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Cretaceous plate tectonic model of Russian Arctic shelf

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Despite a decade of newly acquired geophysical and geological data, the tectonic history of the Arctic region is still very poorly understood. Here we are using the wealth of new geophysical and geological data for the Siberian part of Arctic to unravel possible tectonic scenarios that can explain the newly interpreted structure of the Siberian Shelf and surrounding regions.

Based on the new seismic data and links with onshore geology and drilling wells, a new tectonostratigraphy has been established for numerous sub-parallel rifts in the Chukchi, East-Siberian and South-Anisian basins. We suggest that the main stage of extension for the Chukchi, East-Siberian and Anisian basin that resulted in β-factors of 2, 1.25, and 1.2, respectively, took place in Aptian-Albian. For the Ust-Lena basin the main extensional stage of c. 100 km (β-factors of 1.7), was in Eocene-Oligocene corresponding with the simultaneous opening of the oceanic Eurasian basin. According to this model, we have interpreted an Aptian-Albian extension episode with west-east orientation in the Arctic Siberian shelf. At the same time available global plate kinematics models suggest that during this time span the Arctic was characterized by tectonic quiescence. This interpretation is mostly a result of interpolation between the information obtained for the boundaries of the Cretaceous Normal Superchron (CNS) placed at c. 120 and 83.5 Ma. We therefore compute stage rotations inside CNS which can satisfy the geological constraints identified in the Siberian Shelf data.

The global kinematic models are also predicting considerable compression (c. 300 km) in the Siberian shelf between 82 and 65 Ma which is not observed in our dataset. Here we attempt to discuss possible alternative models that can alleviate this inconsistency. Our new regional model for the Cretaceous implement these changes in an attempt to improve and refine the global plate model for the last 125 Ma.