

## Non-plate tectonics since Phanerozoic: Pan-African orogeny and Asian-Indian continental collision

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The Asian continent was reworked extensively by collision of the Indian continent, and the reworked area extends thousands of km inland from the Himalayan collision front. Although the India continent-Asian continent collision is driven by plate tectonics, the Asian continent behaves as not rigid but fragile plate. The behavior of Asian continent does not belong to plate tectonics in a strict meaning (Here the tectonics is named non-plate tectonics). Strength of lithospheric mantle controls continental crustal deformation under low geotherm conditions. This suggests that the Asian continent lithosphere is remarkably weaker than that of the Indian continental lithosphere. High temperature or existence of water can be considered as the factor that weakens lithospheric strength. If the continent with dry lithospheric mantle collides with continent with wet lithospheric mantle, the latter will suffer extensive deformation. The Asian continent is a young continent that was formed by coalesce of small continental blocks, and this implies that many slabs descended into mantle and water was supplied to the mantle by the slab dehydration. The collision tectonics together with extensive crustal reworking was took place in a part of Pan-African orogenic belt too. In particular, The Pan-African orogenic belt distributed in the area from eastern Africa, the Arabia area, Madagascar, Sri Lanka, India, and the East Antarctica is an example of non-plate tectonics because the width of orogenic belt is ca 2000-3000km. This area is regarded as a collision belt between West Gondwanaland and East Gondwanaland, and some ophiolite and island arc at late Proterozoic are exposed in the orogenic belt (so-called, Arabian-Nubian Shield). This suggests that many slabs sank into the mantle under this area before the continent collision. Therefore geological evidence reveals that non-plate tectonics (extensive crustal remobilization) occurred at earliest Phanerozoic or latest Proterozoic in the area where many slabs descended into mantle. This supports the idea that slab dehydration caused dramatic weakening of lithospheric mantle before continental collision and subsequent extensive crustal remobilization during continental collision. Professor S. Maruyama proposed a hypothesis that slab dehydration started to play an important role in water circulation in solid earth since ca 700 Ma. Indeed, Archean/Proterozoic orogenic belt related with continental collision is represented by narrow zone without extensive crustal remobilization, and this supports that lithospheric weakening occurred after latest Proterozoic, probably 700 Ma. Consequently, non-plate (non-rigid) tectonics has begun to operate in addition to plate tectonics during Phanerozoic. Especially geological and geophysical investigation in the Pan-African orogenic zone mentioned above is significant because the mantle under the orogenic zone is regarded as the oldest and large water reservoir in the earth's mantle.