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Inverting Glacial Isostatic Adjustment beyond linear viscoelasticity using the Burgers rheology

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In Glacial Isostatic Adjustment (GIA) inverse modeling, the usual assumption for the mantle rheology is the Maxwell model, which exhibits constant viscosity over time. However, mineral physics experiments and post-seismic observations show evidence of a transient component in the deformation of the shallow mantle, with a short-term viscosity lower than the long-term one. In these studies, the resulting rheology is modeled by a Burgers material: such rheology is indeed expected as the mantle is a mixture of materials with different viscosities.
We propose to apply this rheology for the whole viscoelastic mantle, and, using a Bayesian MCMC inverse formalism for GIA during the last glacial cycle, study its impact on estimations of viscosity values, elastic thickness of the lithosphere, and ice distribution. To perform this inversion, we use a global dataset of sea level records, the geological constraints of ice-sheet margins, and present-day GPS data as well as satellite gravimetry.
Our ambition is to present not only the best fitting model, but also the range of possible solutions (within the explored space of parameters) with their respective probability of explaining the data.
Our results show that the Burgers model is able to fit the dataset as well as the Maxwell model, but would imply a larger lower mantle viscosity, thicker ice sheets over Fennoscandia and Canada, and thinner ice sheets over Antarctica and Greenland.