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Viscous model calculation for Moho deformation beneath mascon basin expected from gravity field model of Kaguya

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Dichotomy of the Moon has been an important, yet unsolved issue of lunar science. Crust on lunar farside is thicker than that on nearside. And lunar impact basins on the farside show different characteristics from those on the nearside. Surface topography and mantle uplift of Type I basins on the farside have been supported by rigid lithosphere because of low temperature at the time of basin formation. Thus little viscous relaxation of both surface topography and mantle uplift is suggested by topography and gravity field model of Kaguya. On the other hand, both surface topography and mantle uplift of mascon basin on the nearside suggest viscous relaxation (Namiki et al., 2009). We estimate the shape of mantle uplift beneath basins from gravity anomaly data of Kaguya. The central mantle uplift of the farside basin is steep. On the other hand, the central mantle uplift of mascon basins on the nearside is flat and its shape is trapezoidal. On the nearside, thus the steep shape of central mantle uplift at the time of basin formation is inferred to have been deformed to current trapezoidal shape due to viscous relaxation. We assume the top of mantle uplift is modified by heat which magma transports from deep interior. In order to test this hypothesis, we estimate duration of thermal dissipation. Using azimuthally symmetric models with magma chamber just above mantle uplift, we estimate temperature variation of lower crust and mantle uplift from equation of time-dependent heat conduction by finite element calculations. Our previous study shows that viscous relaxation of mantle uplift occurs in 0.1 ~ 0.5 Gyr for Moho temperature higher than 870 K. We independently estimate duration of time for the top of mantle to keep temperature higher than 870 K. While the estimated time is as short as 7.2 million years, we consider it possible for viscous relaxation of the top of mantle uplift to grow within 7.2 million years because mantle uplift could be heated higher than 870 K by ascending magma. We will report estimates of visco-elastic deformation of mantle uplift with heat diffusion.