Upper crustal structure in the northern part of Hidaka collision zone, Hokkaido, inferred from seismic reflection data

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The crustal evolution of Central Hokkaido, Japan, has been dominated by a series of accretion and collision processes from the late Jurassic to the present. This region is divided into three main tectonic belts (the Sorachi-Yezo, Hidaka and Tokoro Belts from west to east) formed in different Cretaceous subduction systems. Since Miocene, the Sorachi-Yezo Belt and the western part of the Hidaka Belt (Hidaka Metamorphic Belt (HMB)) have suffered severe deformation by two tectonic events: the dextral oblique collision between the North America (Okhotsk) and Eurasia Plates and the arc-arc collision of the Kuril forearc sliver with the western part of Hokkaido (the NE Japan Arc).

Recent seismic experiments in 1998-2000 provided a new image of crustal scale structural variation and deformation of Central Hokkaido under the above tectonic environment. In this paper, we present a detailed structure model beneath the northern part of the Hidaka Collision Zone from seismic reflection data collected in 1998 and 1999. The crustal structure east of the Hidaka Mts. is characterized by highly undulated sedimentary layers. Around the Hidaka Main Thrust (HMT), a basement is almost outcropped. Our reflection data indicates a clear lateral velocity variation in the basement. Namely, the velocity in the outcropped part (5.95-6.1 km/s) is 0.2-0.4 km/s higher than those in the surrounding areas. Beneath the Hidaka Mts., distinct reflectors are traced in a depth range of 10-22 km, forming a steep eastward dip. These results indicate the obduction of the Kuril forearc onto the Northeast Japan arc. This high velocity part of the basement probably represents the obducted middle/lower crust (high-T metamorphic rocks) of the Kuril forearc. Beneath these events, another strong reflectors are found at a 25 km depth with almost flat geometry. Their large seismic energies suggest a complicated structure such as a velocity reversal or lamination in a depth range of 22-25 km. The results from the present study indicate the occurrence of crustal delamination in the northern part of the collision zone although its style is considerably different from the wedge-like delamination progressing in the southernmost part of the collision zone.