New insights into the tectonic evolution of the Amerasia Basin, Arctic Ocean

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The tectonic evolution of the older part of the Arctic Ocean, the Amerasia Basin is still not sufficiently understood, despite of a good coverage of aerogeophysical data. In contrast to the Eurasia Basin no seafloor spreading anomalies can be identified for most parts of the Amerasia Basin. The critical information needed for progress is dateable basement samples from various ridges and plateaus, sufficient marine seismic data and a sound understanding of the geology of Siberia and Alaska. This contribution reports new geophysical data along the East Siberian margin. The objective of the 2008 RV Polarstern cruise was to gather new information on the deeper structure of the Mendeleev Ridge at its junction with the Siberian shelf, and the Makarov/Podvodnikov Basin which is situated between the Mendeleev and Lomonosov ridges. Favourable ice conditions allowed data collection along an almost continuous 1000 km-long seismic transect along 81°N with a 300 m streamer and a 32 ltr airgun array, as well as several seismic profiles across the East Siberian margin. The seismic data imaged the entire sedimentary column down to the acoustic basement, and provide the following simple insights into the tectonic evolution:

- The Amerasian margin of the Lomonosov Ridge along our transect is very wide. It shows all characteristics of a rifted continental margin. Most likely rotated basement blocks are successively covered by sediments, which are not affected by any tectonic faulting. Thus, most of the Makarov/Podvodnikov Basin along the transect is underlain by stretched continental crust from the Lomonosov Ridge margin.
- The Marakov-facing margin of the Mendeleev Ridge has a completely different appearance. The ridge is more or less the same age as the small part of oceanic crust beneath the Makarov/Podvodnikov Basin, and was later covered by sediments.
- Approximately 1000 m below the seafloor the Lomonosov Ridge hosts a prominent reflector, previously attributed to be 10-20 Myr old. Considering the entire basin geometry as well as the drilling results from the ACEX campaign, it is more likely that this reflector has an age of at least 55 Myrs. Beneath this unconformity several kilometers of sediment are observed.

This has several significant consequences for any geodynamic models:

- The Laptev Sea stratigraphy from which the younger age of the unconformity was deduced, is incorrect.
- The Makarov/Podvodnikov Basin is definitely of Cretaceous age.
- The oceanic Mendeleev Ridge most likely formed contemporaneously with the initial formation of oceanic crust in the Makarov/Podvodnikov Basin. The oceanic crust is estimated to be 100 Myrs old.
- The rifting and/or formation of the seafloor spreading stopped with the eruption of the Mendeleev Ridge. Alternatively, the stress regime changed from perpendicular to the Lomonosov Ridge margin to strike slip.