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傾斜/粗度データを用いた火星表面の高解像度解析
High resolution characterization of martian surface in terms of slope/roughness

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By recent observations by high resolution images about martian surface various types of the surface are known to be systematically correlated with latitude, which is called as latitude-dependent morphology. They are interpreted as products of climatic control which is induced by variation of the obliquity. The basic type is mantling of dust-ice mixture which has smoother surface than the original surface of mostly aeolian erosion control.

In this presentation we report high resolution estimates of surface roughness/slopes corresponding to various types of latitude-dependent morphology with intention to provide data for future rover exploration.The basic method is photoclinometry applied to HiRISE data to estimate m-scale roughness. Kirk et al(JGR 113,2008) have already conducted m-scal topographic mapping for the survey of Phoenix landing site Our aim is to construct basic data base for roughness/slope statistics of m-scale of typical surface types. Since the coverage of HiRISE image is limited we measured roughness by MOC and THEMIS-VIS data at coarser length scales. We combined fine scale(m-length scale) roughness spectrum and coarse scale(10-20 m) spectrum to a consistent spectrum. In combination to conventional photoclinometry approach we used thermal infrared images to estimate roughness. Bandfield et al (Icarus 193,2008) reported thermal infrared response of the surface irradiated by insolation is controlled by local roughness and a possibility to estimate subpixel scale roughness. We followed this approach.

We selected several test fields where four different types of images(HiRISE,MOC,THEMIS-VIS and THEMIS-IR) are available on the same target. They are west of Scaparelli crater, Amazonis Planitia and Eastern part of Utopia Planitia.