# Ground Penetrating Radar to detect lunar lava structures: preliminary study at Aokigahara lava tube, Fuji volcano

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Flood basalts and long lava flows are thought to be formed by large eruption-rate flows in short timescales. However, recent studies of these flows showed that at least some of these flows are results of sequential eruptions of relatively lower eruption-rate flows and their formations take longer time than those previously expected. On the slow emplacement condition, lava tubes have recently been focused. Recent studies show that lava tubes enhance lava flow advancements very effectively by preventing significant cooling. Therefore they are responsible for feeding many long lava flows and resurfacing of volcanic terrains including the Columbia River Basalts and possibly extraterrestrial lava fields on the Moon, Mars, and Venus.

Although lunar mare lavas are believed to be formed by vast eruptions of flood-type lavas, some features of mare lava flows including sinuous rills and rimae (collapsed features) suggest that they are related to slow movements of low-viscosity lava flows. These features are often interpreted to be formed by successive collapses of roofs of ancient lava tubes. Detailed description of these complex systems of a lava tubes are quite important.

The difficulty in searching uncollapsed lunar lava tubes is very clear: they are only formed deep subsurface and are difficult to find by surface image. Even on the Earth, studies of lava tubes are restricted to several famous volcanoes such as Etna, Undara, and Hawaii. This is possibly because that a lava tube is found only when a part of the tube is collapsed and connected to the surface. Even if a visible lava tube system is investigated very carefully and described in detail, the possibility of unknown tube systems cannot be ruled out. Nevertheless geophysical surveys of lava tubes are not commonly carried out even on the Earth.

To find a subsurface structure, a method allowing deep penetration through the surface crust should be invoked. For this purpose, we propose a new method of detecting lava tubes using a Ground Penetrating Radar (GPR) system, which is known as a powerful tool for detecting subsurface structures. Propagation of the radar wave of GPR is strongly controlled by the water content on the Earth, and therefore, a considerably deeper penetration will be allowed on the Moon compared with the case of the Earth because of the no-water condition prevailing on the Moon. In this talk we present our successful first trial which strongly ensures that GPR is a very effective and convenient tool to discover unknown lava tubes hidden deeply inside lava flows. We also discuss that this method will be quite effective to detect lunar lava tubes as potential sites of future lunar bases.