

Proposal of the EARS program for the active monitoring of the generation of subduction interpolate earthquakes

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Large earthquakes along the subducting plate boundary occur repeatedly in seismic zone, which is the area of asperity that consists of strongly coupled zone of two plates. Other areas are considered as stable - quasi-stable slip region, which may release the strain energy caused by the oceanic plate subduction. Plate boundaries can be classified as asperity and 'non-asperity'. The physical states of large asperities in the ocean are not well known at present.

The strong PP wide-angle reflections from the subducting plate boundary were found in the aseismic subduction zones in the Japan Trench and in the slow slip region in the Nankai Trough. Those suggest the presence of low- V_p /soft materials and/or fluid at the subducting plate boundary. Such regions may cause slow-slip continuously or intermittently. If we can map the areas of strong PP reflections by observations, we will be able to map the distribution of asperities along the plate boundary and the active monitoring of the physical state change on them. The mapping and monitoring of the reflections at subducting plate boundaries can be done by the 2D, the 3D seismic, the wide-angle reflection-refraction surveys and the time-lapse measurements.

Suppose that the slip acceleration at non-asperity regions may trigger a large earthquake at adjacent asperities, the change of physical states in the non-asperity region may suggest the potential of plate-boundary earthquakes. The slip acceleration at the non-asperity region may be detected by a continuous monitoring of seismic reflection intensity at the non-asperity regions. To realize continuous monitoring of the seismic reflection intensity, we propose the ACROSS (Accurately-Controlled Routinely-Operated Signal System) that is an integrated active seismic monitoring system composed of system synchronized by the GPS clock and repeated transmission of frequency modulated seismic waves combined with sophisticated algorithm for signal analysis.

Submarine cable OBS systems near the trenches enable us to continuously monitor seismic reflections provided by ACROSS systems. The planned submarine cable OBS in the Tonankaki region may be a good real-time receiver system. The 'EARS (Exploration of Asperities-Reflectors System)' is proposed for the integration of necessary research components. Mapping, monitoring and real-time monitoring are essential ones. The method of the analysis and important points in such study are described in the paper.