

Radar sounder for exploration of ices below the surface of the Mars

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Design of high resolution radar sounders onboard the rover for exploration of the ices below the surface of the Moon have been investigated.

In the polar regions of the Mars, there are thick ice layers called polar layered deposits, which were investigated in detail by radar sounders onboard the Mars Express [Orosei et al., 2015] and Mars Reconnaissance Orbiter [Phillips et al. 2008; Foss et al., 2017]. The presence of the ices in the polar region was also supported by theoretical studies [Clifford et al. 1993; Grimm et al., 2017]. On the other hand, the presence of the subsurface ices in low latitude regions is still being discussed. Some theoretical studies suggest that ice has been lost due to sublimation [Grimm et al., 2017] while some observations such as surface radar echoes [Mouginot et al., 2012; Castaldo et al., 2017] and gamma ray spectrometer [Feldman et al., 2004; Boynton et al., 2007] suggest the presence of the subsurface ice. Because the subsurface ice is considered to be thin in low latitude if it exists, we propose radar onboard the orbiter with an operation frequency of 50-150 MHz to perform global survey of the ice up to depth of 300 m at a resolution of 1.5 m, focusing on the shallower subsurface structures than the previous radar sounders' observations.

Keywords: subsurface radar sounder