Available online at www.sciencedirect.com
ScienceDirect
Planetary and Space Science 54 (2006) 1115–1116
Planetary and Space Science
www.elsevier.com/locate/pss

Preface

Surfaces and atmospheres of the outer planets, their satellites and ring systems

This special issue of PSS represents select articles based on research presented during the PS1.5, PS3.02 and PS3.03 sessions of the European Geosciences Union (EGU) meeting in Vienna, Austria, from 24 to 29 April 2005, and includes subsequent work. The aim of these sessions was to discuss recent observational and modeling work on the atmospheres and surfaces of the giant planets and their satellites, as well as the ring systems. A number of papers in this issue also review the current state of knowledge about some of these bodies.

The Cassini–Huygens mission to Saturn and Titan has returned a wealth of new data revealing a more complex and dynamic system than that revealed by the Voyager missions. The Cassini–Huygens spacecraft was inserted into orbit around Saturn on 30 June 2004. Complementary Earth-based observations were obtained during the Saturn approach phase and the early in-orbit phase. The Huygens mission returned stunning data from Titan in mid-January 2005. Coordinated ground based observations of Titan conducted around the entry are expected to provide data set complementary to those returned by Huygens. Session **PS1.5** included invited talks and a number of contributed papers by each of the Cassini–Huygens instrument teams and related ground-based and Earth-based observers. In this issue we include two papers from this session. The paper by *Harri* et al. describes the detailed results from the Huygens PPI instrument. This is a major constituent of the Huygens payload and the results have long been anticipated. The results have not previously been published in this level of detail and represent the first order scientific analysis. The paper by *Grard* et al. is a significant contribution to current studies of Titan. It deals with measurements of atmospheric conductivity and permittivity (also of the surface), electromagnetic and acoustic waves as well as radar return signal by the HASI/PWA. The paper presents first results on the electrical properties and related physical characteristics of the atmosphere of Titan from an altitude around 140 km down to the surface.

A series of papers in this issue discuss mosaïcking and projection methods to produce maps of Saturn's satellites, a clue to further scientific investigation of their surface composition and history. In particular, there are several studies reported here from session **PS3.02**. *Giese* et al. define a dense control point network for Phoebe to model its topography using CASSINI-ISS stereo images. This tool allows them to study in unique detail the shape of impact craters and put into evidence the presence of unconsolidated slopes and porous material on the surface. *Roatsch* et al. present new mosaic of medium-sized Saturn satellites at local and global scales, as derived from Voyager and Cassini images. Finally, *Jaumann* et al. develop a method to convert the CASSINI-VIMS spectral data of Saturn's icy satellite into spectral maps. Completing the picture of an active scientific community associated with the CASSINI mission, *Spilker* et al. present new findings of the CIRS infrared spectrometer, putting limits on the spin rate of particles inside Saturn's rings and suggesting that little vertical mixing happens in the densest B ring.

Session **PS3.03** included solicited, contributed and poster papers with the focus on ground-based and spacecraft observations as well as modeling studies related to the neutral atmospheres of the outer planetary systems. Special emphasis was placed on the giant planets, Titan and other satellites with atmospheres (Io for instance). Contributions on concepts of future missions to the outer planet systems were encouraged. From this session, the paper by *Atreya* et al. discusses the cycle of methane in Titan's atmosphere. Its most important conclusions are that methane is most likely produced in the interior of Titan, by a serpentinization process at relatively low temperatures, and that although photochemistry converts methane to ethane, its abundance is comparable to the other main product, hydrocarbon haze, so that the ethane condensate is far smaller than previously predicted and with no possibility of widespread ethane liquid on the surface. In their paper, *Owen and Encrenaz* make a compelling case that SCIPs (solar composition icy planetesimals) were abundant in the outer solar nebula and were responsible for the enrichment of heavy elements in Jupiter. They further argue that SCIPs were the building blocks for all the giant planets and thus the most abundant solid material in the early solar system. The *Hartle* et al. paper deals with the Titan plasma environment and the complex

0032-0633/$ - see front matter
doi:10.1016/j.pss.2006.06.005

magnetospheric–ionospheric–atmospheric interaction. The Cassini Plasma Spectrometer (CAPS) with its higher mass resolution was able to identify the light magnetospheric ions as H^+, H_2^+ and the heavy magnetospheric ions as O^+, CH_4^+, whereas the pickup ions were measured to be H^+, H_2^+, N^+, CH_4^+, N_2^+. The mass loading by these pickup ions caused the ambient plasma to slow down. Also, finite gyroradius effects were observed. The *Sittler* et al. paper presents a more rigorous analysis, with temperature anisotropy included, of CAPS data taken in Saturn's inner magnetosphere ($L = 2.7-10$) and derivation of various plasma fluid parameters (densities, temperatures, flow velocities). The ion fluxes are dominated by two groups: protons and water-group ions. Temperatures are consistent with pickup ionization as an essential mechanism in the energization process. Finally, the *Negrao* et al. paper presents ground-based data of Titan taken over a number of years and put in perspective of the recent findings of the Cassini–Huygens mission. In particular, this paper described thoroughly the influence of the methane absorption coefficients on the surface albedo retrievals for Titan and provides a large portion of the near-infrared surface spectrum of Titan and tends to offer some hints as to the surface composition.

Athena Coustenis, Sushil Atreya, Cécile Ferrari,
Jean-Pierre Lebreton, Dennis Matson, Linda Spilker,
Darrell Strobel
DESPA (Bat. 18), Observatoire de Paris-Meudon, 5 Place Jules Janssen, 92195 Meudon Cedex, France
E-mail address: athena.coustenis@obspm.fr (A. Coustenis).