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Building the Central Andean Plateau

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Understanding the mechanisms that build orogenic plateaus requires a multifaceted view of the surface uplift history and the tectonic evolution that led to the modern lithospheric structure and the modern distribution of topography. In the Central Andean Plateau, comparison of the timing, magnitude, and distribution of shortening and surface uplift, in combination with other geologic evidence, highlights the pulsed nature of plateau growth. In particular, the crustal shortening history of the central Altiplano and Eastern Cordillera leads to estimated crustal thicknesses that exceed the modern crustal thickness, requiring the loss of crustal material by removal of dense lower lithosphere and/or crustal flow. During the late Oligocene-early Miocene in the Eastern Cordillera and late Miocene-Pliocene in the Eastern Cordillera and central Altiplano, rapid surface uplift events correspond with time periods when crustal thicknesses exceeded the modern crustal thickness. In contrast, the crustal shortening history of the northern Altiplano and Eastern Cordillera predicts thinner than modern crustal thickness, requiring crustal flow into this region, likely from the central Eastern Cordillera and Altiplano. Integrative studies of the Central Andean Plateau indicate that gradual crustal thickening and weakening of the lower lithosphere promotes pulsed surface uplift events in discrete regions associated with both convective removal of the lower lithosphere and lower crustal flow. These two processes likely work in concert, with convective removal promoting subsequent crustal flow. Lastly, we will examine an early stage of Central Andean Plateau growth and compare it to the modern architecture of other parts of the Andes, where high standing ranges bound low elevation intermontane basins, to speculate on the processes that ultimately build broad high elevation plateaus or limit mountain belt growth to narrow ranges and basins.