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Microstructure analysis of earthquake-induced deposits associated with the 2004 off Kii Peninsula earthquakes

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An ENE-WSW elongated depression is located between the southern margin of the forearc basin and the outer ridge off Kumano and a terminal basin that captures all sediments supplied from outside is developed in it. No sediment is supplied from the rivers to this basin, so it is an adequate site to study paleoseismology using seismogenic turbidites.

The result of the Cs-137 and Pb-210 measurements indicates that the upper 17-cm mud layer was deposited immediately after the 2004 off Kii Peninsula earthquakes (Ashi and others, in this Session). We herein investigate the characteristics of the earthquake-induced deposits based on several measurements including their compositions, grain sizes, X-ray CT images, and anisotropy of magnetic susceptibility (AMS).

We observed a very thin fine-grained sand layer of 6 mm thick at 17 cm below seafloor and a massive mud below it on the core split section. On the other hand, the X-ray CT image shows seven silty clay laminations thinning upwards at 6 -15 cm below seafloor, and homogeneous clayey silt above it. The AMS parameters decrease upwards in the interval showing parallel/cross laminations and the lowest value is measured in the overlying silt layer, whereas grain sizes have no significant change. These results indicate that the upper 17 cm layer beginning from the very fine-grained sand can be interpreted to be formed by a low-density sediment gravity flow. Below the depth of 17 cm, the deposition is mainly composed of muddy sediments with a wood chip-enriched thin bed and a very fine-grained thin sand layer at the depth of 32 cm. Structural observations by X-ray CT scanner reveal characteristic structures yielding various orientation oblique to bedding plane at the mud layer 17 cm below seafloor, suggesting that the structure is likely formed by coseismic deformation accompanied by the earthquake in 2004 or earlier ones. Magnetic fabrics derived from AMS measurements and the structure observed by X-ray CT scanner also agree to this picture.

Keywords: turbidity current, anisotropy of magnetic susceptibility, X-ray CT, event deposit