The Martian Surface at Human Scales: Using MOLA Data to Improve Earth-based Radar Measured Rover Trafficability

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The Goldstone Solar System Radar (GSSR) has successfully collected radar echoes from the surface of Mars for some 30 years now. These data have been used in support of landing site selection and certification for Viking, Pathfinder, and the 2003 Mars Exploration Rovers. A recent re-analysis of the entire radar dataset available brought to light a shortcoming of previous analyses. The technique used to date to fit the Hagfors scattering model to the radar echoes did not account for local slopes. In fact, it fails to fit a model to slopes over about 3 degrees, and gives good fits for regions with slopes less than about 1 degree. While landing sites are all in flat regions, understanding the surface roughness on the flanks of Martian volcanoes would be of significant interest. Generally the signal-to-noise of the radar echoes is insufficient to cleanly fit a fourth parameter, east-west slope, in addition to the parameters of range, reflectivity and roughness. The MOLA topography offers an elegant solution. We will report on our study of the improvements in estimating the scattering model parameters at the meeting.