



Crustal structure of the central Qaidam basin imaged by seismic wide-angle reflection/refraction profiling

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We present the results of a seismic wide-angle reflection/refraction profile across the central Qaidam basin, the largest basin within the Qinghai-Tibetan plateau. The 350-km-long profile extends from the northern margin of the East-Kunlun Shan to the southern margin of the Qilian Shan. The P- and S-wave velocity structure and Poisson's ratio data provide constraints on composition. The crust here consists of a near-surface sedimentary layer and a four-layered crystalline crust having several significant features. (1) The sedimentary fill of the Qaidam basin reaches a maximum thickness of 8 km, and the basin shape mirrors the uplifted Moho. (2) Within the four layers of the crystalline crust, P- (S-) wave velocities increase with depth and fall within the following velocity ranges: 5.9–6.3 km/s (3.45–3.65 km/s), 6.45–6.55 km/s (3.7 km/s), 6.65 km/s (3.8 km/s), and 6.7–6.9 km/s (3.8–3.9 km/s), respectively; (3) low-velocity zones with a 3–5% reduction in seismic velocity are detected in the lower half of the crust beneath the Qaidam basin and its transition to the Qilian Shan. (4) The crystalline crust is thickest beneath the northern margin of the basin towards the Qilian Shan (58–62 km) and thinnest beneath the center of the basin (52 km). Variations in crustal thickness are caused most pronouncedly by thickness variations in the lowermost layer of the crust. (5) Poisson's ratio and P-wave velocity values suggest that the Qaidam crust has an essentially felsic composition with an intermediate layer at its base. Based on the crustal structure reported here, we suggest that late Cenozoic convergence is accommodated by thick-skinned tectonic deformation with thickening involving the entire crust across the Kunlun–Qaidam–Qilian system.