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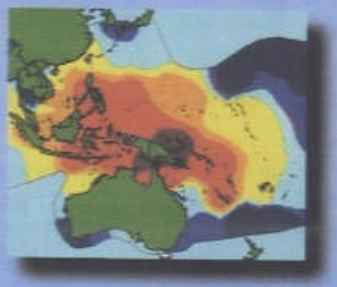

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PETROLOGY AND HYDROTHERMAL SIGNATURE OF THE ABANGKOMBA SEAMOUNT, FLORES SEA, EAST NUSA TENGGARA

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The Neo Volcanic Ridge-NVR- was discovered striking southeastward beneath the sea from the previously known Komba-Batu Tara- Volcano. This NVR is built by three seamounts which are; Barunakomba, Abangkomba, and Ibukomba. The Abangkomba Seamount was built by explosive volcanogenic material of pumice, tuff, breccia, and igneous volcanic rocks some of which indicate hydrothermal alteration. The abundance of explosive material suspected to have accumulated by volcanic activity, corroborate that Abangkomba is previously an active volcano.

Extensional structures found are the older NW-SE striking normal faults cut by younger NE-SW striking faults, resulting in pull apart basins and some spots of hydrothermal activity. Major element compositions of the igneous volcanic rocks indicate they are trachy andesite, trachy basalt, and shoshonite in composition. Petrographically, basaltic-andesites composed of plagioclase, pyroxene, amphibole and biotite indicate a subduction related magmatic source. Chemical compositions indicate the samples are potassium-rich and belong to a shoshonite series. The TAS diagram shows the samples mostly range between trachybasalt and trachyandesite, corresponding to increasing SiO2 and alkali contents. The Abangkomba submarine volcano had undergone lower-grade differentiation with partial melting associated with extensional structures. The altered samples of Abangkomba indicate three alteration zones, characterized by dominant alteration minerals: a). sub-propylitic zone marked by chlorite-carbonate-illite-pyrophyllite, b). phyllitic zone characterized by carbonate-sericite-illite, c). argillitic zone consisting of carbonate-smectite. Significant metal contents of Au-Ag and Cu-Zn was shown by chemical analysis. Increasing illite contents correspond to increasing Au, indicating that mineralization at Abangkomba formed in a near-neutral fluid-rich environment, as also indicated by the occurrence of carbonate minerals. The chemistry and mineralogy of altered rocks strongly resembles the epithermal low sulfidation type.

Petrology and Hydrothermal Signature of The Abangkomba Seamount, Flores Sea, East Nusa Tenggara, Indonesia

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INTRODUCTION

The Banda-ara III expedition is research team of join Indonesia-Germany using research vessel BARUNA JAWA VIII has completed on August 2004. The cruise has focused on the area in the vicinity of the Komba-Batutara-volcano, to reveal such unknown structural propagation and collecting new samples especially in the newly named *nes* volcanic ridge (NVR) consist of three submarine volcanic structures (Batutara Komba, Abang Komba and Ilm Komba) southward of the Komba volcano (Fig. 1).

Figure 1. Location of NVR and tectonic of the region (Hamilton, 1979). Local tectonic (red colored): transcurrent fault by Mc. Caffrey (1988). Index map shows exact location of NVR (Abangkomba seamount), width Benioff Zone contour by Hamilton (1979).

The distinct tectonic feature was the extensional structure develops in the back arc region directing NW-SE (Katili, 1989; Prasetyo, 1985). The striking of the NVR, which is also NW-SE is likely representing this feature since the active volcano of Komba sits have a magmatic source by the conduit/plumbing system generated by this extensional structure. This NW-SE structure was cut by the later structural development which can be seen by the topographic expression as a feature of pull-apart basin. The smaller scale of normal faults was also identified in the northern flank of the Abangkomba seamount, cross-cut each other, and prospective area of hydrothermal interest. The aerial Komba-Batutara volcano was last erupted on March 2007 (Fig. 2).

Figure 2. Komba-Batutara Volcano and BANDAMIN III Research Team

METHODS

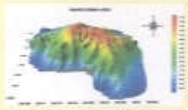
Seafloor was mapped by high resolution hydrographic survey using the Multibeam Echosounder System SEABEAM 1050 (ELAC). The bathymetric data were processed and edited on board. A Parasound Echograph System (Atlas : 2.5 – 5.5 kHz) was employed to identify fault position on the seafloor. The search for hydrothermal activities was supplemented by a vertical profiling of the water column by CTD 60: SEA & SUN TECHNOLOGY (high-accuracy sensors for water pressure, temperature, electrical conductivity and turbidity). The samples were collected by heavy Box-Dredge and Van Veen Grab (10 pkstroted) which was attached within the BARUNA JAYA VIII research vessel (Fig. 3). The dredging activities are yielding 72 rocks samples from 87 times dredging with 15 empty samples. The dredging tools are operating within depth of ~200 m to nearly -1000m of Abangkomba seamount.
Petrography analyses were applied to identify the rocks type and metal mineral contents. Altered rocks are analyzed for clay mineral alteration trough PIMA. Selected samples were analyzed for chemical compositions of whole rocks and metal contents.

Dredge used for submarine rocks sampling | Grab | Video camera used for submarine sampling

Figure 3. Equipment used for sampling

PETROLOGY & HYDROTHERMAL SIGNATURE

Based on morphological features (bathymetric) the NVR is dominated by normal fault NW-SE direction that border the Abangkomba and Ibukomba volcanoes. These normal faults are cut by displacement of left-lateral transcurrent fault which strike E-W. It was succeeded by the E-W back arc basin elongation that separated the NVR in E-W direction. The resulting zig-zag shaped separates the summit of Abangkomba and Ibukomba for about 2~3.5 km at water depth ~1200 m). This structure resembles a sediment-filled pull-apart basin (Fig.4). The intersections of normal faults with the younger transcurrent displacement faults are significant target area for



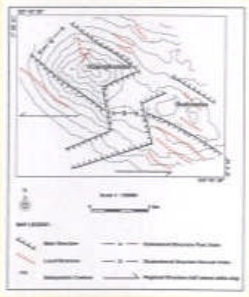


Figure 4. Structure resembles a sediment-filled pull-apart basin.

Dredged samples are mostly consisting of volcanogenic material; pumice, volcaniclastic, igneous volcanic rocks, and some are hydrothermal rocks. It is interesting that the rock from one vicinity of the Abangkomba seamount is ranging from a basaltic, andesitic, dacitic to trachydacite. Whole sample are uniformly shows the appearance of significant hydrous mineral of amphibole and biotite from fine grain to coarsest of 1.5 cm. This phenomena are present in every rock type either andesitic, dacitic or trachydacite. Pumice are quite abundant and have a basaltic-andesitic to andesitic-dacitic in composition, with biotite presence which is coarse grained and very clear, the pumice are also texturally very scorious as a sign of rapid degases, and locate at shallower level at about -200m to -400m in average (Fig 5). It is unquestionable that this pumice are of the pyroclastic flow type deposits, where better forming condition is at shallower level than -200m (Cas and Wright, 1984), thus the questionable is the rapid uplift which always been proposed as tectonic impact of the Banda arc-Australian collision? or the rise of global sea level by ice age melt is faster than the uplift?

Figure 5. Hand specimen rock samples from Abangkomba

Since the existence of extensional and normal fault are reported of being propagated and cut each other in the area by Sarmili and Halbach (2002), it is reasonable to have an expectation of mineralization to be found. There is indication of this, which are seems to corroborate such process, found in the collected samples of vocaniclastic rocks such as ash tuff, lapili and breccia, but only in andesitic and andesitic-dacitic in composition. The later compositions are shows intense alteration, accompany by the presence of millimeter scale of veinlets, vuggy quartz in mm to cm scale, and disseminated sulphide.

The igneous volcanic rocks show much wider range from a truly basaltic colour, andesitic-basaltic, and andesitic-dacitic. Like the volcaniclastic the intens alteration is happen to andesitic-dacitic composition, biotitic and amphibole are also present in every rocks type with few are very coarse, but the vesicular are absent in the andesitic-dacitic type.
The distribution of various rocks type around the Abang Komba seamount can be seen in fig. 6.

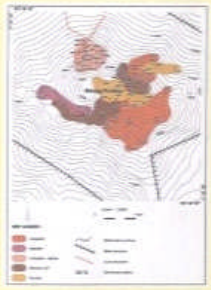


Figure 6. Distribution map of various rocks type around the Abang Komba seamount