Diving surveys of small knolls in the aftershock area of the 2005 M7.1 outer rise earthquake seaward of the Japan Trench

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Diving surveys and geodetic experiments were carried out in the outer rise of the Japan Trench off Northeastern Japan during the Kairei KR07-07 cruise in June 2007 using the ROV KAIKO 7000 II. The cruise aimed at three objectives. The first was diving surveys of small knolls on the outer rise. A new type of young seafloor volcanism called petit spot was recently found near the Japan Trench (Hirano et al., 2001). Three knolls were selected as the target of diving surveys based on the mapping of acoustic reflectivity carried out with the multi-narrow beam echo sounder. The KAIKO could sample fresh basalts from each knoll. The basalts from two knolls resemble rocks previously sampled from the petit spot site (Abe et al., this meeting). The outer rise can be another petit spot volcanic field.

The second objective was diving surveys of the seafloor in the source region of the M7.1 outer rise earthquake in November 2005. It was the largest outer rise earthquake recorded off the Japan Trench since the 1933 M8.4 Sanriku-oki tsunami earthquake. Hino et al. (this meeting) carried out aftershock observation with ocean bottom seismometers. Although we could not find any indication of deformation on the seafloor during the survey, we are interested in the observation that the aftershock distribution was overlapped with the area of the small knolls. The seamounts may have resulted from young volcanism like petit spot caused by the oceanic plate flexure (Hirano et al., 2006). Bathymetric maps show graben structures near the small seamounts sub-parallel to the trench axis suggesting normal faults in the outer rise region. We can suppose that the normal faults can be another mechanism for the young volcanism near the Japan Trench, or that the petit spot volcanism may have induced the large intra-plate normal fault earthquake. Anyway the seamounts can be related to intra-plate earthquakes.

The third objective was renewal of acoustic seafloor benchmarks deployed on the outer rise. Three precision acoustic transponders (PXPs) were deployed in 2002 to observe the motion of the pacific plate near the subduction plate boundary, and somehow exhausted the batteries after a few short observations. Each of two PXPs was replaced with a new one after cm-order measurement of the relative positions. A new PXP was deployed from the sea surface near the third PXP. We plan to combine the geodetic observations with the old PXP net with future works using the data of precise relative positioning.