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火星の Central Elysium Planitia で見られるコーン状地形について
Rootless Cone? Pingo? or Mud Volcano? in Central Elysium Planitia, Mars

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Central Elysium Planitia (CEP) on Mars is famous for having very smooth vast plains, which seem to be composed of material emanated from Cerberus Fossae. The nature of this material has been in long-standing dispute. Here we can found very young aged (10 Ma or less) lava flows have been identified (Hartmann et al., 2000, Vaucher et al., 2009) while aqueous floods also have been identified to emanate from Cerberus Fossae (Burr et al., 2002). If most of landscape in this area are lava flow origin, then this young volcanism is distinct from those at Tharsis Montes in many points and we consider it should be a key to understand present-day thermal state of Mars. If they are mostly aqueous flood origin high temperature lava is not necessary, which suggests different thermal state in the present mantle. In this respect geological interpretation of CEP is critical but still in debate even though high resolution images have been available. In this presentation we present a new interpretation for the formation of distinct ”double cone structure” along magmatic origin.

In CEP, pervasive existence of cone-like morphological features (CLF) have been revealed by high resolution images. Until now three different interpretations are proposed for the origin of CLF: rootless cone (Fagents et al., 2002), pingo (Page, 2006) and mud volcano (Kangi, 2007). Rootless cones are product of phreatomagmatic eruption, which are located on lava flows that have moved over a substrate containing ice/water at the surface or subsurface. Pingo is a periglacial morphology, which is formed by upthrust of underground ice. Mud volcano is formed by effusion of mud by over-pressurization. Since the first interpretation is consistent with lava flow origin and the latter two support aqueous flood origin, CLF is a key morphology.

Some of CLF are known to have peculiar morphology. They have double cone structure (Double Cone Feature, DCF). From outside to center there exist 4 concentric features. Inside caldera-like depression surrounded by low rise rim main cone stands. At the top of the cone vent-like depression exists. In side depression another small cone rises. At the top of this cone a small pit exists. We focus on this morphology and investigate its spatial distribution and measure morphological parameters such as diameters and height by using HiRISE high resolution images. As for the estimate of height footprint of MOLA is so sparse compared to the size of DCF (mostly less than 200 m) photoclinometry is adapted. As for the distribution DCF is preferentially clustered in the area closer to Cerberus Fossae than normal CLF (single cone like feature). This indicates multiple passage of hot lava flows by using the same route. This may give rise to successive eruptions and later event should be smaller in magnitude because of exhaustion of water. Double cone structure is thus consistent with rootless cone activity while it is difficult to form by pingo/mud volcano.

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