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Crustal structure of China from deep seismic sounding profiles

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Abstract

More than 36,000 km of Deep Seismic Sounding (DSS) profiles have been collected in China since 1958. However, the results of these profiles are not well known in the West due to the language barrier. In this paper, we summarize the crustal structure of China with a new contour map of crustal thickness, nine representative crustal columns, and maps showing profile locations, average crustal velocity, and P_n velocity. The most remarkable aspect of the crustal structure of China is the well known 70+ km thickness of the crust of the Tibetan Plateau. The thick (45â€“70 km) crust of western China is separated from the thinner (30â€“45 km) crust of eastern China by the north-south trending seismic belt (105Â°E). The average crustal velocity of China ranges from 6.15 to 6.45 km/s, indicating a felsic-to-intermediate bulk crustal composition. Upper mantle (P_n) velocities are 8.0 Â± 0.2 km/s, equal to the global continental average. We interpret these results in terms of the most recent thermo-tectonic events that have modified the crust. In much of eastern China, Cenozoic crustal extension has produced a thin crust with a low average crustal velocity, similar to western Europe and the Basin and

crust with a low average crustal velocity, similar to western Europe and the Basin and Range Province, western USA. In western China, Mesozoic and Cenozoic arc-continent and continent-continent collisions have led to crustal growth and thickening. Inferences on the process of crustal thickening are provided by the deep crustal velocity structure as determined by DSS profiles and other seismological studies. A high velocity (7.0â€“7.4 km/s) lower-crustal layer has been reported in western China only beneath the southernmost Tibetan Plateau. We identify this high-velocity layer as the cold lower crust of the subducting Indian plate. As the Indian crust is injected northward into the Tibetan lower crust, it heats and assimilates by partial melting, a process that results in a reduction in the seismic velocity of the lower crust in the central and northern Tibetan Plateau.

Previous article

Next article

Keywords

China; crustal structure; deep seismic imaging; average crustal and P_n velocity

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