Geophysical Research Abstracts,
Vol. 10, EGU2008-A-08952, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-08952
EGU General Assembly 2008


# Radar subsurface sounding over the putative frozen sea in Cerberus Palus, Mars

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We present observations acquired by the orbiting radar sounders MARSIS and SHARAD over Eastern Elysium Planitia, Mars. This area encompasses Cerberus Palus, where the Mars Express High Resolution Stereo Camera acquired images of surfaces with platy textures that were interpreted as evidence for a frozen sea close to Mars' equator. MARSIS and SHARAD are synthetic-aperture, orbital sounding radars, carried respectively by ESA'a Mars Express and NASA's Mars Reconnaissance Orbiter. They work by transmitting a low-frequency radar pulse that is capable of penetrating below the surface, and is reflected by any dielectric discontinuity present in the subsurface.

The area of Cerberus Palus has been explored, but not fully covered, by both MARSIS and SHARAD. Subsurface reflections are seen over most of the area, with varying depths and strengths. We have applied a simplified model of radar signal propagation to estimate the loss tangent (the ratio between the imaginary and real part of the complex dielectric constant, a measure of signal attenuation within the medium) of the surface material. We found that the loss tangent is $> 0.1$ in most places, and thus incompatible with a surface made of either pure or dirty ice. Low-loss surface material in Cerberus Palus is found only in small patches over the putative frozen sea. The largest of these areas is centered around 152°E, 5°N. The hypothesis of a frozen sea

several tens of meters thick covering the entire area is incompatible with these results.