



## Where have Titan's ethane oceans gone?

S.K. Atreya (1), J.I. Lunine (2), H.B. Niemann (3), E.H. Wilson

(1) Atmospheric, Oceanic and Space Sciences, Univ. of Michigan, Ann Arbor, MI 48109-2143 USA. atreya@umich.edu, (2) Univ. Arizona, Tucson, USA, (3) GSFC, Greenbelt, MD, USA, (4) Jet Propulsion Lab., Caltech, Pasadena, USA

We will discuss the fate of ethane in Titan's methane-ethane cycle. Kilometer-deep oceans of ethane on Titan were predicted [1] prior to the arrival of Cassini-Huygens at the Saturn system. No indications of such oceans or even lakes of ethane have been found. Instead, lakes of *methane* are inferred from the radar backscatter data of the North Polar Region, combined with geomorphology of nearby terrain [2] and thermodynamic considerations [3,4]. Recent stratospheric chemical models [3,5] imply that no more than 150m of ethane liquid could have rained on to the surface of Titan over the geologic time. The depth would be further reduced to only about ten meters if the methane were released to the atmosphere episodically, with the last such episode 600 Myr ago [6]. Even this ethane could very well get sequestered as clathrate in Titan's subsurface, resulting in a very small amount of ethane liquid actually being present on the surface [4]. Although no data is yet available on the composition of Titan's lakes, they are expected to be made up of *methane-ethane* liquid, as the two liquids are fully miscible into each other. In the (relatively dry) equatorial landing site of the Huygens Probe, ethane was in fact one of the volatiles detected by the GCMS as the heated probe allowed the material from Titan's surface to evaporate [7]. Webpage for downloading pdf's: <<http://www.umich.edu/~atreya/>>

### References

1. Lunine J. I., Stevenson D.J. and Yung Y. L., *Science* 222, 1229 (1983).
2. Stofan, E.R. et al., *Nature* 445 (7123), 61 (2007).

3. Atreya S. K. et al., *Planet. Space Sci* 54, 1177 (2006).
4. Lunine J. I. and Atreya S. K., *Nature Geoscience*, in press (2008).
5. Wilson E.H. and Atreya S.K., *Eos Trans. AGU*, 88(52), Fall Meet. Suppl., Abstract P23B-1364, San Francisco.
6. Tobie G., Lunine J. I. and Sotin C., *Nature* 440 (7080), 61 (2006).
7. Niemann H. B. et al., *Nature* 438, 779 (2005).