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Authors	Caprarelli, G., OROSEI, ROBERTO, Rossi, A. P., Cantini, F., Carter, L. M., Papiano, I., CARTACCI, MARCO, CICCHETTI, ANDREA, NOSCHESE, RAFFAELLA
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P51C-2155: Interpretation of Radar Sounder MARSIS Data from Lucus Planum, Mars: A Complex Geological Setting.

Friday, 16 December 2016

08:00 - 12:20

📍 Moscone South - Poster Hall

Lucus Planum (LP) is a Martian plain located in the central part of the Medusae Fossae Formation (MFF). This geological unit is composed of pyroclastic flows or airfall [1-2], and paleopolar deposits or atmospherically-deposited icy dust [3]. For more than a decade the MFF has been probed by the Mars Express MARSIS and Mars Reconnaissance Orbiter SHARAD synthetic-aperture low-frequency radars, which revealed that the dielectric permittivity of the MFF subsurface is consistent with either a substantial component of water ice or a low-density material [4-5]. Here we report the results of our investigation of Lucus Planum: we processed 238 MARSIS orbits acquired across an area approximately 750,000 km² in extent, and identified the locations of subsurface reflectors in this plain to unprecedented detail. Our work revealed 97 reflectors, mostly concentrated in the eastern, SW and NW sectors of LP. By estimating the thicknesses of strata laying on top of a theoretical basal surface obtained by interpolation of MOLA elevations around the plain, and correlating them with the apparent depth calculated from the radar pulse return times, we were able to estimate the dielectric constants of subsurface materials in the three sectors. The calculated values of dielectric constant in the eastern and SW sectors were ~2.3, suggesting the presence of highly porous material, possibly pyroclastic deposits, in agreement with earlier interpretations [5]. The value of dielectric constant in the NW sector was ~ 4.5, implying the presence of denser materials. In the central area of the plain we obtained only a few strong echoes, related to shallow strata and pedestal craters. The subsurface layers here attenuate the radar pulses, suggesting a material with dielectric characteristics different than those at the margins of LP. Interpretation of these findings is not unique and more investigations are needed to conclusively establish the nature of deposits forming Lucus Planum, but the evidence clearly points to a complex sequence of events, involving different types of geological processes. [1] Tanaka (2000) *Icarus*, 144, 254-266. [2] Kerber *et al* (2011) *Icarus*, 216, 212-220. [3] Schultz & Lutz (1988) *Icarus*, 73, 91-141. [4] Watters *et al* (2007) *Science*, 318, 1125-1128. [5] Carter *et al* (2009) *Icarus*, 199, 295-302.

Authors

Graziella Caprarelli *

University of South Australia

*International Research School
of Planetary Sciences*

Roberto Orosei

Istituto di Radioastronomia

Angelo Pio Rossi

Jacobs University Bremen

Federico Cantini

*Ecole Normale Polytechnique
Fédérale de Lausanne*

Lynn M Carter

*NASA Goddard Space Flight
Center*

Irene Papiano

Liceo Scientifico Augusto Righi

Marco Cartacci

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