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Structural studies in the Pevek region, Russia: Possible implications for the evolution of the East Siberian Shelf and Makharov Basin of the Arctic Ocean

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The Pevek region of Arctic Russia provides excellent beach cliff exposure of sedimentary and igneous rocks that yield detailed information on the nature, progression and timing of structural events in this region. Regional folding and thrust faulting, with the development of a south-dipping axial plane cleavage/foliation developed during N-S to NE-SW directed shortening related to formation of the Chukotka-Anyui fold belt. This deformation involves strata as young as Valanginian based on fossils. Fold-related structures are cut by intermediate to silicic composition batholiths, plutons and dikes of Cretaceous age. Reported K-Ar ages on the granitoids range from 144 to 85 Ma, but to the south, U-Pb zircon ages of compositionally similar plutons yield a much narrower age range of $\sim$ 112-117 Ma (Katkov et al., 2005). Magmas were intruded during an episode of E-W to ENE-WSW directed regional extension based on the consistent N-S to NNW-SSE orientation of over 800 mapped dikes and quartz veins across a broad region. Analysis of small-offset faults yields stress/strain fields compatible with those inferred from the dikes. Younger tectonic activity across this region is minor; there is no evidence for younger faults, basins or magmatic activity. A lengthy period of uplift and erosion post-dated emplacement of Cretaceous plutons to produce present-day exposures. The Okhotsk-Chukotka Volcanic belt (OCVB) is mostly younger than 90 Ma (Tikhomirov et al., 2006), represents a southward jump in the locus of magmatism towards the Pacific margin, and likely post-dates any Arctic Ocean-related rifting at this longitude.

Available seismic reflection, gravity and magnetic data for the offshore Siberian Shelf

reveals a widespread, seismically mappable basement-sedimentary cover contact that deepens northward towards the edge of the shelf and few significant other basins. Various ages have been assigned by different studies to the oldest strata above the unconformity, ranging from Cretaceous (Albian) to Tertiary (Paleocene-Eocene).

Based on our structural studies, we speculate that Cretaceous magmatism, which heralds a change in tectonic environments from compression to extension, could represent one of the consequences of rift-related opening of the Makharov Basin north of the Siberian shelf at this longitude. If so, this rifting may be significantly older (mid Cretaceous) than previously suggested (Late Cretaceous or Paleocene). The post $\sim$112 (age of youngest plutons dated with U-Pb) and pre- 90 (oldest volcanic rocks of the OCVB) episode of uplift and erosion might represent the (yet undrilled) basement-sedimentary contact beneath the shelf, thus cover sequences could be as old as early Late Cretaceous. Although quite speculative, these conclusions suggest that additional land-based structural and geochronologic studies could provide useful constraints for resolving the plate tectonic history of the Arctic Ocean.

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