

Detection of the Lava Tubes by SELENE(Kaguya) Lunar Radar Sounder

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Intact lava tubes on the Moon are potentially the best candidates for constructing lunar bases, where people and instruments are protected from micrometeorites and cosmic ray radiation, and the thermal conditions are stable. Recently, vertical holes were discovered in the lunar surface image data acquired by the high-resolution Terrain Camera onboard SELENE (Kaguya). The holes are possible entrances to subsurface lava tubes. However, whether lava tubes really exist underground on the Moon is still unknown.

We here report the results of our investigation of subsurface lava tube existence using the SELENE Lunar Radar Sounder (LRS) data. We first explored LRS echo wave data obtained near the Marius Hills Hole (MHH) on the “rille-A” in the Oceanus Procellarum of the Moon, and found a reflection peak signature after a sharp drop in echo power, which possibly indicates the existence of a subsurface void such as a lava tube. Then, we expanded the investigation area to 13-15°N and -58.25-55.75°E, including the MHH, and discovered several locations where the LRS echoes show similar wave patterns to that seen at the point near the MHH. We note that four of them are identified along the rille-A and on the extension of the rille, and are also on a long, narrow, sinuous mass deficit found in the GRAIL data.

The present result suggested that subsurface lava tube do exist in the vicinity of MHH, because of discovered wave patterns correspond to the existence of a subsurface lava tube.

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