Contemporaneity among the Miocene fore-arc volcanism in SW Japan

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Along the fore-arc region of the Southwest (SW) Japan, there are two major igneous rock series of middle Miocene age. One is the Setouchi Volcanic Rocks along the Setouchi belt, and the other is the Outer Zone Granitic Rocks.

In about 1980, radiometric data for these rock reries were summarized and concluded that (1) the age of the Outer Zone Granitic Rocks concentrated from 15 to 13 Ma, and (2) the age of the Setouchi Volcanic Rocks was 15 Ma to 14 Ma for the felsic, and 13 Ma to 12 Ma for the intermediate/mafic volcanic rocks. The above has been the general understanding on ages of these Miocene igneous rock series since the 1980s. However, during these two decades, many revisions on chronological data revealed many contradictions to the above general understanding. It is thus required a detailed chronological reassessment about these igneous rocks.

According to the series of works by the authors and their co-workers, the activities of these igneous rocks are summarized as below.

1. The duration of the Setouchi Volcanic Rocks activity was 16 Ma to 12 Ma, and its most active duration was 15 - 13 Ma.
2. There is no distinct, simple separation in ages between the felsic volcanic rocks and the intermediate/mafic rocks in the Setouchi Volcanic Rocks.
3. The duration of the Outer Zone Granitic Rocks activity was 15.5 - 13 Ma.
4. Therefore the activity of the Outer Zone Granitic Rocks was contemporaneous with that of the most active volcanism in the Setouchi region.

Geochemical contributions to a conceptual model of Wayang Windu field, Indonesia

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The Wayang Windu geothermal area is located in western Java, Indonesia, and is associated with a large andesitic volcano, Gunung Malabar. Commercial operations of 110 MW began in June 2000. Using the geochemistry of the produced fluids, a geochemical model was developed in 2001/2 to refine the understanding of fluid flow and reservoir processes. This was done to improve our conceptual and numerical simulation models and to aid in cost-effective management and development of the field.

Major structural features separate the Wayang Windu field into distinct sectors (Figure 1). Each sector hosts a steam cap that overlies geothermal brine. A productive shallow steam cap has developed in the Gambung area, and it currently supplies most of the mass for the current production.

Measured downhole temperatures, Na-K-Ca and SiO_2 geothermometry, and differences in gas chemistry help identify the upflow and outflow features of the conceptual model. Geothermometer temperatures that match measured temperatures are consistent with an equilibrated geothermal upflow at Wayang. A separate upflow feeds the southern Windu sector. The lower salinity and higher gas fluids strongly suggest that the Windu sector is separated from the Wayang region by a permeability barrier, probably a NW-SE trending geologic structure.

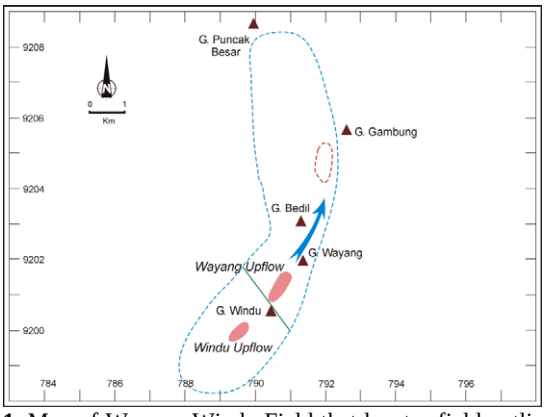

Fig. 1: Map of Wayang Windu Field that locates field outline, major upflow and outflow.

Geochemical data indicates outflow of geothermal brine towards the N and NNE from the main upflow center near Wayang. The outflowing fluids are distinguished by lower non-condensible gas content and enrichments of the more soluble geothermal gases, NH_3 and H_2S.

The Wayang Windu field shows evidence of recharge by dilute waters that are slightly enriched with Mg. Temperature–chloride relationships suggest warm recharge in the north and south with cooler recharge west of Bedil.