Geophysical Research Abstracts, Vol. 8, 08246, 2006
SRef-ID: 1607-7962/gra/EGU06-A-08246

Crustal thickness of the Moon from a gravity inversion by using a polyhedron

H. Hikida and M. Wieczorek
Institut de Physique du Globe de Paris

There are two related problems of using spherical harmonics for modeling the crustal thickness of the Moon; first, every coefficient contains information for all regions over the sphere. Second, in comparison to the resolution of the nearside gravity field, the resolution of the farside gravity field is significantly lower (Konopliv *et al.*, 2001). This is a result of the Moon's synchronous rotation, which does not allow gravity tracking data to be obtained much beyond the lunar limbs. Therefore the mantle relief derived by the spherical harmonic method will be biased by the low resolution of the farside gravity data.

Previous methods (*e.g.*, Neumann *et al.*, 1996; Wieczorek and Phillips, 1998) have shown that spherical harmonic inversions for global crustal thickness of the Moon are unstable as a result of the exponential increase of errors that occurs when the Bouguer anomaly is downward continued to the crust-mantle interface (Phipps Morgan and Blackman, 1993). To account for this, they have iteratively filtered their solutions in the spectral domain. The filter used in these inversions, however, had a value of 0.5 at a spherical harmonic degree of about 30, whereas the resolution of the nearside gravity field is approximately 150. Thus, in order to obtain of global solution in the spherical harmonic domain, the global resolution must be much less than the maximum achievable resolution on the nearside.

Werner and Scheeres (1997) analytically derive the exterior gravity field of an arbitrarily shaped polyhedron. For calculating the field, we only need to know the the location of each vertex of the polyhedron. In this study we examine the applicability of their method to the gravity inversion for the crustal thickness of the Moon in order to bypass the problems associated with the spherical harmonic inversions. In particular, the resolution of the resulting crustal thickness maps will ultimately be tailored to the resolution of the gravity field. Here, however, for a first test of this method, we will use a constant spatial resolution of a polyhedron which consists of triangular patches.