Seismic structure analysis using earthquake records observed by a dense planar seismic array at the Fujigawa-Kako fault zone

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The Fujigawa-kako fault zone locates at the eastern end of the Suruga trough and is supposed as its landward extension. It is composed of many active faults. Among them, the average vertical displacement speed of the Omiya-Iriyamase fault is several meters per 1000 years, which is assumed to be the largest in Japan (The Headquarters for Earthquake Research Promotion, 2010). This fault zone crosses major lifelines such as highways, railroads (including Shinkansen), power grids and pipelines. Therefore, elucidating the structure and activity history of the Fujigawa-kako fault zone is an urgent social issue. "Fujigawa-kako fault zone structure exploration group" has carried out geological surveys and seismic surveys to elucidate the structure of the Fujigawa-kako fault zone and to conduct strict evaluation of its activity. We pointed out that the Fujigawa-kako fault zone is a mega-thrust faults branched from the upper boundary of the Philippine Sea plate, the Omiya-Iriyamase fault is a low-angle reverse fault, and the current seismic risk assessment may be underestimated.
In 2015, a shallow high-resolution quasi three-dimensional reflection survey was conducted to clarify the three-dimensional structure of the shallow subsurface structure from the Omiya-Ieyama fault to the Hoshiyama hills. In order to clarify the deep structure of this region, and the connection relation between the faults and the plate boundary, we carried out a seismic observation for 4 months from the end of December 2015 to the end of April 2014, and continuous earthquake records were acquired. 60 seismic station were deployed in a grid form in the range of about 7 km x 5 km. The station interval was roughly 500 m in east-west and 1 km in north-south.
Using this seismic records, we performed a receiver function analysis of teleseismic earthquakes and a seismic wave interferometry imaging. In the receiver function analysis, eventually nine earthquakes were used for the analysis from 83 teleseismic earthquakes of M 5.5 and above extracted from the USGS catalog. For the seismic wave interferometry imaging, the local deep earthquakes occurring in the Pacific slab were used as a signal source. The reflected wave records were synthesized by calculating autocorrelation of seismic waves whose incident angle is close to vertical. Among the earthquakes extracted from the JMA catalog, only two earthquakes could be used for analysis. The P-wave reflection sections were created using the P-wave arrival and the later phases of the vertical component of the seismic records. The S-wave reflection sections were created from the S-wave part of the radial component synthesized from the horizontal components.
In both the receiver function sections and the seismic wave interferometry sections, the sections show very complicated feature. Clear boundaries corresponding to the plate boundary are hard to recognize. This presumably is because there is no large difference in the physical properties between the two island-arc crusts in contact in this area. It also is because the Izu arc-crust collision resulted in a complicated geological structure. Geological interpretation of the sections seems not easy. In the poster, we will discuss the result of the seismic analysis in comparison with the results of previous seismic surveys and the results of pre-existing studies.

Keywords: Receiver function, Seismic interferometry, Deep earthquakes, structure analysis

