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Using global paleogeographic datasets towards ground-truthing dynamic topography models

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The topography of the Earth's surface is subject to constant change due to tectonic, surface processes and mantle-driven vertical motions. While the effects of mantle convection can be approximated via convection models, there is a lack of temporally and spatially consistent data at global scale to ground-truth these models.
We reverse-engineered data from published, independent global and regional paleogeographic map sets using GIS and the open-source plate tectonic modelling software GPlates and constructed a set of time-dependent, global paleo-shorelines spanning the Cretaceous Period. Within this framework, we then verify the paleoshorelines against geological maps and compute the variations between the different paleoshoreline models, creating a hybrid dataset out of the areas of highest confidence. Using this hybrid dataset, we compute the amount of change in the lateral shoreline position between individual timesteps to derive spatio-temporal patterns of relative subsidence and uplift. By taking stable cratonic blocks as our geographic base reference, we derive the tilting of these blocks and compute hypsometric curves through the amount of flooding. For our analysis we utilize a global, self-consistent set of dynamic plate polygons, sediment thickness data, and a time-dependent collection of rift basins to discriminate between areas undergoing lithospheric deformation and stable continental regions.
A geospatial proximity analysis is performed to determine the spatio-temporal relationship to adjacent plate boundary types. We then compare our results with dynamic topography models.