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Geophysical Results at Titan from Cassini RADAR : Topography and Spin State Overview

R. Lorenz(1), B Stiles (2), R. Kirk (3), H. Zebker (4), P Callahan (2) and T. C. RadarTeam (2)

(1) JHU-APL (ralph.lorenz@jhuapl.edu) (2) JPL (3) USGS Flagstaff (4) Stanford University

Although geological studies have focused on SAR imagery, Cassini RADAR also yields crucial geophysical information on Titan's shape and rotation state. This talk will summarize recent results. Altimetry (including a long swath on T30) and the novel monopulse 'SARtopo' technique that recovers a terrain height profile along parts of the long SAR images together permit topographical investigations such as estimation of the surface slopes which may drive sediment transport by rivers, the extent of crater relaxation and the volume of ejecta blankets, the height of mountains and so on, particularly over long areas. Additionally, with new southern hemisphere coverage from T36 and T39 we now have at least preliminary data at all latitudes, giving some initial insights into global shape.

As coverage has built up, several areas are seen in multiple SAR swaths (i.e. in overlaps.) Because overlaps are often seen at different incidence angles, parallax allows radar stereo imaging to generate 2-dimensional topography with quite high spatial resolution.

On a larger scale, features seen in overlaps show apparent position mismatches when a nominal pole position and synchronous spin are assumed. These mismatches are reduced when a displaced pole, and a faster-than-synchronous spin are used instead. Although the implications of the pole position are not yet clear, the spin rate observed is close to predictions assuming that Titan has an ice crust overlying an internal water ocean which makes it easier for seasonal variations in zonal winds to torque the surface around by decoupling the surface from the interior. Possible time-variations of the spin

rate may constrain both the interior of Titan and its wind patterns.