Global feature of HF radar reflected from lunar surface derived from Kaguya/LRS

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To obtain information on the subsurface geological features of the Moon, the Lunar Radar Sounder (LRS) experiment has been carried out on-board the Kaguya spacecraft. From the data from an early period of the LRS observation from the middle of December 2007, we found clear evidence of subsurface strata extending below the nearside maria regions. We surveyed subsurface strata obvious below the nearside maria regions, and identified them in seven regions with a depth extending from 330 m to 1160 m [Ono et al., accepted].

The purpose of the LRS experiment on-board the Kaguya spacecraft was to better understand the subsurface sounding experiment of the moon to provide a global survey of the geological features of the lunar subsurface region by applying the HF radar method. Because knowledge of topographical features of the subsurface to a depth of several km is directly related to the history of lunar geology, it is necessary to accurately understand the origin and evolution of the moon. In this presentation, the global distributions of some characteristics features of the reflected echoes are shown.

Global distribution of the echo power from lunar surface shows the clear dichotomy, whose values are distributed from -90 to -73 dBV. The mare regions on nearside represent the strong echo power. The echo power of the Mare Serenitatis, and Ocean Procellarum are distributed around -75 dBV. The highland regions represent the weak echo power. The echo power of the Aitken basin is distributed around -83 dBV. This echo power map has a good correspondence with a visible map of the lunar surface.

The most important feature in the mare region is that the echo intensity of LRS radar map has a good correlation with FeO weight percent map from Lunar Prospector. This result implies a strong correlation between radar echoes from the lunar surface and FeO abundance (or high dielectric constant) in the region where roughness could be assumed to be relatively constant.The overall echo intensity in SPA is less than the terra echo. Although the cause of the decrease in SPA is unsolved, the region near SPA is very different from other sample areas. Strong crustal magnetic anomaly may be candidate to connected with the decrease. The systematic difference are still under debatable.

Note that the surface echo power is related to several physical quantities such as the surface roughness, the reflectivity, the dielectric constant, and the porosity. To derive the global features of the physical quantities such as the reflectivity, the dielectric constant, the roughness, and the porosity, we need to attempt a numerical simulation to discuss roles of each physical quantity for each characteristic.