



Geological Expression on Flores Island in Indonesia: The Transition from Oceanic to Continental Plateau Subduction

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Introduction

The Sunda-Banda Arc transition is part of the Indonesian island arc where the tectonic regime changes from oceanic-island arc subduction in western part to continental-island arc subduction to the east. This unique setting makes an ideal target to study about the geodynamic process and associated geothermal systems in the upper crust.

Flores Tectonic Setting

The Flores island is situated at the Sunda-Banda Arc transition (fig.1), which is part of the plate margin where the Indo-Australian plate subduct beneath the Eurasian plate. The transition is marked by the change from Oceanic to Continental Crust (Harris et al., 2009), resulting in a significant change of stress regime along the arc.

Geothermal Resources

There are currently 13 occurrences of geothermal resource in Flores Island (fig. 2), of which 2 have already power plant installed and are producing electricity (Ulumbu and Mataloko Geothermal Field in west Flores).

The geothermal systems in Flores Island are mostly related and located in the vicinity of volcanoes. All the geothermal field has been identified from the presence of surface evidences (fumaroles and hot springs), and were generally found in high altitude on volcanic system.

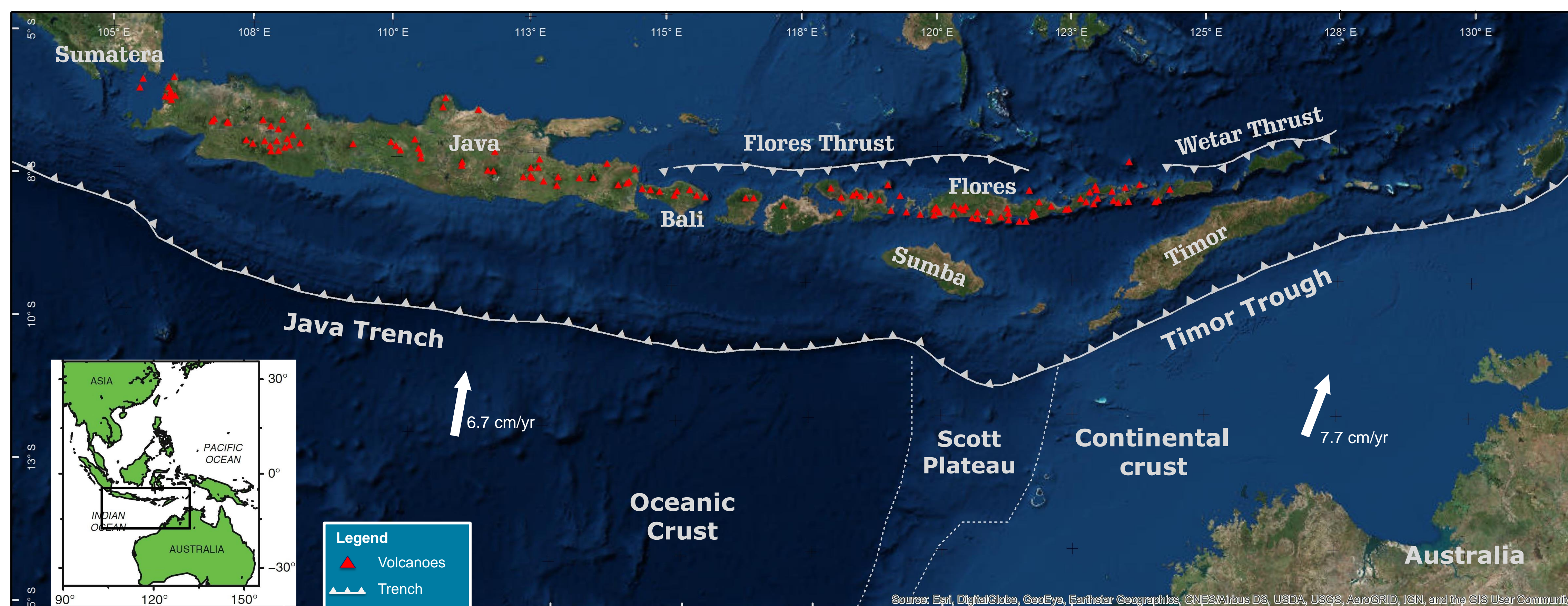


Figure 1: Geodynamic map of the the Sunda-Banda arc transition

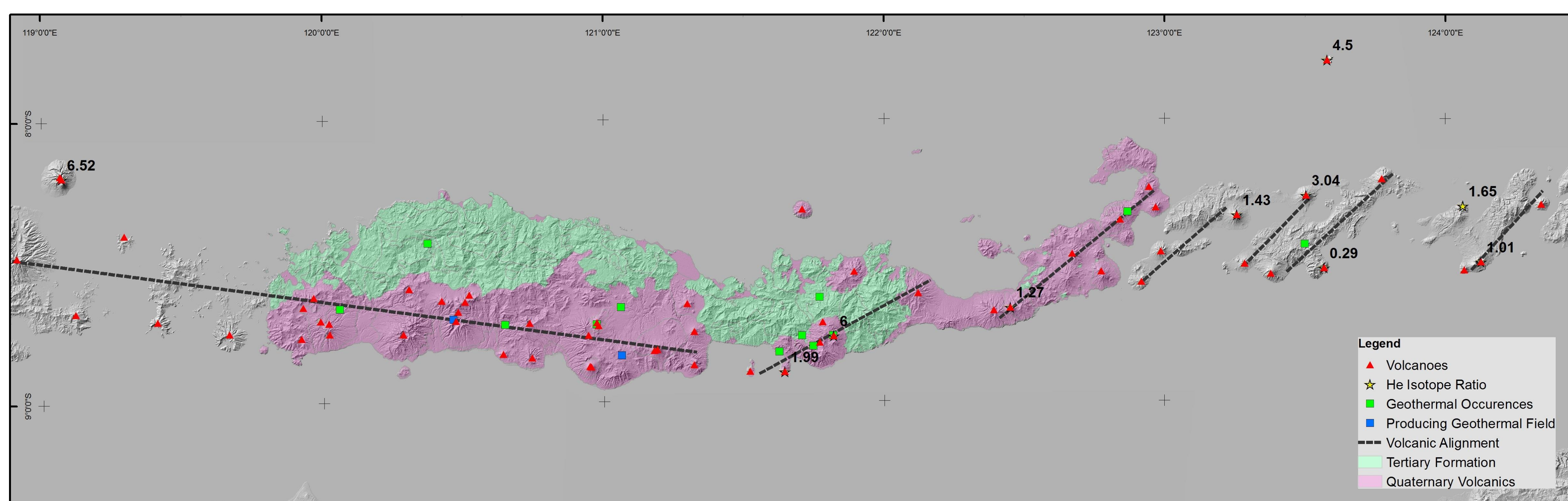


Figure 2: Geological Map of Flores Island

Geology, Geochemistry and Surface Expression of Flores Island

- Geologically, the northwest and central part of Flores is composed of volcano-sedimentary and sedimentary tertiary rocks (green colour on figure 2) while the rest of it is blanketed by quaternary volcanism deposits (pink colour on figure 2).
- The volcanic arc of Flores Island occurs as segments of linearly arranged volcanic centres (Pacey, 2013; Muraoka, 2002), which could be divided into 2 categories:
 - Eastern Flores volcanic center alignment has short, ENE-WSW en echelon alignments
 - Western Flores volcanic center alignment has long, WNW-ESE en echelon alignments, linear segment from Java to Western Flores (Pacey, 2013)
- The high $^3\text{He}/^4\text{He}$ ratios (8.0 – 6.54) and low $^3\text{He}/^4\text{He}$ ratios (0.29 – 4.5) were found on the western and eastern part of Sunda-Banda arc, respectively, suggest that there are changes of magma source from oceanic crust (low ^4He) to continental crust (high ^4He) beneath the volcanic arc (Poreda and Craig, 1989; Hilton, et al, 1992).

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Conclusion

The eastern Flores Island, where the Indo-Australian Continental crust subducts has changed the stress regimes and also changed the way of volcano distributed, resulting in different pattern of alignment compare to the western part of Flores Island. Further study is needed to investigate how the geothermal systems in Flores Island affected by this settings.

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