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# Large-scale overturned folds of Northern Chichibu Belt, western and central Shikoku, Japan

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Chichibu Belt which locates between Sanbagawa metamorphic Belt and Shimanto Belt consists of shallow accretionary complex is important for understanding the mechanism of deep to shallow accretionary complex and island arc. Recently, Northern Chichibu Belt has been revealed that there is a large-scale overturned structure (Tsuji and Sakakibara, 2009) that is different from previously thought low-angle simple structure (e.g. Isozaki et al., 1992). This result suggests a necessity to reconsider the geological structure and the history of the outer zone of southwestern Japan. In this study, we examined additional investigation and recognized the overturned structure distributes western to central Shikoku.

Northern Chichibu Belt of western Shikoku is divided its structure into two by low-angle Nanokawa Thrust (Kumura and Horikoshi, 1959). The hanging wall belongs to Nakatsuyama Unit and the footwall is divided as Oda-miyama, Sumaizuku (Matsuoka et al., 1998), Sawadani (Yamakita, 1998) and Yusugawa Unit (Yamakita, 1998). The strata of the hanging wall side dips low-angle to the north or the south and that of the footwall side orthogonally dips middle to high angle to the north in general. Nanokawa Unit is generally not overturned and predominantly youngs to the north or the south. In contrast, the strata within Oda-miyama, Sumaizuku Unit and the terrigenous rocks of Sawadani Unit, the footwall side, are overturned and young to the south. At the south of the terrigenous rocks, the greenstone-limestone complex and pelitic mixed rock within Sawadani Unit young to the north. Yusugawa Unit, underlying below Sawadani Unit, repeats northward younging (not overturned) and southward younging (overturned). The distribution of the overturned starata suggests the existence of large-scale overturned folds with southward vergents (overturned anticlines and synclines) between those structural boundaries. In central Shikoku, Permian, Jurassic and Cretaceous sedimentary rocks also show overturned structure (northward dipping and southward facing), inferring an overturned syncline. Some of these overturned folds have been cut by northward dipping thrusts.

The overturned folds with their structures of E-W to ESE ? WNW strike, middle to high angle south vergents and the thrusts which cut those folds suggest the north?south compression and top-to-the-southward movement. The phyllitic rocks of Nakatsuyama Unit overlying Nanokawa Thrust which suffered higher grade metamorphism than the underlying rocks is explained as a nap moved by the top-to-the-southward thrusting upon low-grade metamorphic rocks. Wide distribution of the overturned zone at the north of the Northern Chichibu Belt implies the significance of the uplifting and dragging of the rocks compared with that of the south where the distribution of the overturned zone is limited. This overturned fold-thrust structure may be related with uplifting of metamorphic rocks. The timing of folding was constrained at upper Cretaceous or later based on the upper Cretaceous sedimentary rocks that were bent by the overturned fold. The Sanbagawa metamorphic Belt consists of high pressure metamorphic rocks, distributing at the north of Chichibu Belt and its uplifting at late Cretaceous is suggested to be possibly related with the overturned fold-thrust structure. To understand the distribution, structure, kinematics and the timing of the overturned folds is very important to know the evolution of the accretionary complex and the island arc in addition to the geological structure and the history of the outer zone of southwestern Japan.

Keywords: Northern Chichibu Belt, Large scale overturned structure, overturned fold, western Shikoku, upwelling of metamorphic rocks

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