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Spatio-temporal decomposition of geophysical signals in North America

Aoibheann Brady[1], Jonathan Rougier[2], Bramha Dutt Vishwakarma[1], Yann Ziegler[1], Richard Westaway[1], and Jonathan Bamber[1]

[1]School of Geographical Sciences, University of Bristol, Bristol, United Kingdom of Great Britain and Northern Ireland
[2]Rougier Consulting Limited

Sea level rise is one of the most significant consequences of projected future changes in climate. One factor which influences sea level rise is vertical land motion (VLM) due to glacial isostatic adjustment (GIA), which changes the elevation of the ocean floor. Typically, GIA forward models are used for this purpose, but these are known to vary with the assumptions made about ice loading history and Earth structure. In this study, we implement a Bayesian hierarchical modelling framework to explore a data-driven VLM solution for North America, with the aim of separating out the overall signal into its GIA and hydrology (mass change) components. A Bayesian spatio-temporal model is implemented in INLA using satellite (GRACE) and in-situ (GPS) data as observations. Under the assumption that GIA varies in space but is constant in time, and that hydrology is both spatially- and temporally-variable, it is possible to separate the contributions of each component with an associated uncertainty level. Early results will be presented. Extensions to the BHM framework to investigate sea level rise at the global scale, such as the inclusion of additional processes and incorporation of increased volumes of data, will be discussed.