Electrical snd thermal property of surface material of the moon derived by using LRS on-board SELENE and gorund based experiments

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The Lunar Radar Sounder (LRS) on-board the SELENE will provide subsurface stratification and tectonic features in the shallow part (several km depths) of the lunar crust, by using an FM/CW radar technique in HF (˜5MHz) frequency range (Ono and Oya, 2000). Knowledge of the subsurface structure is crucial to better understanding not only of the geologic history, but also of the regional and global thermal history of the Moon, and also of the origin of the Earth-Moon system. In addition to the subsurface radar experiment, LRS will provide the spectrum of plasma waves, and solar and planetary radio waves in wide frequency range covering from 10 Hz to 30 MHz. The pre-flight model integration test of the SELENE spacecraft has been carried out from the April, 2006 to February, 2007, and it will be launched in 2007.

Radio sounding of the moon's surface region has great advantage in term of the sounding depth. When we use radio waves with short wave length of about 1 cm, we can obtain properties of subsurface materials of only several 10 cm below the surface boundary. However, when we use wavelengths of several m the sounding depth becomes more than 100 m. Indeed, the LRS system on-board the SELENE satellite is able to measure the subsurface structure of several km below the moon's surface region.

In this context, we tried to measure the electromagnetic thermal radiation from the moon at 325MHz from the ground by using the Iitate Planetary Radio Telescope established by Planetary Plasma and Atmosphere Research Center of Tohoku University. Accumulation of observation data provides moon temperature of with the wavelength of 0.92m. As the results of the data analysis, we identified moon's brightness temperature as 289 K. This temperature seems consistent with results of the Apollo [Langseth et al., 1976] when we take into account the skin depth of 16.6 m based on the Apollo [Strangway and Olhoeft, 1977] data and ground based radar experiment [Hagfors et al., 1969]. It is concluded that ground based radio observation is able to contribute to identify the electrical and thermal property of the moon's surface region which are important parameters for the data interpretation of the Lunar Radar Sounder data.

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