Paleosecular Variation of the Geomagnetic Field in Alaska: The Aleutians Islands and Wrangell Mountains Revisited

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Two studies were undertaken in the late 1960s to investigate paleosecular variations in the geomagnetic field as recorded in volcanic rocks. One was in the Aleutian Islands, and the other in the Wrangel Mountains. The results were internally consistent, but to be wholly credible by today's standards, further demagnetization, including thermal demagnetization was needed. We have used the duplicate samples from the original collections and applied complete thermal demagnetization protocols.

The Aleutian samples are from six sequences of volcanic flows, two with ages of about 2 Ma, and the other four within the Bruhnes chron. The results are generally similar to those obtained earlier, but show somewhat lower angular dispersions for the Virtual Geomagnetic Poles (VGP). With the exception of the only reversely magnetized site (Ashishik Point, about 2Ma) all sites give lower angular dispersions than those predicted by Secular Variation models for their present day latitudes. Several show clear patterns of clumped and sequential VGP positions. A possible interpretation of the low dispersion and sequential poles is that the time represented by the flows is short, and that the clumps represent flows erupted in quick succession. The available radiometric ages for the individual sections, using both K-Ar and 40Ar/39Ar methods indicate time spans from about 400,000 years (Driftwood Bay) to less than a few thousand years (Crater Creek). In all sections there are significant rubble beds between the flows that argues against an extremely short time-span for the sequence of lava flows to be erupted. The alpha 95 confidence limits for the mean VGPs include the geographic pole for all four of the younger sections with the mean VGPs for the 2 Ma sections being displaced by less than 10 degrees. The mean of all flows from all sections is within 2 degrees of the geographic pole.

For the Wrangell Mountains study a sequence of 21 flows was sampled. The age of the sequence based on K-Ar determinations is 3.5 Ma, and 40Ar/39Ar ages are pending. The five lowermost flows give very dispersed VGPs, including three with negative

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magnetic inclinations. Although these flows appear to be stratigraphicaly conformable with the flows higher in the sequence, it is possible that they represent an earlier volcanic episode. The next twelve flows are more or less evenly distributed in space within a section covering an altitude change of about 200m. These flows give a tightly grouped set of VGPs with an angular deviation of less than 6 degrees and a mean pole at about 40 degrees north latitude. The next four flows give VGPs that trend directly towards geographic north reaching a latutude of 66 degrees. Ancient horizontal is well determined from sediments deposited between the flows, and in small ponds subsequently covered by new lava flows. At face value, the small dispersion of the VGPs would indicate a stable field during the excursion, but could also be due to very rapid extrusion of the flows. We are trying to address this latter problem with more Argon-Argon dating.