



Secular motions of the geocenter

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Mass redistributions within the Earth induce displacements of the center of mass (the geocenter) with respect to the center of figure of the Earth. The up to date realization of the International Terrestrial Reference System (ITRF2005) presents a particularly large translation rate of 1.8 mm per year on the Z-component with respect to the ITRF2000. Such rate is too large to be interpreted as a secular motion of the geocenter. It is most probably linked to the inhomogeneous shape of the station measurement network and other technique systematic errors.

The geocenter motion at the secular timescale is due to the combined relative impacts of different geodynamical phenomena, including the post-glacial rebound, the mantle dynamics, continent mass redistributions induced by the plate tectonics, large period climatic variations, etc. We investigate here theoretically the maximum geocenter motion that can be expected at secular and geological timescales (a first estimation led to a maximum of 0.5 mm per year). We notably focus on the present and past impact of the plate tectonics and the continent mass redistribution on geocenter position and motion with respect to the center of figure. Knowing the temporal evolution of the ocean-continent distribution, we investigate the degree one temporal evolution of the global gravity field of the Earth, which is directly linked to the instantaneous position of the geocenter.