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ABSTRACT SUBMISSION FORM

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Title of the Paper : Topographic local roughness extraction and calibration over Martian surface by very high resolution stereo analysis and multi sensor data fusion
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ABSTRACT(more than 300 words) [5] Nodaway, the spatial resolution and coverage of 3D planetary topography has been dramatically increased by a sequence of the successful exploration missions. Especially stereo analyses employing the very high resolution optical sensors such as HiRISE equipped on MRO (Mars Reconnaissance Orbiter) and Narrow angle image of LRO (Lunar Reconnaissance Orbiter) are the important data sources for the 3D planetary topography construction. It provided not only the detailed 3D geomorphic information over planetary surface but also the height variation in a fine spatial resolution – so called "local roughness" which is an important properties characterizing planetary surface. However, usually the coverage of very high resolution stereo images over target planetary and satellite is very limited, thus the local roughness by the very high resolution stereo interpretation can be determined in only a portion of planetary surface. In this study we tested possible approaches to extract local roughness not only by the direct calculation from stereo height measurements but also by the multi sensor data fusions of medium resolution remote sensing information which is available more globally in the planetary surface. Two multi sensor data fusion approaches to extract local roughness were performed on Martian surface where various remote sensing data can be employed. At first, the surface local roughness using the MOLA laser beam broadening effect (Gardner, 1982) combining the slope of HRSC and/or CTX stereo DTM were processed. The technical difficulties such as across track drifts of laser beam broadening have been tackled by introducing the hierarchical processing scheme for track-wise noise removal. Secondly, the local roughness index by the multi angle image interpretation after applying sub pixel co-registration between the corresponding pixels of different viewing channels were extracted. The data sets from these two approaches were crossly verified and their correlations were investigated. Since all data sources employed in this study are well co-registered due to Kim and Muller (2009)'s geodetic control strategy, it is possible to calibrate the extracted local roughness parameters by the

lateral cover estimated from sub meter HiRISE stereo height points as demonstrated in Marticorena et al., (2006). This information will be extremely useful to classify planetary surfaces by their origins and provide important clues to simulate the surface process over target planet, if it is converted into the aerodynamic roughness length Zo with the help of wind tunnel experiment.

Since the local roughness data is also powerful means to assess the risk of potential landing sites with quantitative engineering standard, we will performed our local roughness processing strategy over potential MSL(Mars Science Laboratory) landing sites. The extensions of this approach to other planet and satellite such as mercury and moon will be considered.

Please refer to overleaf for details.

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