Deep seismic reflection profiling across the Suruga trough, Shizuoka, Japan

*Hiroshi Sato[1], Kayoko Tsuruga[2], Hisatoshi Baba[3], Tatsuya Ishiyama[1], Shinji Kawasaki[4], Yasuhisa Tanaka[4], Toshifumi Hayashi[2], Yoshihiro Sekino[2], Masanao Shinohara[1], Takaya Iwasaki[1], Makoto MATSUBARA[5], Naoshi Hirata[1,5]

1. Earthquake Research Institute, The University of Tokyo, 2. Tokyo University of Marine Science and Technology, 3. Tokai Univerisity, 4. JGI Inc., 5. National Research Institute for Earth Science and Disaster Resilience

An onshore-offshore seismic data set was collected across the Suruga bay in 2018 to determine the deep structure of the subducting Philippine Sea plate (PHS), whose upper surface is estimated to be a seismogenic source fault of the Fujikawa fault system. Three-component of land seismometers (GSX) were deployed with a spacing 100 –200 m from the southern range of Akaishi Mountains to Yui and western part of Izu Peninsula along the seismic lines using total 300 seismometers along the 40-km-long seismic lines. Three-component of ocean bottom seismometers (OBSs) were deployed with spacing of 1 km on the sea bottom deeper than 500 m along the 18 km-long marine part. Five shallow marine ocean bottom seismometers (OBXs) were deployed at the shallow marine western part of Suruga Bay along the 2-km-long interval. They recorded seismic shots generated from four, 200 kg dynamite shots and air gun array with a total volume of 1950 cu. inch. Total number of shots by air gun array was 1479 and shot spacing was 25 m. Data quality is good, allowing the identification of clear refraction by air gun array in the integrated shot gathers. Multi-channel seismic data were also collected towing a 600-m-long streamer cable with 96-ch hydrophones (Tsuruga et al., 2019 JpGU). The redatumed seismic data were produced using interferometric OBS imaging method (Shiraishi et al., 2016). All seismic data were processed according to a standard common-midpoint (CMP) stacking and a post stack time migration. We used refraction tomography to determine the P-wave velocity structure, that revealed down to 10 km in depth beneath the central part of the seismic line. Obtained post-migrated time section portrays the west-dipping reflectors from 3.5 sec (TWT) to 7 sec beneath the eastern part of the Suruga bay, from 5 to 11 sec beneath thesouthern range of Akaishi Mountains. The migrated time section was depth converted using the velocity structure obtained by earthquake tomography based on Hi-net data. On the depth section the depth to an estimated upper surface of PHS is 7 km beneath Yui, western coast of Suruga bay, and 15 km in beneath the central part of land seismic line in the Shizuoka side. The p-wave velocity structure deduced by refraction tomography reveal the wedge-shaped low-velocity area beneath the western part of Suruga bay. The velocity structure accords well to the subduction of PHS and distribution of hypocenters.

The onshore-offshore seismic survey was performed under the Integrated Research Project on the Fujikawa-kako fault zone funded by MEXT. This survey also supported by the research fund of ERI, Univ. Tokyo.

Keywords: plate boundary megathrust, deep seismic reflection profiling, Izu collision zone

