LOCALIZED GRAVITY/TOPOGRAPHY CORRELATION SPECTRA ON THE MOON.

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Introduction: The correlations between the topography and gravity anomalies provide important information on the level of isostatic compensation of the lithosphere at the geological time-scale, and reflect its thermo-mechanical state. Therefore, localized correlation analysis is one of the most important studies of selenodesy. Japanese lunar exploration KAGUYA (SELENE) has two kinds of selenodesical experiments. One is RSAT/VRAD (gravity mapping) experiment and another is Laser ALTimeter (LALT; topography mapping) experiment. These two experiments enable us to conduct localized analysis for the Moon.

Data: KAGUYA mission has been yielding representation of lunar gravity and topography (shape) substantially superior in resolution and accuracy to earlier solutions. For global lunar gravity field, an accurate spherical harmonic model of gravitational potential up to 90 degrees (SGM90d) was derived from 5 month tracking (including 4-way Doppler) data [1]. For topography, LALT has obtained more than 6 million altitude measurements with 5 m, from which a spherical harmonic expansion of topography to degree and order 1439 (STM1439_grid-01) has been determined [2]. In this study, we use those new models.

Localized spectral analysis: We employ the spatio-spectral localization technique [3] to obtain gravity/shape correlation spectra as function of position on the Moon. In this analysis, we localize harmonic field with axisymmetric windows of constant diameter, described by L_{win} zonal harmonic coefficients. This restricts the permissible range of l in the windowed fields at both the low- ($l > L_{win}$) and high-wave number ends ($l < L_{obs} – L_{win}$, ; L_{obs} is the maximum degree of observation) . We chose three fixed windows with L_{win} = 5, 10, 17 (equivalent to spatial scales 2200, 1100, and 640 km, respectively). These window sizes correspond to large-, middle-, and small-size of impact basins.

Results: For up to degree 50 with L_{win} = 5 scale, it is clearly shown that the near-side is contains distinct anti-correlation regions whereas the far-side is mostly occupied by high correlation region. This difference is mainly due to large mascon basins in near-side, such as mare Imbrium. For L_{win} = 10 and 17 scales, we can see anti-correlation regions at not only near-side but also far side. Locations of anti-correlation regions in the far-side correspond to impact basins. However, lots of far side basins are not indicated by anti-correlations. In contrast, almost all near-side basins show anti-correlations. This difference is provably due to the difference of elastic thickness between near-side and far-side during the age of impact basin formation. It provides important information on the origin of lunar dichotomy and lunar thermal history.

Acknowledgements: SHTOOLS2.3 [4] was used for calculating localized correlation.

References: [1] N. Namiki et al., 2008. *this meeting*. [2] H. Araki et al., 2008, *this meeting*. [3] M. Simons et al., 1997. *Geophys. J. Int*., 131, 24-44. [4] M. Wieczorek, 2007. *http://www.ipgp.jussieu.fr/~wieczor/SHTOOLS/SHTOOLS.html*