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EARTH SCIENCE

SPEAKERS CLUB

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Recycling of Continental Crust Captured in Pamir Xenoliths

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Xenoliths that erupted in the SE Pamir of Tajikistan from 1000–1100°C and 90 km depth are exclusively crustal, providing a means of examining what happens to crust that founders into the mantle. 40Ar/39Ar dating of volcanic minerals indicates an eruption age of 10.0 ± 0.2 Ma. U-Pb + trace-element laser-ablation split stream inductively coupled plasma mass spectrometry of zircon shows that the xenoliths were likely derived from the crustal section into which they were intruded: the igneous xenoliths were derived from the Jurassic–Cretaceous Trans-Himalayan Batholith, and the metasedimentary xenoliths are like the stratigraphic section that hosts the Batholith. Recrystallization of these zircons was extensive, yielding a range of dates down to 10 Ma. The zircons show distinct changes in Eu anomaly, Lu/Gd ratio, and Ti concentrations compatible with garnet growth and minimal heating at 22–20 Ma, and then 200–300°C of heating, ~40 km of burial, and alkali–carbonate melt injection at 14–11 Ma. These dramatic changes are interpreted to coincide with foundering of the Pamir lower crust caused by tectonic thickening and northward rollback of the Asian slab. These xenoliths provide our only known record of the physical and chemical changes during the foundering continental crust.

Late Pleistocene to Holocene environmental history of Devereux Slough

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Environmental histories of coastal regions are important for providing a historic perspective on restoration projects as well as evaluating tsunami and other coastal hazards. The Devereux Slough estuary is a flooded river valley located in Santa Barbara County of Southern California. In this study I analyze six new cores from Devereux Slough that contain sediments spanning the last 16,000 years in order to provide insights into the past environmental conditions of the estuary. Five facies representing four main environments were identified. These facies include an anthropogenic fill, two distinct estuarine muds, a marine sand and a fluvial silt. Radiocarbon ages from a cerithideopsis californica suggest the slough is subsiding at a rate of 0.73mm/yr which is similar to other fault bound estuaries in the region and place constraints on the location of the estuary-bounding fault. No tsunamis are recorded within the stratigraphy of Devereux Slough at the same time as proposed large earthquakes on the nearby Pitas Point Thrust. However a 3.5 ka sand bed indicates a period of marine inundation, the origin of which is uncertain at this time.