論文内容の要旨

論文題目： Thermal Inertia of Fine Particle Layer: Implications to the Physical Structure of Martian Surface （微細粒子層の熱慣性: 火星表層地質に関する示唆)

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Thermal inertia of planetary surface is a physical property that controls the diurnal and seasonal cycles in surface temperature, and can be used in geologic interpretation and for understanding the processes responsible for developing the planetary surface. Especially on Mars, thermal inertia is commonly used to infer a typical or effective particle size of the soil. The present standing problems for thermal inertia of Martian surface are 1) lack of experimental evidence supporting extremely low thermal inertia of fine particles, 2) uncertainty of volumetric heat capacity of particle bed, and consequently 3) being two different ideas to account for the extremely low thermal inertia.

We measured thermal diffusivity and volumetric heat capacity of the fine particles (ave. grain size: 5 - 50 μm in diameter, porosity: 0.40 - 0.95) and calculated the thermal inertia of them. Then, based on the results, we estimated the possible lower limit of the thermal inertia of homogeneous regolith on Mars. We concluded that even if the Martian surface is covered with much finer particles than we used in this study, homogeneous particle layer don ’t yield the observed very low value of thermal inertia (5 - 60 tiu) of Martian surface.

This study gives the first experimental evidence consistent with the idea that we should consider not only homogeneous fine particle layer but also surface heterogeneity to account for the very low value of thermal inertia (< 60 tiu) of the Martian surface.