

Injection direction of a clastic dike inferred from magnetic measurements: an example from the Osa dike in central Japan

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The Osa dike is a 50-70 cm thick sandstone dike in an early Miocene sedimentary succession (named the Morozaki Group) on the Chita Peninsula, central Japan. An earlier investigation suggested that the dike formed by upward sand injection. However, a later study found microfossils from the dike, whose age could be younger than the country rock, implying downward injection. The present study was conducted to solve this problem by means of magnetic measurements. Thermomagnetic results indicate magnetite is the main magnetic mineral. Hysteresis data fall into the pseudo-single-domain range. Analyses of alternating field and thermal stepwise demagnetization results revealed a north-northeasterly paleodeclination of normal polarity characteristic remanent magnetization. The age of this paleodirection of the Osa dike is possibly younger than that of the easterly paleodirection of the Morozaki Group that represents early to middle Miocene clockwise rotation of southwestern Japan. More importantly, anisotropy of magnetic susceptibility (AMS) measurements suggest imbrication of magnetic foliations that is consistent with downward flow within the dike. Therefore, downward injection is supported by both the paleomagnetic direction and the AMS result. We suggest that magnetic measurements can be a useful tool for determining the injection direction of clastic dikes.

Keywords: anisotropy of magnetic susceptibility, clastic dike, Morozaki Group, paleomagnetism, rock magnetism