NORMAL- AND REVERSED-POLARITY SYNFOLDING CRM ALONG THE BROOKS RANGE MOUNTAIN FRONT, NORTHERN ALASKA*

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ABSTRACT

During the summer of 1984, a paleomagnetic study was conducted on 596 samples collected at 17 localities distributed over nearly the entire 1,000 km width of the Brooks Range mountain front, from the Lisburne Peninsula on the southwest to the Sadlerochit Mountains on the northeast. The sampled rocks represent predominantly marine (peritic) carbonates ranging in age from late Mississippian to early Cretaceous. These strata experienced only mild heating during the Brooks Range orogeny, based on CAI between 1.0 and 3.0. Progressive demagnetization (thermal, AF, and chemical) and IRM acquisition reveal that the characteristic magnetization at all localities is CRM residing in diagenetic magnetite and hematite, probably produced by oxidation of early diagenetic pyrite. In structurally deformed sections along the mountain front, the CRM is clearly synfolding, commonly appearing to have been acquired midway through the deformation. The prevalence of 50% synfolding CRM, in northern Alaska, in the Appalachians, and in the Overthrust Belt, probably reflects a near-equal balance between diagenetic grains that grew at the onset and at the termination of the orogeny. This relationship suggests that tectonic tilting controls the initiation and cessation of the fluid migration responsible for the chemical remagnetization. Along the mountain front, exclusively normal-polarity CRM was found from the Lisburne Peninsula through the central Brooks Range. Exclusively reversed-polarity CRM was found in the Sadlerochit Mountains and in drillcores from depths of at least 9,000 feet beneath Prudhoe Bay. The normal-polarity CRM could date from the Cretaceous Long Normal Interval, or, equally likely, from a time of normal-polarity-bias between 80 and 63 m.y.B.P. The reversed-polarity CRM probably dates from the Paleocene to middle Eocene (63 to 43 m.y. B.P.) interval of strong reversed polarity bias. The younger age of the reversed-polarity CRM in northeastern Alaska is consistent with geologic evidence for southwest to northeast younging of deformation; tilting did not begin in the Sadlerochit Mts. until the Paleogene.

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PALEOMAGNETIC RESULTS FROM THE SADLEROCHIT AND SHUBLIK MOUNTAINS, EASTERN NORTH SLOPE, ALASKA

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ABSTRACT

We have sampled Carboniferous through Triassic sedimentary units exposed in the Shublik and Sadlerochit Mountains in an attempt to obtain reliable primary magnetic components. Pre-Cretaceous poles from this area would greatly advance the understanding of the rotation and latitudinal displacement history of the Brooks Range.

Lisburne Group carbonates were drilled in south dipping units of Katakturuk Canyon, Sadlerochit Mountains, and in the north-dipping Fire Creek section, Shublik Mountains. Magnetic cleaning involved stepwise thermal demagnetization to 550°C. Application of principal component analysis to initial studies define two major components of magnetization. The secondary component is steep down (Inc=87°) while the characteristic component (325-500°C) is reversed. The secondary magnetization postdates folding, whereas the characteristic is prefolding in acquisition. The components could record two phases of overprinting: a Late Cretaceous-Cenozoic normal overprint and a pre-deformation remagnetization episode during a time of reverse polarity. However, the reverse component could be primary remanence. If so, it would suggest little latitudinal displacement but 40° of clockwise rotation with respect to North America.

The Devonian Nanook Limestone sampled in the Shublik Mountains also reveals two major components of magnetization; however, the characteristic component is isolated in higher blocking temperatures (at least 500°C) and is shallower in inclination than expected.

The recovery of the reversed characteristic component in this study is a significant result by itself. It is good evidence that at least part of the northeast Brooks Range has escaped thorough Cretaceous normal polarity overprinting. Hopefully, analyses of additional samples from Katakturuk, Nanook, Lisburne, Sadlerochit, and Shublik map units in ANWR and from the Triassic Otuk Formation in the east-central foothills will also discriminate pre-Cretaceous magnetizations and will afford some constraints on timing.

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