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Mesozoic ocean basins and the link to modeled dynamic topography of the circum-Arctic

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The tectonic evolution of the circum-Arctic is complex, punctuated by the opening and closing of several ocean basins, and the accretion and deformation of numerous autochthonous and allochthonous terranes. Here, we present a new plate tectonic reconstruction for the circum-Arctic and adjacent regions since the start of the Jurassic, incorporating the opening of the Amerasia Basin and associated closure of the South Anuyi Ocean. The location of palaeo-subduction zones can be used to infer mantle heterogeneity structure beneath north-eastern North America, the Canadian Arctic Islands, Northern Atlantic and Russia. We use this kinematic plate reconstruction to drive forward geodynamic models of mantle flow from which we compute the spatio-temporal evolution of dynamic topography. The passage of the evolving circum-Arctic over subducting slabs is expected to impart long-wavelength subsidence followed by uplift. Separating the isostatic and dynamic contributions to circum-Arctic topography is challenging because of the paucity of offshore and onshore regional datasets, and is complicated by multiple processes, including rifting, long-wavelength mantle flow, magmatic underplating, sediment loading, and volcanism. Therefore, we focus on the possible correlation between the evolution of long-wavelength topography and post-Jurassic subduction zones. We compare the dynamic topography predicted by our geodynamic models to residual topography, published palaeo-geographic maps and anomalous tectonic subsidence.