GEOMAGNETIC FIELD INCLINATIONS AND ABSOLUTE PALEOINTENSITIES FOR A 350 KYR TIME GAP FROM THE 350 METER CORE OF THE KALIHI SCIENTIFIC DRILLING PROJECT FROM THE KOOLAU VOLCANO, O'AHU, HAWAI'I, USA

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In order to investigate the volcanic evolution of the Ko'olau Volcano, O'ahu, Hawaii and the geomagnetic field behavior recorded by the lavas, a palomagnetic and rock magnetic study was conducted on a 350 m thick sequence of flows from the Kalihi Scientific Drilling Project. This drill core records geomagnetic field inclination for the period of approximately 2.75 to 3.1 Ma. The core extends deeper stratigraphycally any surface exposures of the volcano and the rocks obtained have experienced less tropical weathering than surface rocks. Previous published work on Ko'olau has indicated that the volcano was formed during the Matuyama Chron (Doell and Dalryple, 1973, GSA Bull., 84, 127-142). We drilled multiple 1-inch long samples from each of the 103 flows in the drill core section. The paleomagnetic results of all the specimens were stepwise demagnetized by alternating fields from 5 to 100 mT. Companion sprecimens from the same core were demagnetized at 15 temperature steps. In both cases demagnetization diagrams obtained with each technique showed a stable and unambiguous characteristic direction of remanence (ChRM). The ChRM was calculated using principal components analyses for the demagnetization diagrams with a well-defined component trending to the origin. No biased or systematic departure from the origin was accepted and in all cases the ChRM relies on a minimum of 7 successive directions isolated during stepwise demagnetization. In addition, k-T, SIRM, hystereis loops, back field experiments were conducted to characterize the rock magnetic properties of the entire core under study. The results indicate the presence of magnetic minerals such as magnetite (Curie point, 575 C) and in few instances a low-temperature mineral phase such as Ti-poor titanomagnetite (Curie temp=300 to 400 C) as suggested by its large susceptibility. Also, bulk susceptibility (X) measurements were performed on all flows indicating that very few variations existed attesting toa generally uniform lithology derived from its magnetic mineralogy. Magnetic grain sizes range between Single and Multi domain (SD-MD) areas of the Day plot. We also performed absolute paleointensity determinations by using the modified Thellier-Coe double heating method. pTRM checks were performed systematically one temperature step down the last pTRM acquisition in order to document magnetomineralogical changes during heating. Thus, we were able to obtain paleointensities for 25 lavas (out of 103 flows) which represent 25 % success rate. The analyses reveals two instances of near-zero and two instances of low negative inclination (reversed polarity, 7.5 uT of low paleointensity) within an otherwise normal polarity. In particular flow units 34 to 50 recorded a horizontal inclination and may be associated with the top of the Kaena Subchron. This interpretation is supported also by two 40Ar/39Ar age determinations obtained from flow 14 (2.89+/-0.12Ma) and flow 66, (3.06+/-0.15 Ma old). Our findings lead us to conclude that the growth of the Ko'olau volcano was concomitant with respect to the youngest exposed lavas of the Wai'anae volcano and both were forming during the Kaena Subchron.

Inclinations, Absolute Paleointensity, Koolau Volcano

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