

Lithospheric Deformation in the Central Andes

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The Altiplano of the central Andes (18-21°S) is part of an active continental margin mountain belt bounded to the west by the Western Cordillera active volcanic arc and to the east by the Eastern Cordillera and Sub-Andean Zone fold and thrust belts. We combined receiver function analysis, surface wave dispersion, regional broadband waveform modelling, and travel time tomography studies to determine the lithospheric structure of the back-arc region of the central Andes. We infer two different mechanisms of shortening across the central Andes from our seismological studies. The Altiplano and high elevation regions of the Eastern Cordillera have very thick crust with seismic properties consistent with a predominantly felsic to intermediate composition. This implies that the Altiplano crust is weak and is dominated by distributed ductile deformational mechanisms leading to lower crustal flow and flat topography. We observe a low velocity zone that can be traced across the entire width of the Altiplano at a depth of 15 to 20 km. This weak mid-crustal low velocity zone may mark the de-coupling layer between the brittle upper crust and more ductile lower crust. In contrast in the lower elevation regions of the Eastern Cordillera and Sub-andean zone, although bulk crustal velocities remain low, the shortening has been taken up on discrete thrust faults that sole into the top of an under-thrusting cold, strong Brazilian Shield lithosphere. The Brazilian Shield lithosphere has under-thrust as far west as the Eastern Cordillera but does not extend under the Altiplano.