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Arc-arc Collision Structure in the Southernmost Part of the Kuril Trench Region -Results from Integrated Analyses of the 1998-2000 Hokkaido Transect Seismic Data-

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The Hokkaido Island, located in the southernmost part of the Kuril trench region, has been under a unique tectonic environment of arc-arc collision. Due to the oblique subduction of the Pacific (PAC) plate, the Kuril forearc sliver started to collide against Northeast (NE) Japan arc from the east at the time of middle Miocene to form complicated structures in the Hidaka collision zone (HCZ), as characterized by the westward obduction of the crustal rocks of the Kuril arc (the Hidaka metamorphic belt (HMB)) along the Hidaka main thrust (HMT) and a thick foreland fold-and-thrust belt.

In and around the HCZ, a series of seismic reflection/refraction experiments were undertaken from 1994 to 2000, which provided important structural features including crustal delamination in the southern HCZ and a thick fold-and-thrust belt with velocity reversals (low velocity layers) in the northern HCZ. Reprocessing/reinterpretation for these data sets, which started in 2012, is aimed to construct a more detailed collision model through new processing and interpretation techniques. A multi-disciplinary project of the 1998-2000 Hokkaido Transect, crossing the northern part of the HCZ in EW direction, collected high-quality seismic data on a 227-km seismic refraction/wide-angle reflection profile and three seismic reflection lines. Our reanalyses revealed interesting collision structure ongoing in the northern part of the HCZ. The westward obduction of the Kuril arc crust was clearly imaged along the HMT. This obduction occurs at a depth of 27-30 km, much deeper than in the southern HCZ (23-25 km). The CRS/MDRS processing to the reflection data firstly succeeded in imaging clear reflection events at a 30-45 km depth below the obducted Kuril arc crust. These events show an eastward dip, probably corresponding to the lower crust/Moho within the NE Japan arc descending down to the east under the collision zone. Gently eastward dipping structures above these events (in a depth range of 5-10 km) are interpreted to be fragments of Cretaceous subduction/arc complexes or deformation interfaces branched from the HMT.

The refraction/wide-angle reflection analysis revealed a series of eastward dipping interfaces at depths of 15-30 km east of the HMT, some of which show a very large Vp contrast exceeding 0.5-1.0 km/s. The subducted NE Japan arc meets the Kuril arc 20-40 km east of the HMT at a depth of 20-30 km. The above mentioned high Vp contrasts may result from the mixture of the upper crustal (low Vp) materials of the NE Japan arc and lower crustal (high Vp) materials of the Kuril arc.

Seismic reflection image in the southern HCZ reprocessed by almost the same techniques confirms a clear crustal delamination, where the upper 23-km crust is thrust up along the HMT while the lower part of the crust descends down to the subducted PAC plate. At the moment, the results in the northern HCZ do not provide positive evidence on shallow crustal delamination as found in the case of the southern HCZ, suggesting regional difference in collision style along the HMT.