ross, Karen L. Jones

What I learned From Jerry

- How to write
- Take the 50 km view
- Uncertain? Parametrize
- Do not get overly detailed
- Collaborate
- Boundary conditions
- Give credit generously

The dreaded Red Pen

2.5 Conservation of Momentum: The Navier-Stokes Equations of Motion 33

$$\rho\left(v_r \cancel{\frac{\partial v_r}{\partial r}} + \frac{v_\theta}{r}\frac{\partial v_r}{\partial \theta} - \cancel{\frac{v_\theta^2}{r}} + v_z \frac{\partial v_r}{\partial z} + \cancel{\frac{\partial v_r}{\partial t}}\right) = \rho g_r - \frac{\partial p}{\partial r} + \mu\left[\frac{\partial}{\partial r}\left(\cancel{\frac{1}{r}\frac{\partial}{\partial r}}(r v_r)\right) + \frac{1}{r^2}\cancel{\frac{\partial^2 v_r}{\partial \theta^2}} - \frac{2}{r^2}\frac{\partial v_\theta}{\partial \theta} + \cancel{\frac{\partial^2 v_r}{\partial z^2}}\right], \tag{2.11r}$$

$$\rho\left(v_r \cancel{\frac{\partial v_\theta}{\partial r}} + \frac{v_\theta}{r}\frac{\partial v_\theta}{\partial \theta} + \frac{v_r v_\theta}{r} + v_z \cancel{\frac{\partial v_\theta}{\partial z}} + \frac{\partial v_\theta}{\partial t}\right) = \rho g_\theta - \cancel{\frac{1}{r}\frac{\partial p}{\partial \theta}} + \mu\left[\frac{\partial}{\partial r}\left(\cancel{\frac{1}{r}\frac{\partial}{\partial r}}(r v_\theta)\right) + \frac{1}{r^2}\cancel{\frac{\partial^2 v_\theta}{\partial \theta^2}} + \frac{2}{r^2}\frac{\partial v_r}{\partial \theta} + \cancel{\frac{\partial^2 v_\theta}{\partial z^2}}\right], \tag{2.11θ}$$

$$\rho\left(v_r \cancel{\frac{\partial v_z}{\partial r}} + \frac{v_\theta}{r}\cancel{\frac{\partial v_z}{\partial \theta}} + v_z \frac{\partial v_z}{\partial z} + \cancel{\frac{\partial v_z}{\partial t}}\right) = \cancel{\rho g_z} - \frac{\partial p}{\partial z} + \mu\left[\frac{1}{r}\frac{\partial}{\partial r}\left(\cancel{r\frac{\partial v_z}{\partial r}}\right) + \frac{1}{r^2}\cancel{\frac{\partial^2 v_z}{\partial \theta^2}} + \frac{\partial^2 v_z}{\partial z^2}\right]. \tag{2.11z}$$

Closing Thoughts

- Jerry had a hand inventing the concept of planetary science
- He taught me how to be an interdisciplinary scientist
- He was a great guy
- Thanks Jerry