Subsurce structure in the orther lowlands inferred from crater degradation

Yutaka Ishikawa[1]; Kei Kurita[2]

[1] Tokyo Univ; [2] ERI,Univ. of Tokyo

Existence of paleo-ocean is proposed in the northern lowlands of Mars by geomorphological analysis(Head et al,1998). In this area wide spread peculiar layer covers the surface, which is named as Vastitis Borealis Formation(BVF) of the age of Hesperian. This layer is considered as ocean bottom sediments carved and transported from Tharsis and southern highlands areas by the outflow channels. This layer has several distinct characteristics; high porosity, which is indicated by the peculiar compaction structure(Buczkowski et al.2005),explosive nature of cratering(Ogawa & Kurita,2005) and layered structure having contrast in dielectric/permittivity properties. These suggest large reservoir of H_2O and CO_2 in the subsurface region here. The keypoint in the argument of the Martian hydrologic environment is the volume of this formation.

Here we report the thickness of BVF based on the degradation of craters.

We surveyed the morphology of craters in Ascidalia region,Utopia region and south of Olympus Mons. The measured quantity is diameter, floor depth, rim height and the surface gradient. The deviation from the reference curve proposed by Garvin indicates the magnitude of degradation in the morphology of craters. Shallow craters are quite distinct in Ascidalia and Utopia regions for craters having the diameter between 8-20 km. They also represent the decreasing trend of rim height and the maximum values of the surface gradient with the floor depth. They all show severe degradation process in the surface layer down to 1200-1500m. The proposed subsurface structure is a surface soft and easily erodable layer (thickness of 1200-1500m) underlain by a rigid layer. We suggest this soft layer corresponds to BVF. Resultant volume of BVF is one order of magnitude larger than that by Boyce et al(200%).We will discuss implications of this large value of the sediment volume.