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Investigation of empirically estimated GIA over Antarctica based on various data inputs

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Glacial Isostatic Adjustment (GIA) plays a crucial role in a wide range of geophysical applications, e.g. affecting global mass transport derived from analysis of time-variable gravity data, sea level change or GPS measured vertical land motion. Since GIA can not be measured directly, it is either forward modelled based on long-term ice-histories or derived empirically by combining GRACE gravity data with height changes derived from ice-altimtery data and modelled surface processes. However, there are significant differences between individual models and approaches, especially over Antarctica.

Here, we focus on the GIA signal in Antarctica and investigate the dependence of an empirical GIA estimation based on Gunter et al. (2014) on individual input variables. We will focus especially on the influence of models considering surface processes and the choice of ice-altimetry data. Furthermore, we examine the influence of different GRACE solutions in combination with corresponding processing choices.

We validate our results against existing models and a global sea level inversion (Rietbroek et al., 2016) which co-estimates contemporary GIA rates. Preliminary comparison results with the inversion approach indicate significant discrepancies. Knowledge of the limitations of both approaches and the error characteristics will help to integrate the ice-altimetry measurements as an additional observation into the global inversion approach, in order to improve future estimation of the GIA rates which as of now require careful regularization.