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Seaward extension of the Nishiyama Fault Zone off Fukuoka, western Japan

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The Nishiyama Fault Zone is an active left-lateral strike-slip fault existing between Fukuoka City and Kitakyusyu City and is estimated to make a M7.3(Richter scale) earthquake (the Headquarters for Earthquake Research Promotion, 2004). This fault zone has been rated an overland fault. The Off O-shima Fault was discovered in the northwest extension sea area of the Nishiyama Fault Zone, but it had not seemed a sequence of the Nishiyama Fault Zone because they were away by 5 kilometers. On the other hand, the Kego Fault is 20 kilometers southeast of the Nishiyama Fault Zone and also had seemed to be an overland fault. But the 2005 West Off Fukuoka Prefecture Earthquake (M7.0 in Richter scale) happened in the northwestern extension sea area of the Kego Fault and the fault seemed to extend to the northern sea area. In response to this, Abe et al.(2010) conducted reflection seismic survey and vibratory coring and revealed that the Nishiyama Fault Zone extended to the northwest sea area, too. Then, Japan Coast Guard conducted accurate topographic survey in the same area and discovered tectonic reliefs on the seafloor. In this study, the fault distribution is investigated by these survey analyses. Survey vessel and multibeam echo sounder used by Japan Coast Guard are "Kaiyo" and EM302, respectively.

The depth of this sea area is between 60 and 100 meters and northern area is deeper. Sand waves with long frequency and gentle slope are found in southern area and sharp and small-scale reliefs are distributed in northern area. This geomorphological difference is caused by the agglomeration degree of sediments. The new and soft sediments with sand waves cover the old and hard bed.

Lineament composed of channels and bulges in direction of northwest-southeast was found in the northwestern extension sea area of the Nishiyama Fault Zone and the Off O-shima Fault. The bulges are formed by the old and hard bed uplifted by the faults of both sides and crop out in the new and soft sediments. The maximum relative elevation is 5 meters. The channels deform both new sediments and old bed. The maximum depth is 2 meters. The flower structure is found in the seismic profile under the channels and this shows that the channels were formed by a lateral strike-slip fault. The main lineament runs for about 30 kilometers from O-shima to Oki-no-shima and extends further north. Some short faults are shown in the seismic profiles and on the seafloor and indicate that the fault is splitting toward north.

The surveyed sea area was a land in the Last Glacial Maximum about 20,000 years ago. The soft sediments with sand waves laid down after the submergence.

Keywords: Nishiyama Fault Zone, active fault, lateral fault, sea area, seafloor topography, seismic reflection survey