Geochemistry and zircon U-Pb geochronology of igneous rocks from southwestern Vietnam: implications for the transition from an active continental margin to post-orogenic extension

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Introduction

• Late Mesozoic igneous rocks are predominately found in the Dalat zone, but also in smaller volumes to the southwest, in the Bay Nui – Ba Hon area, southwestern Vietnam. Within the latter area three different groups can be distinguished based on petrological features: (1) the Dinhquan intrusive magmatic suite; (2) the Deoca magmatic suite and (3) the Ankroet magmatic suite.

• The Dinhquan–Deoca igneous series display a typical fractional crystallization trend similar to Cordilleran I-type batholiths. Based on the geochemistry we conclude that the Dinhquan-Deoca series were part of an active continental arc, which existed along the eastern margin of the Eurasian continent during the Late Mesozoic.

• The slightly younger Ankroet suite has characteristics of A-type granitoids indicating a transition in the tectonic setting of the subsequent extension producing within-plate intrusions.

• U-Pb zircon ages yield values of 105.0±0.6 Ma for the Dinhquan suite, 89.3±0.9 Ma for the Deoca suite, and 89.3±0.9 Ma for the Ankroet suite.

Fieldwork and Petrography

• The Dinhquan suite comprises mainly diorite, monzodiorite, monzonite, and syenite. The Deoca suite is the major magmatic group and consists mainly of granodiorite and granite. Ankroet presents only fine-grained granite.

• The typical accessory minerals of the Dinhquan–Deoca series are titanite and allanite, while those of the Ankroet suite are magnetite and fluorite.

• By contrast, the Ankroet suite rocks display a higher content and narrower variation in silica, peraluminous, tendentially have a higher content in heavy rare earth elements (HREE) and strong negative Eu, Sr, Ba, Ti anomalies likely typical for A-type granitoids.

• The Dinhquan suite rocks are metaluminous, while the Deoca suite rocks are mainly peraluminous. The crystallization of Ti-Fe oxides and ferromagnesian minerals are noticeable in both suite.

Geological setting

• The survey area located in the southwest of Vietnam is around 45000 km² in size. It borders the Dalat zone to the north, which contains a large number of Late Mesozoic granitoid intrusions.

• A Jurassic-Cretaceous arc-related igneous belt runs from Japan to southern Borneo and bears witness of the convergent boundary between the Paleo-Pacific and the Eurasian plate and the Asian continent (Zhou and Li, 2000; Thuy et al., 2004).

Geodynamic model and conclusion

• We conclude that Late Mesozoic magmatism in the Southwest Vietnam is mainly linked to the subduction dynamics of the Paleo-Pacific plate beneath the Eurasian plate and the subsequent extension which may lead to the opening of the East Sea (South China Sea).

• Several zircons of the Deoca suite samples show inherited cores with ages similar to those of the Dinhquan suite.

• The ages of rock assemblages are coincident with the "Late Yanshan" stage (i.e. 140-90 Ma) (Zhou and Li, 2000).

Zircon U-Pb geochronology

• Tectonic profile of the granitoid formation and tectonic evolution of the Dalat zone and southwestern Vietnam during the middle Cretaceous – Late Cretaceous assuming the extension of the eastern Eurasian margin. This model is consistent with the model of the tensional environment along the eastern Eurasian margin during the Late Cretaceous.

• We conclude that Late Mesozoic magmatism in the Southwestern Vietnam is mainly linked to the subduction dynamics of the Paleo-Pacific plate beneath the Eurasian plate and the subsequent extension which may lead to the opening of the East Sea (South China Sea).

References:


