

UC SANTA BARBARA
Department of Earth Science

Earth Science Colloquium

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Earth's Continental Crust Through Time

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Among the terrestrial planets in our solar system, Earth is the only one to have continents. These are high-standing regions with an evolved crust, on average 35 km thick, underlain by refractory peridotitic mantle lithosphere. The continental crust provides most of our society's resources and is the platform on which our species evolved. Weathering of the continental crust is a major source of dissolved ions in seawater and, thus, influences atmospheric CO₂ concentrations. Despite its importance, major questions remain regarding its composition, when and how it formed, and how it may have evolved over time. In this talk I will review evidence for the nature of the uppermost continental crust, as sampled by fine-grained terrigenous sedimentary rocks (shales, loess, glacial diamictites). Using concentrations and ratios of relatively insoluble elements in shales and diamictites over Earth history, as well as novel stable isotope data, it can be shown that the upper continental crust had significantly greater proportions of mafic and ultramafic rock types in the Archean, and that a fundamental transformation occurred from ~3 Ga to 2.5 Ga that resulted in an upper crust composition similar to today's. This transformation is most parsimoniously explained by the widespread emplacement of evolved igneous rocks (e.g., granites, *sensu lato*) and may mark the onset of plate tectonics.