Thesis Summary

Age-integrated tectonic model revealing the deep- to shallow-crustal evolution of Eastern Ghats Orogenic Belt, India

(インド東ガーツ造山帯の地殻深部から浅部の進化過程を説明する年代統合テクトニックモデル)

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The Eastern Ghats Belt (EGB), India is a Proterozoic orogen which co-evolved with its Precambrian neighbors (East Antarctica - Australia - China - parts of Laurentia) during several Supercontinental cycles before cratonized with Archean Proto-India. Such orogen preserves the evidences of deep-crustal tectonothermal events in the orogen-interior. However, the exterior of the orogen (orogen boundary) may preserve the record of both deep- to shallow-crustal events until the final amalgamation process. Hence, the orogen-craton margins are the best candidates to understand the comprehensive evolutionary history of the orogen. To unravel such history of the EGB with respect to Proto-India during and prior to its amalgamation, detailed petrological (qualitative and quantitative analyses), and geochronological investigations are carried out in the present study. The geochronological investigations include high-resolution U-Pb isotopic dating (zircon SHRIMP) and texturally well-constrained U-Th-total Pb dating (monazite EPMA) on the systematically sampled rocks collected in a transect across the western boundary of the EGB, where deep- to shallow-crustal rocks are exposed on the present day erosional surface. Inherited zircon grains of ~2900–2500 Ma in mafic granulite represents a Late Archean to Early Paleoproterozoic protolith ages, which was metamorphosed under granulite facies condition during the Grenvillian time. Petrological and geochronological evidences of granulite facies metamorphism during ~950–930 Ma recorded exclusively from the granulites, which are located ~60 km eastward from the boundary between the EGB and the BC. Granulite facies metamorphism during ~950–930 Ma suggest that during Rodinia assembly the EGB was co-evolving with East Antarctica, but not with Proto-India. Followed by the granulite facies metamorphism, a strong decompression-related reaction microtexture and REE chemical signatures in the associated monazite of the reacting garnet suggest that decompression vis-à-vis exhumation occurred at ~850–775 Ma during Rodinia breakup. Zircon grains of deep-crustal charnockitic augen gneisses and shallow-crustal foliated quartz breccia also yield the similar age. Amphibolite-granulite transitional facies overprinting at ~530–500 Ma erased all the earlier geochronological histories from the granulites near the craton margin, which is completely absent in the orogen interior part of the study area. Such documentation of the age-imprints confined along a narrow zone adjacent to the both sides of the thrust boundary due to the effect of thrust-related tectonics. Geochronological and

petrological imprints from the cratonic rock firmly testify that the amalgamation was achieved during the Gondwana assembly. Foliated quartz breccia preserves conformable thrust-related regional foliation. Maximum depositional age for deposition of the foliated quartz breccia was calculated as 484 (+ 10/- 18) Ma, which suggest that the thrusting was continued up to ~485 Ma. Combining all the geochronological data with qualitative and quantitative petrological data, we present a comprehensive and geochronologically well-constrained tectonic model of the EGB, which encompasses its earliest deep-crustal to the latest shallow-crustal tectonic events up to the stage of final amalgamation. The new geochronological data coupled with field evidences and textural evidences from the shallow-crustal rock finally suggest that the amalgamation related final thrusting was continued, at least, up to Late Cambrian, i.e., post-dating the the final phase of Gondwana assembly vis-à-vis Kuunga orogeny.