

Development of the Amerasia Basin: Insights from analogue modeling

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The tectonic development of the Amerasia Basin and its sub-domains (the Canada Basin, the Makarov-Povodnikov basins, the Alpha-Mendeleev Ridges, and the Chukchi Plateau) has long been debated. Recent studies confirm the conjugate relationship between the Alaskan and Canadian Arctic margins, in which counterclockwise rotation of Arctic Alaska from Arctic Canada resulted in the opening of the Canada Basin; although the northward extent of this spreading is debated, the tectonic development of the Canada Basin is 'broadly' understood. The precise timing and the role of the Chukchi Plateau is also problematic. In a series of two-plate analogue models with properties homologous of homogeneous continental crust, we were able to model the development of the Amerasia basin and its sub-domains (those not related to the HALIP). In all models, a triangular (ocean) basin forms between the two 'diverging' plates, however, depending on the mode of opening and initial plate configuration transpressive, transtensive, and 'pure' strike-slip structures are generated and account for the following first order observations: i) transcurrent margins of opposite motion, ii) curvature in the fossil ridge, and ii) asymmetry of the basin. In addition, extension and clockwise rotation of the Chukchi Plateau (without compression) is achieved as part of the upper-plate of a detachment system in which lower-plate motion exceeds upper-plate motion. Our results elucidate the development of sea-floor spreading in the Amerasia Basin and are consistent with a rotational opening scenario.