Uranus at Equinox

Summary of Workshop held in Padadena, October 2006

Report to OPAG, 7 November 2006
Tucson, AZ

Mark Hofstadter, JPL

Report from previous meeting and other information available at:
http://www.apl.ucl.ac.uk/iopw/

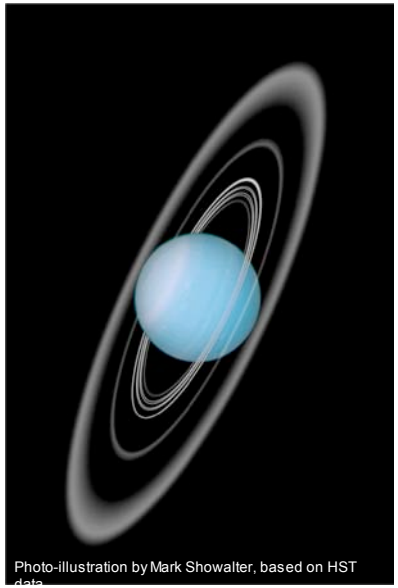
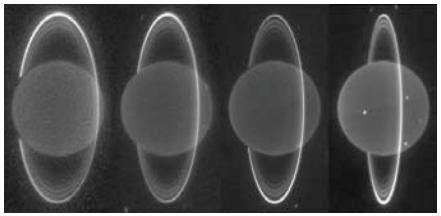


Photo-illustration by Mark Showalter, based on HST data

Why is there Interest in Uranus Now?


Keck II Images from de Pater, Hammel, and Gibbard

This is a special time seasonally.
Equinox, December 2007.
(Voyager encounter, in 1986, was Southern Solstice.)

There is a special viewing geometry from the Earth.
Ring-Plane Crossings in May 07, Aug 07, and Feb 08.
We are seeing the far north for the first time.

Why Hold Workshops?

- Share most recent science.
- Coordinate observations.
- Encourage Uranus and Neptune research among
  Peers,
  Funding agencies,
  Observatory time allocation committees,
  The public.

October Workshop organized by Nancy Chanover and Heidi Hammel.
~30 scientists attended.
Focused on atmosphere and ionosphere, and the observations, theory and lab work needed.

Atmosphere: Goals

- Observe northern (spring) conditions, compare to southern (fall). Determine temperature, composition, wind, and cloud properties as a function of latitude and height.
- Look for rapid changes near equinox, consistent with visible (Lockwood et al. 2006) and radio (Klein and Hofstadter 2006) photometry from the 1960s.

Need frequent, multi-spectral imaging.

Need improved dynamical/radiative/convective models.

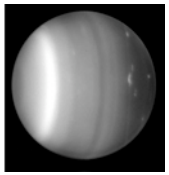
Timing of observations is not critical.

Atmosphere: Some Recent Results

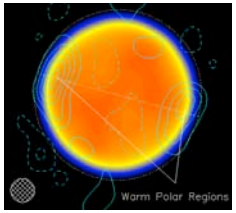
The first millimeter (below) and mid-IR images (see Orton's science report later this meeting).

UKIRT spectral imaging (Irwin et al., reported by Teanby) suggest a uniform tropospheric haze layer overlying a latitudinally varying deep cloud layer near 6 bars.

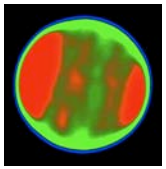
Improved CH_4 and H_2 opacity models for the infrared (Sromovsky et al. 2006, Irwin et al. 2006, Orton and Gustafsson in preparation).



1.6 μm (Hammel et al., Icarus 2005)



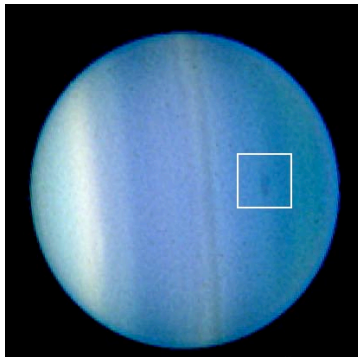
1.4 mm (Gurwell et al., 2006 pers. Com.)

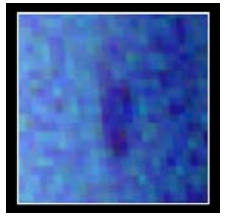


1.3 cm (Hofstadter and Butler 2005)

Atmosphere: Some Recent Results

Discovery of a Dark Spot on Uranus with Hubble (Sromovsky, Rages, Hammel, and Fry).

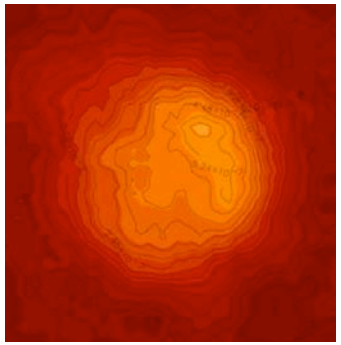




Ionosphere: Goals and Results

- Study Uranus' tilted and offset magnetic axis, and the magnetosphere's interactions with the sun and atmosphere.
- Explain the high temperatures of the upper atmosphere.

Tom Stallard reported work by Miller et al. looking for auroral emission of H_3^+ in the IR. While at the noise limit, their data are a tentative re-detection of the uranian aurorae (last seen by Voyager).



The Next Year

Satellites workshop: 16-18 November, Paris.

Rings workshop: Deferred in favor of informal collaborations more appropriate for this small community.

Observations of atmosphere at visible to centimeter wavelengths.

Observations of auroral phenomena at infrared wavelengths.

Request a letter of support from OPAG, suitable for inclusion in observing proposals.

Draft Letter

The 2007 equinox of Uranus represents a rare opportunity for probing the planet, its rings, and its satellites. The Outer Planets Assessment Group encourages observatories to be attentive to this event, and to be generous with their observing time…….