CHAPTER 5

DISCUSSION

Igneous rocks distributed in the study area are both extrusive and intrusive. The composition of these two different modes of origin of rocks are ranging from intermediate to silicic. Evidences from field, petrographic and geochemical studies have suggested that the plutonic rocks are shallow emplaced and are genetically related to the capped volcanic rocks. Furthermore, igneous activities can also be deduced to have had taken place in post-Permian which is consistent with the conclusion of post-Permian to pre-Jurassic by Bunopas (1980). The rhyolitic pyroclastic rocks are normally late in sequence of igneous activities. They are interbedded with sandstone, shale, and carbonate rocks of the Middle Triassic age especially in the area near Changwat Uthai Thani. Therefore it is possible to conclude more definite that the igneous activities took place during the period of post-Permian and Middle Triassic.

Geochemical data and their variation diagrams indicate that these plutonic and volcanic rocks belong to the same differentiation trend of calc-alkaline series. Diorite and andesite are the intermediate rock of the series and the rhyolitic tuff is the silicic. Diorite and/or andesite found in the study area though are apparently too small in volume to represent parent magma source for other silicic rocks to be derived, they are more widely distributed elsewhere especially along the edge of the Khorat plateau, for instance in Changwat Loei, Changwat Phetchabun, and Changwat Nakhon Ratchasima. The granodiorite of Phu Kwai Ngoen, Amphoe

Chiang Karn, Changwat Loei was dated radiometrically by Jacobson et al. (1976) to be 230 Ma. The dioritic and associated rocks from Changwat Loei and other places mentioned above are consistent in terms of mineralogy and age (Middle Triassic) with the diorite in the study area. Therefore it is reasonable to conclude that the igneous rocks in the study area were originated primarily from a dioritic or andesitic magma. Other intermediate and silicic rocks, either plutonic or volcanic, are products of magmatic differentiation from the dioritic or andesitic parent magma.

It was widely accepted long ago that the temperatures required for the formation of magma of intermediate composition, even under most favorable water-saturated conditions, are so high that it seems improbable that andesitic or dioritic liquid could be generated in the crust (Eggler, 1972; Allen et al., 1975). On that account the intermediate magmas must have been produced primarily from the region of upper mantle or secondary from the primary basaltic magmas. Experimental works have suggested that primary andesitic liquids can be produced by partial melting of hydrous upper mantle peridotite (Mysen and Boettcher, 1975) or subducted ocean floor tholeiitic basalt (Green and Ringwood, 1968). It is also possible that andesitic magmas or perhaps associated dacitic and rhyolitic magmas are able to be derived from fractionation crystallization scheme of basaltic parent magmas (Bowen, 1928; Osborne, 1959, 1969 ; Eggler, 1972 ; Holloway and Bernham 1972 ; Nicholls and Ringwood 1973 ; Allen et al., 1975 ; Cawthorn and O' Hara, 1976).

Along the western edge of the Khorat Plateau and the central plain, Loei Fold-belt (eastern belt), and along the central Chao

Phraya Plain which extends north to Lampang and Chiang Rai and south to Trat, Sukhothai Fold-belt (western belt), intermediate to silicic igneous rocks are found to be present throughout. Bunopas (1981) has suggested that the eastern belt actually was a former volcanic arc of the easterly dipping subducted plates and the western belt, which majority of the plutonic and volcanic rocks of the present study belongs to, was a former volcanic arc of the westerly dipping subducted plates in late Permian-early Triassic age. If this postulation is appropriate the igneous activities of intermediate magma in the area concerned are more probable to be generated from partial melting of hydrous mantle materials or subducted oceanic plate than from fractionation differentiation of basaltic magma. Abundance of intermediate and silicic rocks in Permian-Triassic ages also suggest that the igneous activities of both the eastern belt and the western belt were more likely to develop in the regions of active continental margin where the crust was more than 30 kilometers thick (Miyashiro, 1957; Green, 1983).

From the distribution of entirely calc-alkaline series of intermediate to silicic rocks, arcs of the continental margin type seem to be more favarable to have been developed in these two belts. Dacitic and rhyolitic rocks were simply products of primary andesitic magmas by means of fractionation crystallization at depth.