UC **SANTA BARBARA**

Department of Earth Science

Speakers Club

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Quaternary Chronology and Uplift of Gaviota Coast Marine Terraces, Southern California

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Marine terraces and changes in mountain topography record important information about active tectonic processes. The Gaviota Coast, located west of Santa Barbara on southern California's transpressional continental margin, provides an ideal natural laboratory for tectonic geomorphology research because marine terraces are preserved for over 60 km and parallel the Santa Ynez Mountains. Although these terraces have been studied and dated to estimate rock uplift rates, absolute dates along the Gaviota Coast are sparse, and there is disagreement between older ~80 ka ages near Point Concepcion (Rockwell et al., 1992) and recently acquired ~48 ka ages at Isla Vista (Gurrola et al., 2014). Establishing an accurate terrace chronology is crucial because ~40 m differences in paleo-sea level between marine isotope stages (MIS) 3 and 5 significantly change uplift rate estimates, which can impact tectonic models and assessments of seismic hazard.

This study aims to constrain the chronology of the first emergent terrace, and define the nature of uplift along the Gaviota Coast: Are uplift rates relatively consistent, or do uplift rates decrease from east to west, mirroring the declining topography of the Santa Ynez Mountains? In this talk I will present a new geochronologic dataset from the first emergent terrace spanning ~55 km between Cojo Bay and Isla Vista. Age control is provided by twelve radiocarbon dates and eight optically stimulated luminescence dates on raised beach sands. We estimate rock uplift rates from these newly acquired dates and discuss them in the context of the regional tectonic framework. We find that the first emergent terrace is MIS 3 in age, and that uplift rates on the western Gaviota Coast are over five times higher than previous estimates. Furthermore, uplift rates drop to the west across South Branch of the Santa Ynez Fault, supporting geomorphic evidence that this fault acts as an active tectonic segment boundary.

Comparative analysis of hydrocarbon-induced terrains

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Areas of natural hydrocarbon seepage are significant for many reasons, for example, they host chemosynthetic biological communities, are sites of methane gas hydrate formation and decomposition, and can be potential geohazards. Seepage of liquid, semi-solid, and gaseous hydrocarbons have been observed to be expressed differently on the seafloor, and are either positively or negatively elevated. Elevated features generally divide into two categories: features that extrude saturated sediment, such as mud volcanoes, and those that do not, such as mud diapirs or mounds. Pockmarks are depressions in the seafloor and can be formed from the expulsion of methane on the seabed; their size is influenced by sediment type and overlying pressure. These features are difficult to study because a majority of our seafloor has yet to be mapped, and they can be too small to be identified from the resolutions produced by shipboard surveying techniques. However, advances in seafloor surveying technologies are expanding the bathymetric database of these features. Multibeam surveys from autonomous underwater vehicles (AUVs) produce ultra high resolution bathymetric maps that allow details to be studied that cannot be identified from the resolutions of shipboard systems. Identifying the geomorphology associated with a given hydrocarbon phase in an area can increase the efficiency that these features can be studied. Here, I compare the geomorphology of hydrocarbon induced terrains in the Santa Barbara and Santa Monica Basins to build a spatial context for how gas hydrates, methane, and oil are expressed in this area.