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Surface and subsurface radar backscattering coefficient over the Martian South Polar Layered Deposits from MARSIS data

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Planum Australe was probed for the first time with the Mars Advanced Radar for Subsurface and Ionospheric Sounding (MARSIS) onboard the European Space Agency's Mars Express. In most cases, a strong reflection is seen at a time delay consistent with the expected depth of the contact of the south polar layered deposits (SPLD) materials with the substrate, up to a depth of 3000 meters for the case of the SPLD maximum thickness.

We extend the analysis of MARSIS data over the SPLD, extracting quantitative information from radar echoes on the strength of surface and subsurface reflections, characterized through the radar backscattering coefficient.We recover the backscattering coefficient only in a relative sense, starting from measured echo amplitudes and correcting for geometric terms in the radar equation such as the altitude. We are capable of discerning changes in the backscattering coefficient from place to place, but we cannot attach an absolute physical quantity to measured values.

We produced a database of backscattering coefficient values for reflections coming from both surface and subsurface (the base of the SPLD), for all observations of MARSIS over Planum Australe. Other relevant parameters are also reported, such as latitude, longitude, spacecraft altitude, frequency and operative mode. We produce maps of the surface and subsurface backscattering coefficients for homogeneous observations. We correlate them with SPLD thickness, to find significant departures from

the expected decrease of the subsurface echo strength with depth.