Crustal structure in the source region of the 2007 Noto Hanto earthquake from two-vessel reflection profiling

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The deep geometry of active faults and crustal structure in the marine-land transition zones are the key issues for evaluating the risk of destructive earthquakes and improving the reliability of predicted strong ground motion. In general, deep seismic profiling using a long streamer cable in the transition zone has unavoidable problem in the operation due to active fishery and large vessels on the sailing routes. The method to mitigate these problems is the two-vessel seismic exploration using flip-flop shooting and short digital-streamer cable. The two-vessel profiling can accommodate the simultaneous acquisition of large-aperture reflection/refraction data to delineate pre-Tertiary basement and the Miocene rift system of Honshu Island. A supplementary land and ocean-bottom seismic line provides the dense seismic reflection profile in the transition zone. In the source region of the 2007 Noto Hanto earthquake, multidisciplinary studies are conducted including the dense seismic observation of aftershock, geodetic measurement with GPS and laser profiler, and reflection/refraction seismic survey (Sato et al., 2008). In September 2007, a series of two-vessel reflection profiling with 7 seismic lines was carried out in NNW-SSE direction around the source region of the 2007 Noto Hanto earthquake. For the northeast seismic line across the source region, a two-vessel seismic profile with the deployment of 5km-long land geophones was acquired using the combination of expanding-contracting and wide-aperture inline spread with 11km offset distance. The obtained seismic profiles, which were obtained by precise velocity estimation and unified seismic profiling in the transition zone, demonstrate the detailed geological structure in the source region and deep geometry of source faults. Deeper extension of the imaged fault accords well to the linear distribution of hypocenters of aftershocks.