Simulation of hypocenter determination of assumed hypocenters by using S-net stations

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To observe earthquakes occurring under seafloor and tsunami, project to construct Seafloor Observation Network for Earthquakes and Tsunamis along the Japan Trench (S-net) is started in 2011. The S-net consists of 150 seismic and tsunami observation stations. These stations are arrayed from off Hokkaido to off Boso at intervals of about 30km in the direction North-South (parallel to the trench axis) and at interval of about 50-60km in the direction East-West (perpendicular to the trench axis). S-net makes it possible to forecast earthquake warning and tsunami warning much earlier than presence. To understand occurrence of earthquake occurring under seafloor, we must research hypocenters distribution, focal mechanism, velocity structure, and stress field under seafloor accurately. Then we need to research relationship between subducting plate and occurrence of earthquake and process of strain accumulation at interplate. To research these in detail, we need to locate hypocenters under seafloor precisely. In our previous study, travel times from aftershocks of 2011 off the Pacific coast of Tohoku Earthquake located by an ocean bottom seismic network [Shinohara et al. (2011, 2012)] to S-net stations were calculated and hypocenters were located. We researched resolution of hypocenter determination from the result. To estimate resolution of hypocenter determination, it is importance to analyze similarly in more large area than source area of 2011 earthquake.
To understand accuracy of hypocenters determined by S-net, we simulated of hypocenter determination by using travel times from assumed hypocenters to stations of S-net. These hypocenters are assumed in range between 35.5°N and 40.0°N latitude (grid spacing: 0.25°) and 140.5°E and 143.0°E longitude (grid spacing: 0.25°), depth between 5 and 50km (grid spacing: 2.5km). A number of earthquakes are 3971. We calculated travel times from these hypocenters to seismic stations and estimated arrival times of every station. Hypocenters were determined by using the arrival times. Then hypomh program [Hirata and Matu'ura (1987)] was used. Velocity structure of S-net used calculation of travel times and determination of hypocenters was modeled by introducing result of seismic survey for installation of S-net. As the result, 3914 hypocenters were located. We compared located hypocenters with assumed hypocenters. 196 of the hypocenters were difference than assumed hypocenters. Difference in the epicenters and/or in the depth is more than 3km. Hypocenters assumed in land of more than 100km from coast line were not located precisely. It is importance to research range of precise location of hypocenters by S-net because hypocenters far from a seismic network are not located precisely.

