Geophysical Research Abstracts
Vol. 15, EGU2013-130, 2013
EGU General Assembly 2013

Ultraslow spreading processes along the Arctic mid-ocean ridge system

Vera Schlindwein
Alfred Wegener Institute for Polar and Marine Research, Geophysics, Bremerhaven, Germany (Vera.Schlindwein@awi.de)

Generation of new seafloor in the Arctic Ocean occurs along the more than 2800 km long Arctic Ridge System from the Knipovich Ridge in the south to Gakkel ridge in the northeast. The plates separate at velocities of only 6-15 mm/y making the Arctic Ridge System the most prominent representative of an ultraslow spreading mid-ocean ridge. The engine of crustal production splutters at very low spreading rates such that ultraslow spreading ridges show a unique morphology: Isolated volcanoes, capable of vigorous eruptions, pierce the seafloor at distances of several hundred kilometres; in between there are long stretches without volcanism.
My work group studies at global, regional and local scale the spreading processes of the Arctic ridge system, using earthquake records of ocean bottom seismometers, seismometers on drifting ice floes and of the global seismic network.
We discovered that, contrary to faster spreading ridges, amagmatic portions of the Arctic ridge system are characterised by decreased seismicity rates with few and relatively weak earthquakes, whereas magmatically robust segments display more frequent seismic events. The maximum depth of earthquake hypocentres varies markedly along axis reaching maxima of 22 km depth below sea floor. Volcanic centres are characterized by vigorous earthquake swarm activity including large earthquake swarms that are recorded teleseismically. These earthquake swarms appear to be connected to episodes of active spreading as demonstrated at the 85°E volcanic complex at eastern Gakkel ridge which experienced an unusual spreading event between 1999 and 2001. The varying patterns of seismicity along the ridge axis correlate well with the pronounced differences in ridge morphology and petrology and its magnetic and gravimetric signatures. Our results support current theories of magma production at ultraslow spreading ridges which postulate a lateral melt flow towards isolated volcanic centres.