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Miocene extensional and contractional tectonics in the northern part of Kyushu

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The NW-SE trending faults have been developed in the northern part of Kyushu, especially Fukuoka Prefecture. As the thing which characterized in this area, it is said to block-tilting half graben structures by normal faulting, regulated the distribution of Paleogene system, have been developed. It is called Chikuho-type structure (Matsushita, 1949). However, in fact, there are many N-S to NW-SE trending left-lateral and reverse faults in the district, and the part of Chikuho-type structure are considered as left-lateral or reverse faults. Rather north Kyushu is an area characterized by complicated structure caused by the changes from extensional to contractional tectonics. In considering the active tectonics in this area, it is important to clarify history of formation of these geological structure in this area that strongly takes influence of its structures. About two structures that are main geological structure in this area, their characteristics and examination result about the formation time are shown as follows.

(1) Half graben structure of NW-SE trend

The half graben structures formed by the normal faults develop in Fukuoka and western Yamaguchi Prefecture, as represented by the Fukuchi-yama, Futajima and Takakura Faults. The vertical shift of the structure reaches up to 1,000-3,000m, showing the biggest displacement in these areas. Many of these structures are called Chikuho type structure. The dips of master faults are around 80-60 degrees, however, a few faults are identified as a listric normal fault by the data of the coalfield. Those structures are complicatedly deformed by the later compression stress as described later. It has been thought that so-called the Chikuho-type structure is syn-sedimentary deformation of Paleogene coal-bearing formations (Matsushita, 1971). However, there is no sedimentary evidence indicative of syn-depositional half graben development in the Paleogene starta. Moreover, NW-SE trending half grabens cut the E-W trending half graben and earliest Middle Miocene Kawajiri Formation in the back arc basin of the Sea of Japan in Yamaguchi Prefecture (Ozaki et al, 2006). Furthermore, the extensively distribution of Paleogene system along the Pacific side of the inner zone of Southwest Japan Arc that became clear recently, indicate that the Paleogene system of the northern part of Kyushu is a part of Paleogene forearc basin fills of in the continental margin arc of southwest Japan and it is not necessary to relate the special structure that is not recognized in the other areas to peculiar distribution. Therefore, the half-grabens seem to have been formed in NW-SE extensional stress in the earliest Middle Miocene time. This timing would be important in understanding of not only tectonic status of northern Kyushu but also the timing and mechanism of the opening of southern Japan Sea.

(2) Left-lateral strike-slip and revers faults of N-S and NW-SE trends

Left-lateral strike-slip and revers faults trending N-S and NW-SE direction are well distributed in north Kyushu, caused by NW-SE directed compressional stress from Middle to Late Miocene time. The Kokura-Tagaw and Kumagahata Faults which are representative of the faults, are estimated that strike-slip and dip-slip displacements reach a few km and several 100 m respectively. The NW-SE trending half graben structures have strongly been deformed and bent by above compressional fault-related movements. Some planes of strike-slip and revers faults overlap partly master fault plane of half grabens such as the Fukuciyama Fault and so on. Therefore, the normal fault of the NW direction derived from the main strike-slip fault and the secondary reverse and strike-slip faults fault of the NW direction by shortening of the half graben structure have been developed in half graben fills. The active faults in this area are considered to be reactivated faults of the left-lateral strike-slip and reverse fault mentioned above.

Keywords: north Kyushu, Miocene, extensional tectonics, contractional tectonics, half graben, Chikuho-type structure