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A global empirical GIA model based on GRACE data

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Global Glacial Isostatic Adjustment (GIA) processes are usually represented by numerical models that simultaneously solve for glacial evolution and Earth rheology, being mainly constrained by the geological evidences of local ice extent and global sea level, as well as geodetic observations of Earth rotation. In recent years, GPS and GRACE observations have often been used to improve those models, especially in the context of regional studies, where the largest effects of lateral heterogeneities in the Earth structure are expected. However, regional models are intrinsically limited when it comes to answering questions from global scale geodesy. Examples are the closure of the sea level budget, the explanation of observed changes in Earth rotation, and the determination of the origin of the Earth reference frame. Furthermore, the issue of the consistency of regional models with each other is typically ignored. We consider this as a drawback, since such a consistency may not only be considered as an additional constraint, but is also important if the regional models are to be integrated into a global one.
Here, we present a global empirical model of present-day mass changes driven by GIA, solely based on GRACE data and on geoid fingerprints of regional GIA combined with surface mass redistribution. We will show how the use of observations from a single space-borne platform allows us to tackle the questions from global scale geodesy mentioned above, and at the same time obtain a self-consistent GIA model at regional scales.