Seismic exploration for the Japanese legal continental shelf

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Article 76 of the United Nation Convention on the Law of the Sea (UNCLOS) presents an opportunity to investigate geological and geophysical structure of the continental margin around Japan. We must provide the seismic structural models supporting natural prolongation of the landmass in order to intend the Japanese continental shelf territory extending beyond 200 nautical miles. The full-dress seismic investigation collaborated with JAMSTEC had started in 2004 and will continue until 2007. These explorations should be conducted with advanced and up-to-date techniques in order to pass the scrutiny and assessment by the UN Commission of experts.

The wide-angle seismic and multi-/single-channel seismic (MCS/SCS) investigation by the Hydrographic and Oceanographic Department (HOD), Japan Coast Guard, is divided into two according to the seismic source: one is a large capacity tuned airgun array equipped in M/V Tairikudana for penetration to thicker crusts and the other is a non-tuned airgun array in S/V Shoyo for rather thin crusts. M/V Tairikudana is equipped with a tuned array of 36 airguns with a total volume of 8,040 inch3 as a controlled seismic source. We shot the airgun array at an interval of 200 m (90 s) for wide-angle seismic profiles and at 50 m for MCS (480 channels, 60 folds) profiles. Ocean bottom seismographs (OBSs) as receivers are deployed at a standard interval of 5 km. The experimental specification by S/V Shoyo is basing on that by M/V Tairikudana, except for a non-tuned airgun array with a capacity of 6,000 inch3. The OBS data are modeled by a tomographic inversion (tomo2D, Korenaga et al., 2000) and two-dimensional ray tracing (Kubota et al., 2005). The MCS data are processed by a conventional procedure and pre-stack depth migration is applied to the data in the more important area.

The target areas for the continental shelf survey are very large, including the region around the Minami-Tori Shima island in the western Pacific Basin, the Ogasawara Plateau on the Izu-Ogasawara subduction zone, the Kyushu-Palau Ridge, Daito Ridges (Amami Plateau, Daito Ridge and Oki-Daito Ridge) and the Oki-Daito Escarpment on the Philippine Sea plate, and in addition the plate subduction zone beneath the Ryukyu Trench at the northern end of the Philippine Sea plate. During 2004-2005, the total numbers of the seismic profiles and OBSs only in the experiments by HOD were 32 and 2502, respectively. The total length of these profiles amounts to 12,125 km. Enormous amount of OBS and MCS data of high quality were obtained from these surveys. This unprecedented project should be expected to provide large quantities of new information to us.