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MIDDLE PALEOGENE TERRANE JUXTAPOSITION ALONG THE MEDIAN TECTONIC LINE, SOUTHWEST JAPAN: EVIDENCE FROM $^{40}AR/^{39}AR$ MINERAL AGES

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The Median Tectonic Line (MTL) is a regional transcurrent fault separating anadalusite-sillimanite metamorphic rocks within the Ryoke terrane from glaucophanic-type metamorphic rocks within the Sambagawa terrane in southwest Japan (Fig. 1).

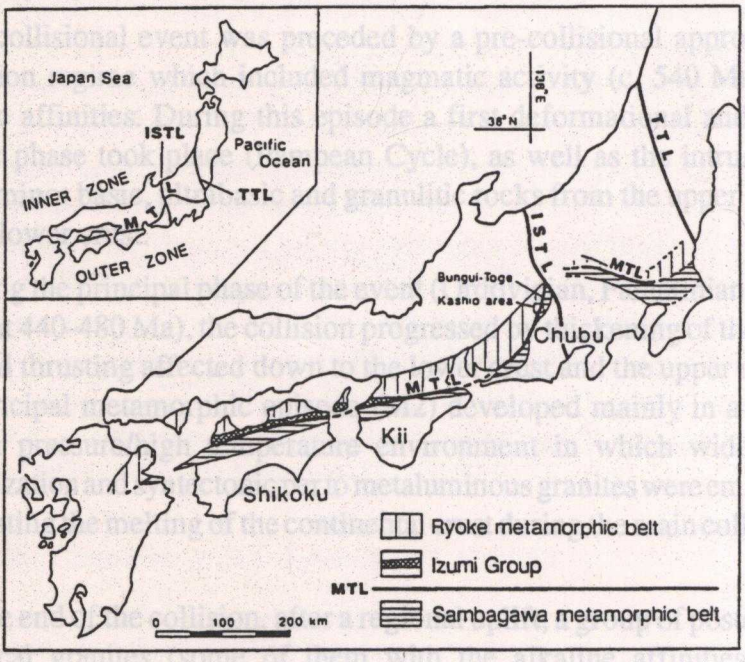

Fig. 1: Principal tectonic map along the Median Tectonic Line (MTL). TTL= Tanakura Tectonic Line; ISTL= Itogawa-Shizuoka Tectonic Line.

The Late Cretaceous Izumi Group unconformably overlies Ryoke metamorphic rocks and is tectonically separated from the Sambagawa terrane by the MTL. Recent $^{40}Ar^{39}Ar$ mineral ages reported for the Sambagawa terrane in this area suggest extensive Late Cretaceous uplift; however, no Sambagawa erosional debris have been described from the Izumi Group.

$^{40}Ar/^{39}Ar$ have been determined for hornblende and biotite separated from samples systematically collected along a traverse from the Ryoke terrane into the MTL (Kashio area, Chubu district: Fig. 1). In addition whole-rock samples of protomylonite within the MTL have been analyzed. Similar 68-70 Ma isotope correlation ages are recorded by hornblende within massive (Ikuta) and foliated (Minakata) granite and protomylonite within the MTL. Biotite from these samples record ages ranging between 66 and 68 Ma. Together the mineral ages suggest relatively rapid post-magmatic cooling through appropriate argon closure temperatures. These also indicate that temperatures maintained during protomylonite formation within the MTL were less than those required to effect even partial rejuvenation of intracrystalline argon systems within hornblende. Protomylonite samples yielded well-defined whole-rock plateau ages of 62-63 Ma which are interpreted to closely date the last phase of ductile flow within the MTL. These results suggest that a significant ductile phase of movement occurred within the MTL in th Middle Paleocene. This may have been associated with significant sinistral displacement and resultant tectonic juxtaposition of previously separated portions of the Sambagawa and Ryoke belts (with unconformably overlying Izumi Group).

The MTL separates contrasting metamorphic belts (Sambagawa and Ryoke). Conditions attained during Sambagawa metamorphism reached c. 600°C and 10 kb. Maximum metamorphic pressures attained during metamorphism of the Ryoke belt have been estimated to have been c. 3-5 kb and c. 650°C.

There is no transition between the high-P Sambagawa and low-P Ryoke belts, suggesting that parts of both geologic sequences have likely been tectonically excised as a result of movement within the intervening MTL.

The late Cretaceous (Campanian to Maastrichtian, c. 66-84 Ma) Izumi Group unconformably overlies the Ryoke belt. There is no evidence of any Sambagawa erosional debris within the Izumi Group, and it appears that Sambagawa metamorphic rocks were not exhumed until after deposition of

the Izumi Group. However, $^{40}Ar/^{39}Ar$ ages reported for minerals within clasts of Sambagawa metamorphic rocks within the Middle Eocene (c. 45-50 Ma) Kuma group suggests that some structural units within the Sambagawa belt were affected by a Jurassic thermal event. Moreover, present erosional levels within the Besshi nappe complex (central Shikoku) appear to have been rapidly exhumed at c. 80 Ma (Late Cretaceous; Campanian). These relationships suggest that portions of the Sambagawa metamorphic terrane must have been subareally exposed during deposition of the Izumi Group in the late Cretaceous. Lack of any Sambagawa erosional detritus within the now proximal Izumi Group suggests palinspastic separation of the two areas in Cretaceous time. The Ryoke belt (with unconformably overlying Izumi Group) and the Sambagawa belt must have been subsequently juxtaposed as a result of sinistral strike-slip movement along the MTL at c. 60 Ma (Fig. 2). The Eocene Kuma Group unconformably overlies both Sambagawa and Ryoke belts, and provides an upper age limit for strike-slip movement within the MTL.

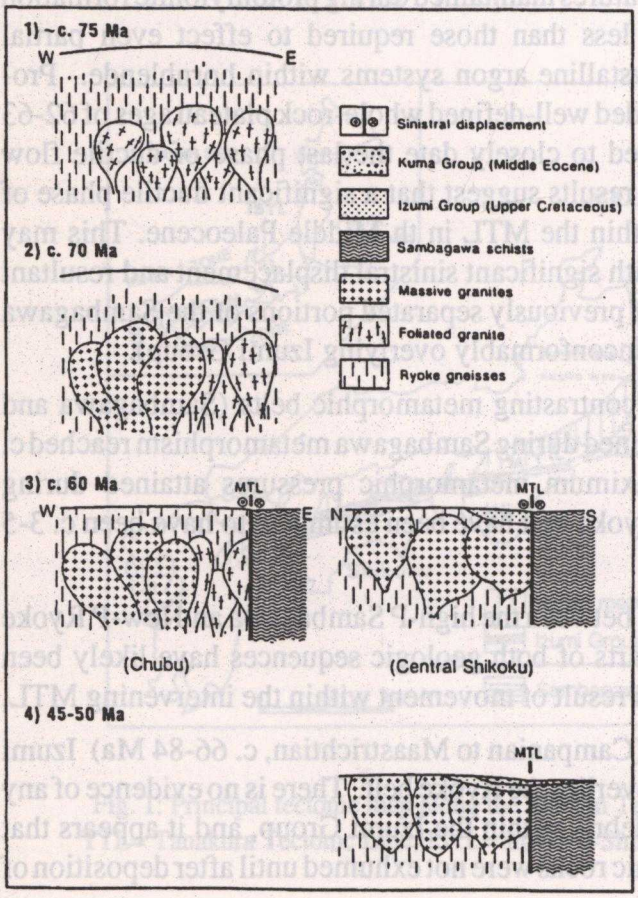

Fig. 2: Generalized model for the tectonothermal evolution of the Ryoke belt and the MTL:
1) Emplacement and cooling of the foliated granites;
2) Emplacement of the massive granites;
3) Sinistral movement of the MTL and resultant tectonic juxtaposition of the Sambagawa and Ryoke belts. The Ryoke belt was unconformably covered with the Izumi Group of Late Cretaceous in Shikoku before the juxtaposition.
4) The juxtaposed Sambagawa and Ryoke with the Izumi Group were unconformably covered with the Eocene Kuma Group in Shikoku.