Crustal structure derived from refractions and wide-angle reflections in the Mizuho Plateau, East Antarctica

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Large seismic experiments were conducted on the traverse route from Syowa to Mizuho stations by the JARE-41 in 1999-2000 and JARE-21 in 1980-1981. The P-wave velocity structure of the ice sheet, the crust and the uppermost mantle in the Mizuho Plateau, East Antarctica, is constrained from travel-time analysis of these combined data of refractions and wide-angle reflections. The ice sheet has a surface 60-100m in thickness with a P-wave velocity of 2.34 to 3.01 km/s and the deeper part has a P-wave velocity of 3.80 to 3.85 km/s. There is a valley which has a drop of 600m in the basement topography at the middle of the profile line, and that is consistent with the variations of ice sheet flow. The uppermost crust has a P-wave velocity of 6.17 to 6.20 km/s on the ocean side, 6.08 km/s under the valley at the middle of the profile line and 6.21 to 6.26km/s on the inland side. The middle and the lower crustal P-wave velocities are 6.45 and 6.56km/s, and their thicknesses are about 10 and 20 km, respectively. The Moho boundary is almost 40km deep with a gentle dip in the inland direction with a Pn of 8.03km/s. The Vp/Vs value of 1.70 for the entire crust is derived from an S-wave travel-time analysis. Calculated gravity anomalies based on the obtained velocity structure coincide closely with observed anomalies, but there are some misfits at the valley of the basement rock and around the shot points S-1 and S-6. From these results, it is implied that felsic gneiss is possibly a dominant rock in the uppermost crust along the Mizuho traverse route and that the layer with a P-wave velocity of 4.69 km/s near the coast and the bottom of the ice sheet at the valley may be a mixture of ice with sand or stone.