論 文 審 査 の 要 旨
(Summary of Dissertation Review)

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論文題目 (Title)

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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〔論文審査の要旨 (Summary of Dissertation Review)〕

The evolution of the continental crust through time is best understood from the rocks of the deep continental crustal origin. These high-grade metamorphic rocks travelled through the different depth of the Earth's crust experiencing different physical and chemical changes. Physical changes include those in pressure, temperature, deformation, and chemical changes are due to the interaction between the solid, melt and fluid at different depths in the crust. These rocks presently exposed at the Earth's surface are very crucial, hence to unravel the records of the processes related to the crustal dynamics. Majority of these rocks are found in the old mountain belts, called orogenic belts, which were built-up at different times of the Earth's history. Particularly challenging is to get the proper information of the crustal evolution of the Precambrian time (older than ca. 500 million years). The major information come from the detailed structural, metamorphic and the geochronological studies of these high-grade metamorphic rocks, occurring in the Precambrian orogenic belts. The challenge for a geoscientist becomes manifold when these rocks suffer "extreme condition of metamorphism" on a regional scale. The Eastern Ghats granulite Belt (EGB), India is one such old mountain belt, which had been under focus of the geoscience community for years as a site for understanding the detailed mechanisms of the crustal dynamics. Discrete information of the petrological studies, structural studies and geochronological studies are so far available, but mostly from the interior of the orogenic belt. The

boundaries of such old orogenic belts, where they are juxtaposed to the preexisting Archean cratons are most important areas as these are the sites of intense interactions resulting in complex but all-inclusive histories of metamorphism and deformation, in other words tectonic activities. The present study aims to do (1) a detailed petrological analysis of the rocks from the western boundary of the EGB with the adjacent Bastar Craton (BC) along an east-west transect, (2) a detailed high-resolution geochronology of the samples collected systematically, and making an age-integrated tectonic evolutionary model for this orogenic belt from its early history to the final amalgamation with the Archean India (proto-India).

(1) Research on petrological evolution

Detailed field studies were carried out at the western boundary of the EGB, India to collect the data for lithological and structural mapping, and systematic sampling of all the rock types occurring at a stretch of ~ 60 km eastward from the presently known geological boundary between the EGB and the BC. Microtextural studies of all these rocks along with the quantitative analyses of mineral composition and whole rock composition revealed at least three successive stages of metamorphism, i.e. peak deep crustal granulite facies metamorphism followed by a near-isothermal decompression stage (bringing the rocks to a shallower level) followed by a cooling and rehydration stage at the shallow crust. The adjacent cratonic gneisses preserve the evidence of mid-crustal metamorphism (peak stage) followed by a heating and cooling stage. The integration of structural data and petrological data of both deep- and middle-crustal rocks clearly suggests the independent evolution of these two terranes before final docking through a top-to-the west vergent thrust tectonics.

(2) Research on geochronology

High resolution U-Pb isotopic data of zircon grains and U-Th-total Pb chemical data of monazite grains from total 17 samples of 8 rock types yielded wide range of age data from ca. 3200 Ma to ca. 1000 Ma (protolith age), and ca. 1000 Ma to ca. 500 Ma (age of deep to shallow crustal metamorphism and associated magmatism). This helped to produce a tightly age-integrated tectonic model.

Mr. Chatterjee could produce extremely good quality petrological and geochronological data from this study of the natural rocks. His study newly brings out texturally well-constrained age data indicating the peak metamorphic stages ($\pm$magmatism) at the EGB in between ca. 1000 Ma to 900 Ma followed by the decompression stage (i.e. crustal exhumation) at ca. 800 Ma. Until this stage the EGB was a part of the East Antarctica, but no connection with the proto-India. The final mid-crustal metamorphism occurred at ca. 500 Ma when the EGB was finally docked with the proto-India through thrust tectonics in a collisional setup, which continued till so far unknown age of Late Cambrian period. Age zonation across the boundary is also a new discovery.

Finally, it is agreed from the above review result that the author of the present thesis has enough credentials to be awarded the doctoral degree (Science).

公表論文

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[2] P. Dasgupta, A. Chatterjee, Mechanism of formation of water-escape structure due to seismogenic fluidization: an experimental revelation. *Proceedings of the Indian National Science Academy* (under review)