

CAT scans of Mars:
Three-dimensional imaging of the polar layered deposits with SHARAD

Orbital sounding radar investigations typically acquire data along a ground track and display it as a radargram, an image format with distance along track on the X axis and returned-signal power as a function of range delay (sometimes converted to depth) along the Y axis. Where coverage is sufficiently dense, collections of such two-dimensional (2-D) cross-sectional views can be used to map out subsurface features in three dimensions, which has been done with some success for the Martian polar layered deposits. However, individual radargrams are often obfuscated by returns from off-nadir topographic features such as craters or polar troughs. I will present an alternative approach, where the collection of 2-D data is binned into a horizontal grid over a given surface area, transforming it into a 3-D volume. Once the data are properly co-registered and adjusted for any orbit-to-orbit power or timing differences, advanced 3-D image-correction processing can be applied to the volume, largely correcting off-nadir returns and greatly enhancing interpretability of the data. My presentation will include an overview of results obtained from the conventional approach, first results from the 3-D approach applied to Planum Boreum, and arguments for extending the 3-D approach to Planum Australe.

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