Geophysical Research Abstracts
Vol. 14, EGU2012-13474, 2012
EGU General Assembly 2012

The Arctic lithosphere: an overview

S. Drachev (1), V. Pease (2), and R. Stephenson (3)

(1) ExxonMobil International Ltd., Leatherhead, United Kingdom (sergey.s.drachev@exxonmobil.com), (2) Department of Geological Sciences, Stockholm University, Sweden (Vicky.Pease@geo.su.se), (3) School of Geosciences, University of Aberdeen, United Kingdom (r.stephenson@abdn.ac.uk)

The Arctic is comprised of three deepwater oceanic basins, the Norwegian-Greenland, Eurasia, and Amerasia basins, surrounded by continental masses of the Achaean to Early Proterozoic North American, Baltica and Siberian cratons and intervening Neoproterozoic and Phanerozoic fold belts. Though the tectonic history of the Arctic continental realm spans almost three billions of years, the formation of the Arctic began with the creation of Pangaea-II supercontinent at end of Permian epoch. Between 250 and 150 Ma the Proto-Arctic was represented by the Anyui Ocean, or Angayuchum Sea – a Paleo-Pacific embayment into Pangaea II. During the Mesozoic Pangaea II was destroyed and the Anyi Ocean was isolated from the Paleo-Pacific, finally leading to the separation of Arctic Alaska-Chukchi Microcontinent from the North American side of Laurasia; the collision of this microplate with the Siberian margin occurred at ca. 125 Ma in association with the opening of the Canada Basin. The final stage of the Arctic formation took place in the Cenozoic, and was related to the propagation of the divergent Atlantic lithospheric plate boundary between North America and Baltica with the separation of the Lomonosov continental sliver from the Eurasian margin and opening of the Eurasia oceanic basin between 56 and 0 Ma.

The present-day Arctic, especially its shelves and oceanic basins, is one of the least studied places on the Earth. Though we know the geology of the surrounding continental masses, there are still many questions remaining about major lithospheric divides beneath the Arctic seas, such as:
• Where are the plate boundaries associated with the Amerasia Basin?
• How and when did the Canada Basin open?
• What was the pre-drift setting of the Chukchi Borderland?
• Which tectonic processes formed the East Siberian shelves?
• How and when did the major ridges in the Amerasia Basin form?
• Where are the Early Tertiary plate boundaries in the Arctic?
• What is the relationship between segmentation of the Gakkel Ridge and ultra-slow spreading processes?
• Has the axial geometry of the Gakkel Ridge changed since rifting? If not, why?
• What structures connect seafloor spreading on the Gakkel Ridge to continental extension on the Laptev Shelf?
• Where are the continuations of pre-Eocene orogens in the Arctic?
• How do these crustal-scale discontinuities influence Arctic tectonic evolution?
• How has this tectonic evolution affected the sedimentation history of the Arctic basins?