

## DEVELOPING PROTOTYPE CROSS-SECTIONS OF THE UPPERMOST MARTIAN CRUST

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We have attempted to establish prototype cross-sections through the uppermost 100 m of the Martian crust for several different Martian terrains: (a) generic northern hemisphere; (b) generic southern hemisphere; (c) generic older cratered terrain; (d) generic younger cratered terrain, and (e) polar regions. The cross-sections are built from four main materials: (1) uncemented sediment (i.e., dust and aeolian deposits, unconsolidated fluvial and mass wasting products); (2) cemented sediment (i.e., evaporites, sediment consolidated by diagenesis); (3) igneous rock (e.g., basaltic lavas and related intrusions, impact melt) and (4) megaregolith (i.e., impact-bombarded and impact-mixed materials from 1-3 above). Megaregolith constitutes the foundation component. We also consider H<sub>2</sub>O-CO<sub>2</sub> ice in the cross-sections, which are dependent on latitude, as well as other factors. The cross-sections have been constructed primarily in order to help optimize the design of a potential orbital ground-penetrating Synthetic Aperture Radar (SAR) system for Mars, but they have applications in other planetary exploration technologies (e.g., site selection for multi-metre drilling programs).

Understanding the composition of the uppermost 100 m of the Martian crust is important for future missions. We need to estimate the likely substructure for landing sites so that we can optimize mission design. This is particularly important for rover-based drilling, ground-penetrating radar technology, sampling for evidence of life, and accessing H<sub>2</sub>O. Constructing cross-sections is an iterative process, largely based on remote sensing data (Mariner, Viking, MGS, Odyssey, Mars Express), combined with analogies with other terrestrial planets, especially Earth and the Moon. In this respect, Mars shows similarities with both the Moon (e.g., in megaregolith development and its preservation) and Earth (e.g., relatively recent volcanism, presence of sedimentary deposits). Establishing Martian crustal structure helps to address a number of Mars Exploration Program Assessment Group (MEPAG) objectives, including Goal C: Determine the evolution of the surface and interior of Mars ("Geology"), including establishing the large-scale vertical structure of the crust and its regional variation, assessing sedimentary processes and their evolution through time, and indicating favourable sites for seeking evidence of life.