index varies from -10 nT to -20 nT, Σ Kp index reached value of 12+). The eclipse was notably exceptional in uniform solar disk. These conditions and fact that the culmination of the solar eclipse over central Europe occurred at local noon are such that the observed ionospheric response is mainly that of the solar eclipse. We provide a full characterization of the propagation of the waves in terms of times of occurrence, group and phase velocities, propagation direction, characteristic period and lifetime of the particular wave structure. However, ionospheric vertical sounding technique enables us to deal with vertical components of each characteristic. Parameters are estimated combining Fourier and wavelet analysis. Our conclusions confirm earlier theoretical and experimental findings, reported in [Altadill et al., 2001; Farges et al., 2001; Muller-Wodarg et al.,1998] regarding the generation and propagation of gravity waves and provide complementary characterisation using wavelet approaches. We also report a new evidence for the generation and propagation of acoustic waves induced by the solar eclipse through the ionospheric F region. Up to our knowledge, this is the first time that acoustic waves can be demonstrated based on ionospheric measurements and analysis. We report similarities in generation and occurrence of acoustic and gravity modes in the eclipsed region. Our analysis techniques enable us to "locate" wave bursts in particular height of ionosphere, specify source region and give characteristics of acoustic and gravity wave movement through ionosphere. Altadill D., J.G. Sole, E.M. Apostolov: Vertical structure of a gravity wave like oscillation in the ionosphere generated by the solar eclipse of August 11, 1999, J. Geoph. Res.-Space Phys., 106 (A10), 21419-21428, 2001. Farges T., J.C. Jodogne, R. Bamford, Y. Le Roux, F. Gauthier, P.M. Villa, D.Altadill, J.G. Sole, G.Miro: Disturbances of the western European ionosphere during the the total solar eclipse of 11 August 1999 measured by wide ionosonde and radar network, J. Atmosph. Solar-Terr. Phys., 63 (9), 915-924, 2001. Muller-Wodarg I.C.F, A.D. Aylward, M. Lockwood: Effects of a Mid-Latitude Solar Eclipse on the Thermosphere and Ionosphere - A Modelling Study, Geoph. Res. Letters, 25 (20), 3787-3790, 1998.

SA21B CC: 519 A Tuesday 0830h

Surface-Boundary-Exospheres in the Solar System I *(joint with A, P, SH, SM)*

Presiding: **A Sprague,** University of Arizona**; M Mendillo,** Center for Space Physics, Boston University

SA21B-01 0830h INVITED

Exploring Mercury's Surface-Exosphere-Space Environment System during the MESSENGER Mission.

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When MESSENGER begins its four-Mercury-year orbital mission about the planet, it will carry an Ultraviolet-Visible Spectrometer (UVVS), designed to study the composition and structure of the exosphere. The UVVS is one member of a suite of instruments that will provide us with our first comprehensive picture of Mercury's surface-exosphere-space environment system. Also on board the MESSENGER spacecraft are four instruments that will measure surface elemental and mineralogical composition. These are the Gamma Ray Neutron Spectrometer (GRNS), the X-Ray Spectrometer (XRS), the Mercury Dual Imaging System (MDIS), and the Visual and InfraRed Spectrometer (VIRS). In addition, the Energetic Particle and Plasma Spectrometer (EPPS) and Magnetometer (MAG) will measure magnetospheric and pick up ions and a map Mercury's magnetic field respectively. In this presentation we describe the UVVS investigation and how it will contribute to our understanding of Mercury's exospheric processes. We also describe how measurements from UVVS, EPPS, and MAG can be combined with surface composition measurements to provide an overall picture of Mercury's surface-exosphere-magnetosphere interactions and briefly describe our plans for modeling and visualization of the combined data suites.

SA21B-02 0850h INVITED

Sources of the Escaping Lunar Atmosphere Derived from a Decade of Imaging Science Experiments

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The lunar sodium exosphere owes its existence to the impact of solar photons, solar wind plasma, and meteorites on the lunar surface. Perhaps the most effective methods of testing the effects of each impact process are to make two or more similar observations of the lunar exosphere during periods when the flux of one or more of these agents has changed, or to make a single observation where the effects of different fluxes can be seen simultaneously. We have observed the escaping component of the lunar sodium exosphere under several different sets of conditions. Magnetospheric plasma sputtering was tested during five Full-Moon phase observations in eclipse, where the Moon was in the Earth's magnetospheric plasma sheet three times, and outside of the sheet twice. Multiple observations of the lunar sodium tail at New Moon phase include a unique observation affected by the spectacular 1998 Leonid Meteor shower. Finally, observations near quarter Moon phase show latitudinal variations in solar wind sputtering and/or photon stimulated desorption. In this paper we will summarize the source strengths from each of these mechanisms derived from Monte Carlo simulations studies.

URL: http://sirius.bu.edu/planetary/moon.html

SA21B-03 0910h

Neutral Particle Emission Induced by Solar Wind in Mercury's Environment

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The peculiar configuration of the Hermean magnetosphere, characterised by a weak magnetic field, may allow a solar wind entrance and circulation in Mercury's environment. More particularly, intense ion fluxes are expected in the cusp regions, which are extremely large if compared to the Earth's ones. In the present study we reconstruct the H+ distribution in space, energy and pitch angle by means of a single-particle Monte-Carlo model. The neutral particle emission induced by the solar wind in the Hermean environment is investigated as well. The H+ are likely to rapidly leave the Hermean magnetosphere or precipitate onto the surface of the planet, thus originating neutral particle emission via ion-sputtering as well as energetic neutral atoms, generated via charge-exchange process. Different external configurations of both interplanetary magnetic field and cross-tail potential drop result in variations of the sputtered and charge-exchange neutral particle signal. The Neutral Particle Analyser - Ion Spectrometer experiment (NPA-IS/SERENA), proposed to fly on board of the ESA mission Bepi Colombo, will monitor the circulating ion and neutral particles. The modeled distributions here presented have been processed in the frame of SERENA instrument and may be considered as a reference tool for the future observations.

SA21B-04 0925h INVITED

Laboratory Studies of Alkali Components in Tenuous Planetary Atmospheres

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We report on studies performed at the Laboratory for Surface Modification of Rutgers University and focused on the origin of alkali vapors (Na, K) in the tenuous atmospheres of the planet Mercury, the Moon, and Jupiter's icy satellite Europa [1, 2]; we also address the question why alkaline-earth metals (Mg, Ca) are less abundant in the atmospheres. A variety of ultrahigh-vacuum surface science techniques are used, including X-ray Photoelectron Spectroscopy (XPS), Low-Energy Ion Scattering (LEIS), Thermal Programmed Desorption (TPD), Electron- and Photon-Stimulated Desorption (ESD and PSD), Surface Ionization (SI). Measurements have been made on different samples, including the model mineral binary oxide SiO_2 that simulates lunar silicates, and a lunar sample obtained from NASA. Desorption induced by electronic excitations (mainly PSD) rather than by thermal processes is found to be the dominant source process on the lunar surface. The flux at the lunar surface of ultraviolet photons from the Sun is adequate to insure that PSD of sodium contributes substantially to the Moon's atmosphere. A model based on irradiation-induced charge-transfer is proposed to explain the desorption process. There is a strong temperature-dependence of Na ESD and PSD signals from a lunar sample, under conditions where the Na surface coverage is constant and thermal desorption is negligible [3]. On Mercury solar heating of the surface is high enough that thermal desorption will also be a potential source of atmospheric sodium. Ion bombardment of the lunar sample causes both the sputtering of alkali atoms into vacuum and implantation into the sample bulk. In the future we outline the use a novel method, Nuclear Resonance Profiling (NRP) to study the diffusion of alkalis through model minerals, ices, and lunar samples; these measurements would provide additional information to understand the replenishment of Na at the surface of the Moon, Mercury and Europa. We also describe a new detector that we will use to search for desorption of alkaline-earth atoms.

T.E. Madey, R.E. Johnson, T.M. Orlando, Surf. Sci. 500 (2002) 838. [2] B.V. Yakshinskiy, T.E. Madey, Surf. Sci. 528 (2003) 54. [3] B.V. Yakshinskiy, T.E. Madey, Icarus 168 (2004) 53.

SA21B-05 0945h

Sputtering Contribution to Planetary Atmospheres

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We have measured the sputtering of specific species during ion irradiation of water ice, labradorite, albite, anorthoclase, and olivine targets, to understand the importance of sputtering in the generation of atmospheres around icy satellites of the outer solar system by magnetospheric ions, and around the Moon and Mercury by the Solar wind. We use mass spectrometry in ultrahigh vacuum to measure sputtered species and gas evolved during post-irradiation heating to identify chemical species formed by ion implantation. We will discuss the formation of NO and other molecules in the Saturnian system that may be detectable by Cassini, and the relative importance of different mechanism that lead to the formation of Na atmospheres around the Moon and Mercury.

SA22A CC: 519 A Tuesday 1030h

Surface-Boundary-Exospheres in the Solar System II *(joint with A, P, SH, SM)*

Presiding: **A Sprague,** University of Arizona**; M Cowee,** Institute of Geophysics and Planetary Physics

SA22A-01 1030h INVITED

State of the Art of our Understanding of Mercury's Exosphere

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Mariner 10 is the only spacecraft to have been close enough to observe Mercury's exosphere by UV spectrometry. After the three flybies of Mariner 10, Earth based observations have provided some complementary information on Mercury's exosphere. Thus, the next planed future missions, Messenger and Bepi Colombo should dramatically improve our knowledge of Mercury's exosphere. Therefore up to now, most of the efforts to describe Mercury's exosphere considered only the sodium exosphere, the best known component easily observable from Earth based ground observatory thanks to its strong resonant emission. In this talk, I will describe the particularities of Mercury's surface bounded exosphere due to the length of Mercury's day