月磁気異常磁場３成分の月面マッピング（序報）

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Surface mapping of three components of the lunar magnetic anomaly field: Preliminary results

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We have developed a surface mapping method of three components of the lunar magnetic anomaly field and applied it to several strong anomaly regions of the Moon. In mapping magnetic anomalies, magnetic field data at various altitudes are normalized to a constant altitude. The surface mapping of the anomaly field is considered to be normalization at zero altitude. There have been three major methods of the altitude normalization: an empirical power law of the altitude dependence of the magnetic anomaly amplitude (Richmond and Hood, 2008), approximation by horizontal magnetic dipoles on the lunar surface to give the magnetic anomaly field at a constant altitude (Purucker, 2008) and equivalent pole reduction (EPR) using magnetic charges on the surface (Toyoshima et al., 2008). However, these methods can not be applied to the surface mapping since the estimated anomaly field diverges at zero altitude. Thus another method is required for the surface mapping of three components of the lunar magnetic anomaly field.

Altitude normalization of the magnetic anomaly field is treated as a boundary value problem of the potential field. For the second-kind boundary value problem, surface radial component distribution of the magnetic anomaly field is obtained through an inverse problem (Tsunakawa et al., 2010). Taking account of a reasonable assumption that there are no point sources of the magnetic anomaly on the surface, the obtained distribution of the radial component could represent an actual surface field. Applying our new method, two horizontal components of the anomaly field on the surface can be estimated from the surface radial component distribution. Thus three components of the anomaly field on the surface are estimated from the observed magnetic field. This method of horizontal component estimation was checked applying various model fields of a single magnetic dipole source. As a result, it shows good accuracy of horizontal components if radial components are correct.

We have applied to several strong anomaly regions observed by Kaguya and Lunar Prospector at low altitude, mostly 15-45 km. Preliminary mapping results show that most of the anomaly patterns are composed of a few spots and linearly elongated fragments with strong intensities up to 500 nT. Detailed features will be discussed on the basis of the surface mapping results.