arc.The new model leaves no room for allochthonous terranes originating in Gondwanaland.

Geodynamic Evolution of Loei Area - Northeastern Thailand

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Based on the discovery of detrital chromian spinel in sandstones of the Permian Nam Duk Formation Chutakositkanon et al. (1997, 1999) suggest a new suture and terrane boundary in north-central Thailand which they named "Loei Suture" and which they trace from north of Loei through Phetchabun to the region of Saraburi (Chutakositkanon et al. 1999, Fig.5).

We fully recognize the importance of the discovery of the chromian spinel detritus in sandstones of the Nam Duk Formation since it confirms the interpretation that the siliciclastic part of the Nam Duk Formation is related to an evolving mountain belt caused by contractional deformation during late Middle to Late Permian times (Helmcke & Kraikhong, 1982). But we disagree with the interpretation that the influx of the chromian spinel is due to the closure of a previously unknown suture which runs from the P.R. of Laos via Loei in northeastern Thailand to the south. We still favour the view that the evolution recorded in the sediments of the Nam Duk Formation reflects the closure of the Nan-Uttaradit Suture (Chonglakmani, 1998, Helmcke & Lindenberg, 1983). To substantiate our point of view we like to reiterate and to reevaluate some previously published information by various authors.

From Chiang Khan on the Mekong River to Wang Saphung south of Loei an apparently important tectonic line can be drawn which marks the western boundary of the region tentatively described by Workman (1975) as a Hercynian Massif. Based on fossil finds by Fontaine et al. (1981) and his own data, Altermann et al. (1983) suggested that the main deformation in this region can be dated approximately at the Devonian/Carboniferous boundary. The Carboniferous and Permian strata are clearly much less deformed. The description of the Loei area by Chairangsee et al.(1990) does not highlight the stratigraphic age of this main orogenic event.

But the data on the basement of the Khorat Basin (Kozar et al., 1992) prove that the basin developed in a region affected by an Early Carboniferous Variscan event, which is manifested in an angular unconformity. The Variscan Unconformity divides the Loei Group from the Saraburi Group (Mouret, 1994). Strata of the Saraburi Group are distributed in most parts of the Khorat Basin proving that the likely southern continuations of the Loei ocean floor tholeiites and the Loei rhyolites dated by Intasopa & Dunn (1994) could not have been eroded during Permian times.

Orogenic activity of this range in age (mainly Early Carboniferous) is well known from regions in Vietnam (Fontaine & Workman, 1978) and the ages reported by Intasopa & Dunn (1994) for the Loei ocean floor tholeiites and the Loei rhyolites are not in conflict with the given interpretation. The ages recorded in detrital muscovites of the Khorat red beds mentioned by Heggemann (1994) support Devonian to Carboniferous orogenic activity.

On the contrary to the above mentioned region, the Permian strata of the Nam Duk Formation along the Lom Sak-Chum Phae highway which contain the detrital chromian spinels recently reported by

Chutakositkanon et al. (1997, 1999), are severely affected by contractional deformation. This deformation was first dated by Chonglakmani & Sattayarak (1978). They discovered a pronounced angular unconformity between deformed Permian Nam Duk Formation and the Upper Triassic Huai Hin Lat Formation approximately at km 34 of the above mentioned highway (Chonglakmani & Sattayarak, 1978, Fig.15). In the following years the stratigraphy and facies of the Nam Duk Formation were studied. The youngest deformed fossiliferous strata found were dated by H.G. Lindenberg (Fig.16, 17 in Helmcke & Kraikhong, 1982) and by R. Ingavat (Fig.4 in Altermann et al., 1983) as Murgabian and very likely also part of Midian. These data are now independently confirmed by Chutakositkanon et al. (1997, 1999). Based on these data, the main orogenic event which affected this region has been dated as approximately late Middle Permian-early Late Permian. Only some K-Ar age determinations on the fine mineral fractions (Ahrendt et al. 1993) support this interpretation. The younger ages found are probably caused by younger thermal overprint or the respectively younger intracontinental deformation.The pronounced angular unconformity (Chonglakmani & Sattayarak, 1978) between the folded Permian strata and the Upper Triassic sediments cannot be overlooked.

Paleocurrent indicators recorded in the siliciclastics are deposited by turbidites and point to a sediment transport parallel to the axis of the basin and gave therefore no conclusive result where to expect the source area. If we discuss the possibility that the source area of the siliciclastics deposited by turbidity currents of the Nam Duk Formaiton was to the east as some authors suggested, we have to correlate the stratigraphic column of the Nam Duk strata very carefully and in more detail. Mouret (1994) may serve as an example. He suggests that the sudden sand influx in the Nam Duk Formation is caused by a major relative sea level fall which occurred according to the data by Dawson et al. (1993) during the Bolorian. This possible explanation cannot be substantiated by stratigraphic results obtained in the Nam Duk Formation because they indicate that the sudden influx of siliciclastics started not earlier than the late Kubergandian-Murghabian (R. Ingavat in Winkel et al., 1983, Fig.2).

However, the distribution of the Nan-Uttaradit ophiolite and the geometry of the folds exposed in the Nam Duk strata suggest that the subduction zone was located to the west. Therefore we expect the source area of the newly discovered chromian spinel detritus in the more internal zones of the rising mountain belt farther to the west. We regard the areas to the east of the section along the highway Lom Sak-Chum Phae as foreland areas and the possibility of major influx of detrital material during the late Middle Permian from the foreland area seems to us quite unlikely.

If we accept the data by Intasopa & Dunn (1994) indicating a Loei ocean, this ocean was already closed in pre-Permian times. If the Loei suture has a continuation to the south, then this continuation must be searched for in the deformed basement of the Khorat Plateau. The occurrence of the Paripteris flora (Laveine et al., 1993) in the Loei area witnesses that this region was already fully integrated into the Northern Continents in the Late Carboniferous time.

According to the data mentioned above we cannot accept the interpretation of the "Loei suture" (exposed in the mountains east of Loei, Intasopa & Dunn, 1994) as an important tectonic divide that runs from the Mekong river via Loei towards south into the Phetchabun region. The geodynamic evolution of the Phetchabun region is by all means incompatible with the situation depicted in the area east of Loei.

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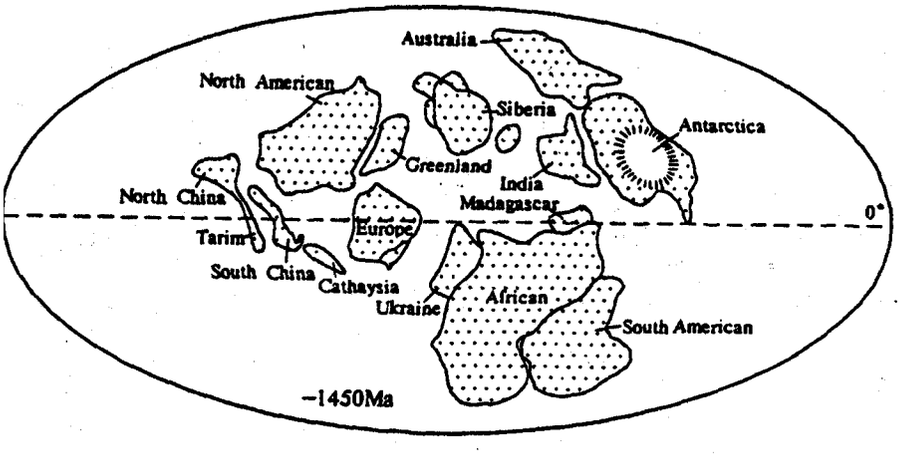

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