



Leidecker: NASA to Re-try Delta / GOES This Summer



DR. LEIDECKER

Dr. Henning Leidecker, NASA Goddard Space Flight Center, will discuss his problems and solutions in the Geosynchronous Orbiting Environmental Satellite (GOES) program, with emphases on the successes, in his June 7 National Capital Astronomers lecture. One GEOS was lost in the recent Delta rocket failure; another launch is expected in late summer.

The annual NCA Science Fair Awards will also be presented (See page 39).

Hundreds of lives and hundreds of millions of dollars in property losses are now saved each year by satellite hurricane warnings. Millions of us also see the visual images from the GOES each day on weather telecasts. Goes images in infrared keep the satellite working in the dark; combining goes data allows synthesis of three-dimensional images of clouds. Among a variety of other functions of GOES is distribution of the very precise National Bureau of Standards time base, corrected for signal transit time.

The GOES series was created by the National Oceanic and Atmospheric Administration (NOAA)

in 1970, and is managed by NASA-GSFC. Hughes Aircraft Corporation is the prime contractor.

One small flaw in the design, which seemed reasonable at the time, has shortened the useful term of a number of GOES satellites. Dr. Leidecker is a member of a team which has analyzed and corrected the problem. He will describe his work on this interesting problem and its solution.

Dr. Leidecker received his Ph.D. in physics from Catholic University in 1968. Before coming to NASA he worked at Bell Laboratories, consulted at NIH on thermal physics, and was professor of physics at American University. He is a member of the American Association for Advancement of Science and the American Physical Society, and is a past president of National Capital Astronomers.

JUNE CALENDAR -- *The public is welcome.*

- Tuesday, June 3, 10, 17, 24, 7:30 pm -- Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.
- Friday, June 6, 13, 20, 27, 7:30 pm -- Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.
- Saturday, June 7, 6:00 pm -- Dinner with the speaker at the Ding How Restaurant, 1221 E Street, NW. Reservations unnecessary.
- Saturday, June 7, 8:15 pm -- NCA monthly lecture at the U.S. Department of Commerce Auditorium, 14th Street and Constitution Avenue, NW. Dr. Leidecker speaks.
- Saturday, June 14, July 26, August 9, 9:00 pm -- *Exploring the Sky*, presented jointly by NCA and the National Park Service. Glover Road south of Military Road, NW, near Rock Creek Nature Center. Planetarium if cloudy. Information: John B. Lohman, 820-4194.
- Friday, June 6, 13, 27; July 11, 25, 9:30pm -- NCA 14-inch telescope open nights with Bob Bolster, 6007 Ridgeview Drive, south of Alexandria off Franconia Road between Telegraph Road and Rose Hill Drive. Call Bob at 960-9126.
- Saturday, 12 July, 9:00 pm -- Special Algonkian Park program. Volunteers needed. See page 40.

MAY LECTURE

Dr. John E.P. Connerney, NASA Goddard Space Flight Center, discussed the magnetospheres of the outer planets, particularly that of Uranus, in his May 3 National Capital Astronomers lecture. His emphasis was on the recent magnetic-field investigations by the Voyager 2 spacecraft.

Dr. Connerney first described the two flux-gate magnetometers, mounted on the end of the 13-meter boom, the longest ever flown on a spacecraft, to avoid magnetic disturbances from the craft. These sensitive devices measured interplanetary fields of less than 0.1 nanotesla (nT), about one half-millionth of the Earth's field strength at this location; their wide dynamic range can encompass both.

He then described briefly the self-sustaining dynamo model of the planetary-field-generation mechanism. Prerequisites include an electrically conducting fluid core, a radial transport mechanism, as convection, and, probably necessary, rotation of the body. Mapping of the magnetic field thus reveals much about the interior conditions of a planet.

Charged particles experience a force, the vector cross product of velocity with field, which constrains them to orbit magnetic field lines. The magnetosphere thus also organizes the particle environment of the planet.

Each of the large outer planets, Jupiter, Saturn, and Uranus, has interesting individual peculiarities. Jupiter's magnetodisk, Saturn's coaxial magnetic and rotational axes, and Uranus' excentric dipole. Connerney described each of these in turn, and discussed the impact of the observations on the model.

A charged-particle flux, apparently from Io, is steered by Jupiter's magnetosphere into a ring current of about 300 megamperes. The resulting perturbation field deflects the Jovian dipole field lines nearly radially outward at low magnetic latitudes, thus altering Jupiter's magnetosphere into a magnetodisk. A magnetohydrodynamic equilibrium apparently exists: if the disk were of greater radius the charged-mass ring would dissipate; if the radius were smaller the perturbation field would push it out.

A spherical harmonic analysis of the magnetic-field data acquired along the trajectory of the spacecraft yields a surface map of field contours. A maximum field of about 13 Gauss at the north magnetic pole, and a minimum of about 4 Gauss at the magnetic equator, were measured. For comparison, The Earth's maximum polar field is about 0.65 Gauss and equatorial field of about 0.3 Gauss. Jupiter's internal field shows a harmonic (quadropole, octopole, etc) content of 20 to 25 percent on the surface. The dipole axis differs by 9.6 degrees from the rotational axis.

A good model of Jupiter's internal field and magnetodisk has been derived from Pioneer and Voyager encounter data, after accounting for the ring currents.

Connerney suggests that encounters by the Galileo and Solar Polar Missions around 1990 may disclose any secular change in the Jovian magnetic field.

Saturn's magnetosphere is more like that of the Earth, essentially dipolar, with the magnetotail of the classical model. The surprise here was that only axisymmetric field parameters were necessary to fit the observations to the model; No terms were required to describe deviation from axisymmetry. The magnetic and rotational axes are coaxial! According to Cowling's theorem an axisymmetric field cannot be sustained by axisymmetric fluid motion. After reviewing Cowling's original work, Connerney opines that Saturn does not violate the antidynamo theorem, but that the theorem is too restrictive, only treats a subclass, and has been over-generalized.

A few years ago, observations of Saturn's ionosphere showed some latitudes where the ionosphere disappeared.

There is a direct correspondence between any given radial distance in Saturn's rings and a specific latitude pair joined by magnetic field lines. Charged particles from the rings are steered to the uniquely corresponding latitudes. Based upon this relation, Connerney and Waite proposed a new model of the ionosphere assuming first a classical, Earth-like F2 ionosphere layer produced by dissociative photoionization of hydrogen. Subsequent recombination is catalyzed through charge-exchange reactions with an influx of water from the ring system. The rates of photoionization in the ring system, supplemented by micrometeorite-impact ionization, are consistent with the observed ion densities.

Connerney further suggested to NCA that the albedo features on the planet

OCCULTATION EXPEDITIONS PLANNED

Dr. David Dunham is organizing observers for the following occultations. For further information call Dave at 585-0989.

UT Date	Time	Place	Vis Mag	Pcnt Sunlit	Cusp Angle	Min Aper
Grazing Lunar:						
06-18-86	20:39	Wheaton, MD	8.4	87	10N	20 cm
06-28-86	20:58	Oak Springs, CA	5.2	56	10N	5 cm
Asteroidal:			Star Mag	Delta Mag	Name	
06-06-86	00:23	Bermuda	8.5	7.0	(778) Theoba	5 cm
06-07-86	21:53*	Ecuador	10.0	1.9	(165) Loreley	15 cm

*Asteroid appulse: +1"6 at DC.

SCIENCE FAIR WINNERS TO RECEIVE NCA AWARDS

At the June 7 meeting of National Capital Astronomers, three Metropolitan Area high school students will be awarded one-year NCA junior memberships for their projects:

Deidre C. McCarthy, Eighth Grade, Thoreau Intermediate School, Vienna, Virginia; Brian Marcey, Twelfth Grade, Robinson High School, Fairfax, Virginia; Angie Naylor, Lord Baltimore Middle School, Fort Washington, Maryland.

NCA congratulates these young people and welcomes them to membership.

NCA WELCOMES NEW MEMBERS

Philip E. Barringer
3711 Idaho Avenue, NW
Washington, MD 20016

Lorraine and Jonathan Bellingham
1208 Potomac Valley Road
Rockville, MD 20850

Richard J. Kafka
18643 Turmeric Court
Germantown, MD 20874

Brian Marcey
10829 Mount Vinyard Court
Fairfax, VA 22032

Deidre C. McCarthy
2432 Riviera Drive
Vienna, VA 22180

Angie Naylor
8500 Vistabula Drive
Fort Washington, MD 20744

Allan W. and Patricia Schultz
1811 Florin Street
Silver Spring, MD 20902

Henry Snyder, Sara Tweedie
4304 Matthews Lane
Kensington, MD 20895

may be explained by a similar process. Latitudinally localized influx enhancements occur at latitudes magnetically related to features of the ring system, particularly the inner edge of the B ring, which is being electromagnetically eroded by these processes. Gravitational-centrifugal competition for a particle determines whether it will be returned to the rings by the magnetic-mirror effect, or will fall into the atmosphere as a condensation nucleus. An influx of ice particles thus may clear optically a latitudinal band in the atmosphere.

Uranus is unique in the solar system in that the inclination of its rotational axis is 97.9 degrees. At the time of Voyager 2 encounter the axis was almost directly in the sunline. The planet proved to be unique in other interesting ways: Expected radio emission was not observed on the daylight-side approach, but was strong on the night side, all below 500 kHz; high plasma density shields the day-side radiation. The magnetic field, less than 0.1 nT on approach, increased to about 413 nT at bowshock, and a current sheet was crossed. The magnetic-dipole axis was found to be offset about one third of the planet radius away from the Sun along the rotational axis and tilted 60 degrees from it.

Uranus is believed to have core of 6 or 8 earth masses of silicate rock overlain by an ocean of ices of methane and water, covered by a few earth masses of hydrogen and helium. The pressure is insufficient for metallic hydrogen; the dynamo is out in the shell of ices, which must be a convecting ion conductor.

It would be interesting indeed to compare the present measurements with those of a similar encounter in about 20 years, when the rotational axis is normal to the sunline.

Connerney concluded with a brief comparative review of the magnetospheres of Jupiter, Saturn, and Uranus.

R.H. McCracken

EXCERPTS FROM THE IAU CIRCULARS

1. Apr 23--Brahic, Grenier, McLaren, and Grundseth observed the occultation of a star by Neptune with the 3.6-m Canada-France-Hawaii telescope at Mauna Kea at the infrared wavelength of 3300 nm. The occultation lasted 34 minutes. No secondary events were seen during the four hours of observation.

2. May 3 -- R. Evans, New South Wales, discovered a supernova of 12th magnitude in NGC 5128 (Centaurus A).

3. May 3 -- Stephen Singer-Brewster discovered a comet of 15th magnitude in Libra on films exposed by himself, Schneeberger, and Burr with the 46-cm Palomar Schmidt telescope. Orbital elements by Marsden indicate that 1986d has a period of 6.07 years and will reach perihelion on May 20 at 1.95 au from the Sun.

NCA ELECTS

The following officers for fiscal 1987 were elected at the annual meeting of National Capital Astronomers on 3 May 1986:

President, Stanley G. Cawelti
Vice President, Jay H. Miller
Trustee, Richard J. Byrd

Secretary, Patricia B. Trueblood
Treasurer, Ruth S. Freitag
Sergeant at Arms, Terrence M. Lososky

ALGONKIAN PARK PROGRAM

On Saturday, July 12 at 9:00 pm, Dr. John Lohman will conduct a special program at Algonkian Regional Park in Loudoun County, Virginia; he needs volunteers with telescopes.

Algonkian Park is on Virginia Route 637, 2.3 miles north of Virginia Route 7 (Leesburg Pike). Call Dr. Lohman at 820-4194 (in Arlington) for details.

AIR AND SPACE MUSEUM OFFERS TALKS, SAFE SOLAR VIEWING

On Saturday, June 7, at 9:30 am, in the Einstein Planetarium of the Air and Space Museum, T.H. Callen II, of the Planetarium Staff, will discuss British astronomical history.

Following the talk, weather permitting, Stanley Cawelti will offer telescopic viewing in hydrogen alpha on the east deck.

On Wednesday, June 25, at 7:30 pm, in the Planetarium, Dr. C. Robert O'Dell, professor of physics and astronomy, Rice University, will discuss the Hubble Space Telescope.

Following the talk, weather permitting, Stanley Cawelti will offer telescopic viewing featuring Saturn on the east deck.

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