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AMS fabrics and emplacement processes of sheeted dikes in IODP Hole 1256D

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IODP Hole 1256D in the equatorial East Pacific off Panama is located on the C5Br and C5Bn.2n magnetic boundary (~15.16 Ma), The crust at the site formed under a super-fast spread condition with full spread rate of 22 cm/y. The hole penetrated basalts and sheeted dike complex of an intact oceanic crust and reached to two sheets or lenticular gabbroic layers of several 10 meter-thick. Dolerite rocks around the gabbros are metamorphosed to form a granoblastic textures with opx mineralization. The hole supposedly nearly reached to the upper boundary of the third layer of the oceanic crust. Zircon separated from the gabbros yielded weighted mean U-Pb ages of 15.0~15.2 Ma. The upper volcanic and doleritic rocks have reversed magnetic polarity, whereas the lower granoblastic dikes and gabbros have normal polarity. Because the hole 1256D was inclined ~5 degree to west from the vertical, the hole may have penetrated the boundary between C5Br and C5Bn.2n crust as the hole was deepened. Otherwise, the intrusion of the gabbros at later stage may have modified the original magnetic structure.

Magnetic properties indicate that the main ferromagnetic minerals are mostly pseudo-single domain (titano)magnetite crystals and that these are responsible for both anisotropy of magnetic susceptibility (AMS) and magnetic remanence signals. Measured AMS fabrics were reoriented into a geographic reference frame using magnetic remanence data, and corrected for a counterclockwise rotation of the Cocos Plate relative to the East Pacific Rise (EPR) ca. 15 Ma. Corrected AMS fabrics were then compared with the orientations of chilled margins previously obtained from Formation MicroScanner (FMS) images of the SDC at Hole 1256D. Samples from dike margins tend to have dike-normal Kmin, horizontal Kmax parallel to the dike planes and prolate AMS ellipsoids implying that the Kmax can be used to infer melt flow directions. The horizontal Kmax direction implies that the flow potentially delivered melts to the surface far from robust melt-source regions within the EPR system. Subvertical Kmin orientations in the interior of the dikes, however, may have required settling or compaction of the magma shortly after intrusion, thus rearranging the AMS fabric.

Keywords: sheeted dike complex, fast-spread-rate crust, AMS, emplacement processes