Simulation of the Lunar Surface Emission and Inversion of the Regolith Layer Thickness Using Fusio

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A correspondence of the lunar regolith layer thickness to the lunar digital elevation mapping (DEM) is p
to construct the global distribution of lunar regolith layer thickness. Based on some measurements, the
temperature distribution over the lunar surface is proposed. Albedo of the lunar nearside at the wav
0.42, 0.65, 0.75, 0.95 μm from the telescopic observation is employed to construct the spatial distributi
FeO+TiO_2on the lunar regolith layer. A statistic relationship between the DEM and FeO+TiO_2 conte
lunar nearside is then extended to construction of FeO+TiO_2 content of the lunar farside. Thus, the d
permittivity of global lunar regolith layer can be determined.
Based on all theses conditions, brightness temperature of the lunar regolith layer in passive microwav
sensing, which is planned for China's Chang-E lunar project, is numerically simulated by a parallel lay
using the fluctuation dissipation theorem.
Furthermore, taking these simulations as observations, an inversion method of the lunar regolith layer t
is developed by using three- or two-channels brightness temperatures. When the FeO+TiO_2 conten
and the four channels brightness temperatures in Chang-E project are well distinguishable, the regol
thickness and physical temperature of the underlying lunar rocky media can be inverted by the three-
approach. When the FeO+TiO_2 content is so high that the brightness temperature at higher frequency
might be saturated, the regolith layer thickness is alternatively inverted only by the two-channels appr
Numerical simulation and inversion approach in this paper make an evaluation of the performance
passive microwave remote sensing, and for future data calibration and validation.