



Lithosphere with variable thickness: the case of a one-plate planet

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The lithosphere of terrestrial planets is often modeled as an elastic plate or shell deflected by a topographic load. The elastic thickness and other lithospheric geophysical parameters are then obtained from a spectral analysis of gravity and topography data. Since properties of the lithosphere vary from place to place on the planetary surface, it is mandatory to provide local estimates of the geophysical parameters. However global effects due to the spherical geometry cannot be neglected on one-plate planets such as Mars. We thus derive the equations for the deflection of a spherical shell with variable thickness and solve them in example cases. In simple cases allowing comparisons, we show that significant deviations occur with respect to combinations of solutions with constant elastic thickness. In this way, we can estimate the error in the localized spectral analysis (or spatio-spectral method) due to the variation of the lithospheric thickness.