

K-Ar ages and palaeointensities of the Auckland geomagnetic excursions

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Geomagnetic excursions are characterised by a swing of the palaeomagnetic field direction which is apparently larger than palaeosecular variation, but distinct from geomagnetic reversals, and which occurs within a short period (e.g. 1500 years, Laj et al., 2000). Geomagnetic excursions are generally identified by a virtual geomagnetic pole departure (e.g. more than 45 deg.) from the geographic pole and its return to the original polarity. A number of well-documented geomagnetic excursions at about 20-50 ka have been identified from volcanic and sedimentary rocks, for example in France, Iceland and western North America. For clarifying geomagnetic excursions, the records of volcanic rocks are considered to be important since they can provide radiometric ages as well as absolute palaeointensity data.

Shibuya et al. (1992) first reported excursions of palaeomagnetic field directions from six monogenetic volcanoes, some of which were dated approximately between 20 and 50 ka, in the Auckland volcanic field, New Zealand. Those excursions were classified into three groups: a north-down excursion from three volcanoes (ND group), a west-up from two volcanoes (WU group), and a south-up from one volcano (SU group). As the Auckland geomagnetic excursions were recorded in alkali basaltic lavas of several volcanoes, it provides an excellent opportunity for obtaining precise ages for the excursions using the unspiked K-Ar dating method with the mass fractionation correction procedure.

Mochizuki et al. (2004) reported K-Ar ages for the Wiri volcano (27 ± 5 ka, 1 sigma) of the ND group and Hampton Park volcano (55 ± 5 ka, 1 sigma) of the WU group. These ages are statistically distinguishable at 2 sigma level indicating that at least two geomagnetic excursions have been recognised in New Zealand. Recently, we have carried out K-Ar age determinations on three volcanoes including a volcano belonging to the SU group. On the basis of all the K-Ar ages and the absolute palaeointensities (Mochizuki et al., 2006), we discuss the characteristics of the geomagnetic field during the Auckland geomagnetic excursions.