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Geometrical Model of the Earth's Geocenter Based on GRACE Gravity Field Maps

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We derived the rate in geocenter z-coordinate from the secular rate of low-degree odd coefficients (˝pear-shaped˝) over the last 15 years (GRACE RL05) and compared it with results from the global GPS and SLR solutions, tide-gauge records over the last 100 years and the limited data set of geocenter z-coordinates estimated from the combined orbit determination for the Jason-2 satellite and the GPS constellation. This confirms the initial assumption that temporal gravity field maps provided by the GRACE mission contain an information on the geocenter z-coordinates and, in addition, reveal an interesting information that the asymmetrical mean sea lever rise between the Northern and the Southern hemispheres could be reflected in the rate of asymmetric surface spherical harmonics (˝pear-shaped˝). Following (Cazenave and Llovel 2010), satellite altimetry observations suggest that the mean sea level has been rising faster over the Southern than over the Northern Hemisphere, whereas recently (Wöppelmann et al. 2014) using selected tide-gauges measurements corrected with the glacial isostatic adjustment (GIA) and GPS velocities report the opposite sign, i.e. the mean sea level rise of 2.0 ± 0.2 mm/yr for the Northern hemisphere and 1.1 ± 0.2 mm/yr for the Southern hemisphere. Based on the 15 years of GRACE gravity field models (GRACE RL05), we can draw the conclusion that difference in the mean sea level rise between the Northern and the Southern hemispheres is reflected in the rate of the z-coordinate of the geocenter and that the mean sea level has been rising faster over the Southern than over the Northern hemisphere.