Multidisciplinary research project on the zones of high strain rate

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The headquarter of earthquake research promotion established after 1995 Kobe earthquake has been promoting the construction of fundamental earthquake observation network, investigation of major active faults and compiling the national seismic hazard maps. Moreover, some regions where the strong ground shaking is simulated have been selectively investigated. Recently, some large earthquakes, 2004 Niigata Chuetsu Earthquake, 2007 Niigata Chuetsu-oki earthquake, and so on, occurred in the high strain rate zone in the eastern margin of Japan Sea. However, the high strain rate zone is a kind of blank space area. Therefore, the Ministry of education, culture, sports, science and technology decided to start the special multidisciplinary research project for the high strain rate zones. The purpose of this project is to resolve the general feature of the active tectonics in this region and to construct the earthquake fault model in order to contribute to improvement of the long-term evaluation of the earthquake occurrence and evaluation of strong motion. In this project, comparative studies in some volcanoes and other fault systems as high strain rate areas will be carried out in order to clarify the mechanism of formation of the high strain rate zone. Main programs are as follows.

(2) Seismic survey with artificial source

Deep seismic reflection, refraction, high resolution reflection surveys by using artificial sources is carried out in order to obtain the active structure, configuration of deep fault plane, absolute value of the seismic velocity, and so on. This year, we carry out the unified seismic survey in land and sea with a long survey line from Fukushima Prefecture to west off of the Sado island. In the Japan Sea, multichannel survey will be carried out along profiles with a total length of longer than 10,000 km.

(3) GPS observation

Two profiles composed of 50 GPS sites are constructed across the high strain rate zone in Niigata prefecture. Based on repetition of the GPS measurement, detail distribution of the crustal deformation is obtained and a physical model to explain the observed deformation is constructed.

(4) Geomorphologic and geological survey for active fault

Based on tectonic geomorphology, shallow borehole stratigraphy and other survey in the land area and high-resolution reflection survey, dating of sediment materials in the sea area, tectonic landforms and late Quaternary slip rates are resolved.

(5) Study for improvement of strong motion evaluation

Based on collection of surface soil data and microtremor survey, combined model of surface and deep soil structure in the sedimentary plain in the high strain rate zone is constructed. The source property of the earthquake in the high strain rate zone is analyzed and the source fault model is improved based on combination of information related to fault model. Models of the source fault and underground structure obtained in this project is tested based on the evaluation of strong motion

(6) Collection and analysis of records for historical earthquakes

Based on the geological, historical, and seismological records for historical earthquakes in the high strain rate zone, precise distribution of seismic intensity is resolved in order to improve the long-term evaluation.