Sandbox Experiments of Accretionary Process in Nankai Trough

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Nankai Trough lies off Southwest Japan in the Pacific Ocean,where the Philippine Sea Plate is subducting underneath the Eurasia Plate and forming an accretionary wedge.Since a large quantity of methane hydrates may exist at the Nankai accretionary wedge,it is essential to analyze internal deformation in the wedge to examine where and how much methane hydrates accumulate.

The purpose of this study is to reproduce the fault growth by the analogue model experiments and bring the result to develop the exploration of methane hydrates.

Sandbox experiments are excellent technique for modelling.In this study, the experimental rig is an acrylic box with a flat sheet laid on the bottom of it. At a constant velocity of 1 cm per minute a motor pulls layers of modelling material which have been made on the sheet. The box has a slit under a fixed wall through which the sheet is exhausted outside of the box.The modelling materials are dry sand and micro glass beads.They are suitable to simulate the brittle deformation of the upper crust.Their cohesion and angle of internal friction are measured by shearing tests.

The experiments were practiced varying the height of the slit and the modelling material.In some experiments the material used was only glass beads, but in the other experiments we put a glass beads layer between sand layers.

Each result was examined for reproducing the geologic structure of the accretionary wedge.The characteristics of the structure are

1.the geology stratum tilt landward.

2.thrusts are developed inside the wedge.

3.new tectonostratigraphic units are forced underneath the old ones, thus the landward wedge is old and the seaward wedge is new.

Each result well reproduced the characteristics above.The change of the material used or the height of the slit influenced the structures of the faults and the inclination of the wedge.In the experiments which used sand and glass beads as the material the sand layers below the glass beads didn't deform.In the sand layers above the glass beads a group of thrusts was formed and converged on the glass beads layer.We succeeded in reproducing the decollement inside the glass beads layer.

Our experiments succeeded in reproducing the fore of the real accretionary wedge.Therefore, the further analysis of the results can play its part in examining where and how much methane hydrates accumulate.