Paleomagnetic Study of selected dykes and lava flows from Bandung Area

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Attempts have been made to determine the stability of a geomagnetic field for the last 4 Ma of Plio-Pleistocene volcanics rocks from the Bandung area, and it was found that the geomagnetic directions were indicated to be much deflected from the present geomagnetic direction (Sunardi, 1996, Sunardi and Koesoemadinata,1997). Paleomagnetic investigation combined with K-Ar datings (Cox et al., 1963a; McDougall and Tarling, 1963a; Watkins et al., 1973), and in the present study were supported by complementary studies of petrographical and geochemical characteristics leads to a better comprehensive on the variations of the Earth's magnetic field. The results shown that most of K-Ar ages are consistent with obtained magnetic polarity and other stratigraphic indicators. Therefore, an improved chronostratigraphy in this area would be as a standard for correlation, especially to establish the Plio-Pleistocene stratigraphy on the area such like West Java in particular, which is mainly dominated by volcanic origin. Even though the magnetic polarity stratigraphy were observed not from continuous stratigraphic section, but each volcanic unit has been established stratigraphically by means of radiometric dating, and its petrology and geochemical characters are well defined (Sunardi and Kimura, 1998). Hence, the established magnetic polarity stratigraphy for the last 4 Ma in this area, can be very useful as guides to

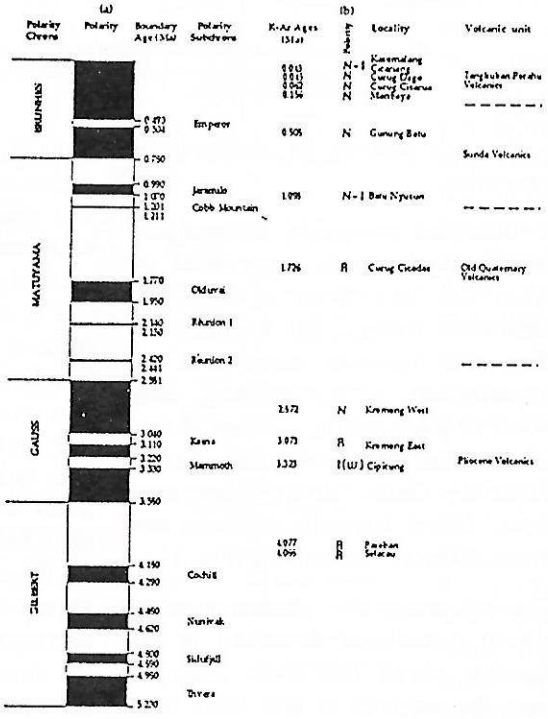


Fig. 1. Correlation of paleomagnetic results and K-Ar dating of volcanic unit in Bandung Area, West Java, Indonesia with the geomagnetic polarity time scale by Cande and Kent (1995). In the polarity, N/R/I shows Normal/ Reverse/Intermediate,and I(w) shows intermediate with westerly direction. (a) after Cande and Kent (1995), (b) present study.

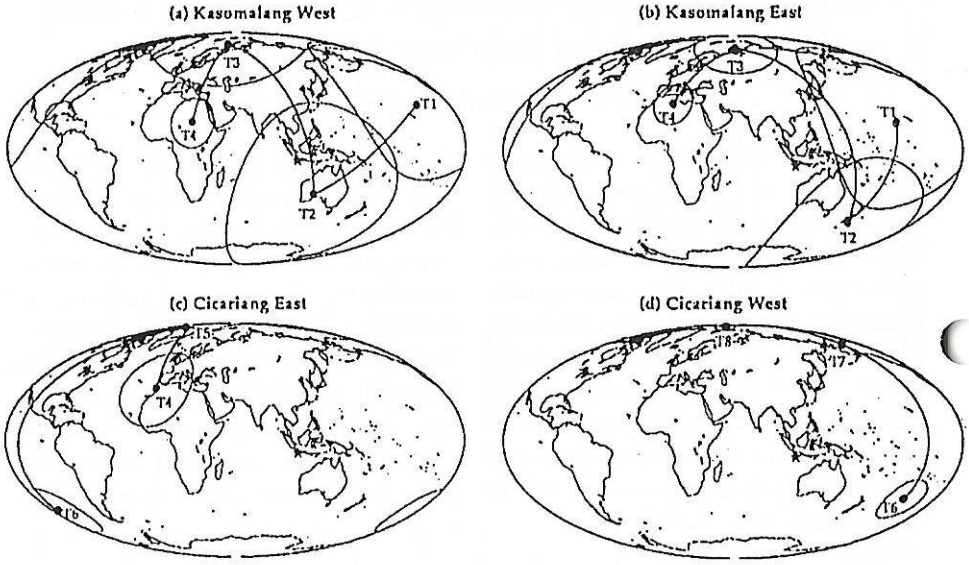


Fig. 2. VGP paths for the excursion of each locality plotted on a Mollweide projection. T1 to T8 are the time acquisition of remanence magnetization during excursion. Star indicates the sampling site.

isochronous position for stratigraphic correlation.

As described previously, assignments for all eruptive units represented by dykes and lava flows of the Plio-Pleistocene volcanic unit around Bandung area has been made, and the emplacement of the volcanic unit would be place within : Gilbert chron, Lower Mammoth subchron, Kaena subchron, Gauss chron, Matuyama chron, Lower Jaramillo subchron and Brunhes chron, respectively (Fig. 1).

The paleomagnetic phenomenon of clearly excursional directions in the Brunhes chron also were observed from the sequence of lava flows from four different sampling localities, and it would be considered as an excursion (Fig. 2). The paleomagnetic record indicates that in general the specimens are characterized by high-stability components, most of them exhibit single component. These widely distribution of a single component are tend to occur at the same stratigraphic level of lava flows section and has mean direction clustered in the southeast, north and southwest directions respectively. This would be suggests that the lava flows were recorded of past geomagnetic field at different time with different directions. Instead of that, two separate characteristic magnetization components were distinguished while the directions seem likely to have differs almost antipodal to each other, suggesting an excursional field.

Geologically they are belong to the same volcanic event, where the contemporaneous of lava flows are thought to flow from Mt. Tangkuban Perahu, which formed an extensive sheet flow specially toward the north of volcanic center, as seen in Kasomalang and Cicariang the selected sites in the frame of this study (Figure 3). The activity of this volcano is well recorded since Late Pleistocene time of about 156 ka until present, and the most recent one in the year 1992 which consist of eruption of ashes and mud. Petrographic and geochemistry analyses of the lava samples show similar characteristics, and classified into TH series (Miyashiro, 1974), they are aphanitic and usually has modal phenocryst of less than 10%. The groundmass is composed of plagioclase lath-shaped, apatite, pigeonite and minute opaque mineral, all of them could be magnetite with multi-domain component and some may be as superparamagnetic. Ferromagnesia phenocryst are commonly clinopyroxene and of basalt to basaltic andesite compositions. Vie trace amounts of olivine are associated with each other. Based on the major element analyses, these lavas has high content of potassium that is near the upper boundary of High-K field of Gill (1980) and also shows a strong iron enrichment, with relative low in Al_2O_3 content. These lavas also show the highest compositions of in-

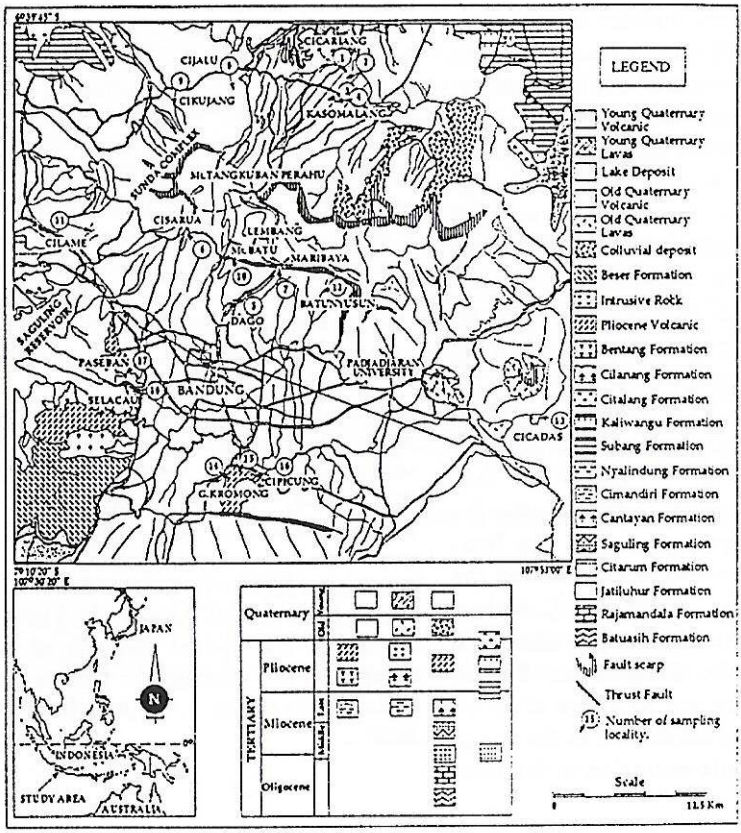


Fig. 3. Geological map of Bandung and surrounding areas, West Java, Indoneisa (modified after Koesoemadinata, R.P.,1992) with sampling location

compatible elements such as Ba, Ce, Rb, Th, Y and K. The results on petrographical and geochemical analyses suggested that all the lava samples were produced during a single volcanic eruption event with relatively high rate extrusion. Unfortunately, the extrusion rate of the lava flows could not be established due to lack of representative stratigraphic section of the lava flows, partly is covered by dense forest and often strongly affected by tropical weathering, the excellent exposure which is suitable for paleomagnetic as well as dating purposes can only be found in the active quarries.

K-Ar age determinations on six samples with duplicate measurements on the same aliquots for both in K and Ar, from different sampling localities gaves an apparent ages range from 39 +/- 3 ka to 46 +/- 5 ka. The age differences of these results are fall within the calculated errors of the age determinations. Therefore, the mean age could thus be calculated from all the measurements, and yield the weighted mean age of 43 +/- 4 ka. This age is compatible with the obtained age as reported by Dam and Suparan (1992) and Dam (1994), where they have found episodic volcaniclastic influxes in large amounts on the Bandung basin and have determined the ages to be 40 - 50 ka by ^{14}C dating. These ages, therefore, may indicate the collapse of the Tangku-ban Perahu volcano. Hence, the K-Ar age of 43 +/- 4 ka, would be considered as the age of the geomagnetic excursion in the Bandung area.

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