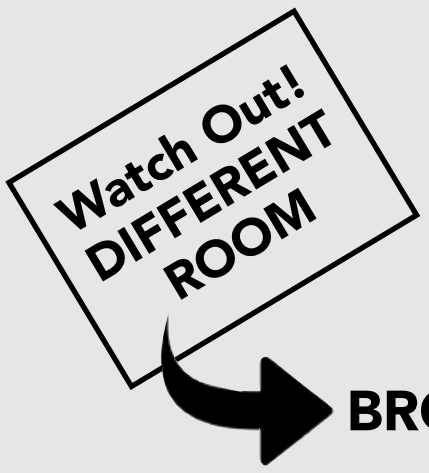

UC **SANTA BARBARA**

Department of Earth Science

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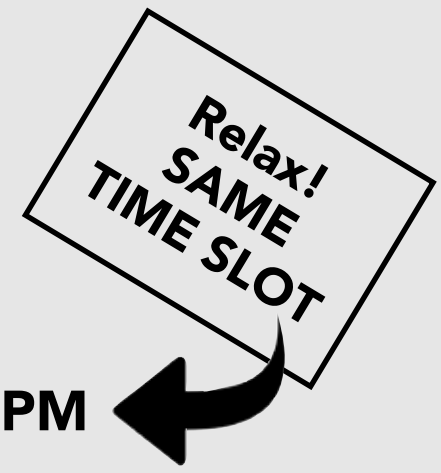

Volcanic Influences on Tropical Climate:
From the Last Millennium to the 21st Century

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Volcanic eruptions are the strongest natural (non-anthropogenic) influence on the climate system. When eruptions are sufficiently strong, sulfate aerosols are lofted into the stratosphere, with resulting reductions in surface shortwave radiation causing cooling of several degrees or more worldwide. A relatively recent example was the 1815 eruption of Mt. Tambora in Indonesia, which led to the 'Year Without A Summer' in Europe as well as perturbations to natural and human systems in many other locations. However, although historical records and paleoclimate reconstructions provide some clues as to the climate impacts of past eruptions, significant uncertainties still remain: the major roadblocks are the sparsity of available climate information, and the lack of constraints on key aspects of eruptions (e.g. size, location, and season of occurrence). Climate models provide important tools for understanding, allowing us to impose simulated volcanic events and examine the dynamical response; I will present results from the Community Earth System Model (CESM), covering both the last millennium and the 20th/21st centuries. Eruption latitude is shown to play a key role in the subsequent response of the tropical Pacific, with El Nino initiation being favored after both tropical and high-latitude Northern Hemisphere eruptions but with differences in temporal evolution. The same is true for the patterns of hydroclimate change after an eruption, which bear a strong resemblance to El Nino 'teleconnections' but for dynamically distinct reasons. The month in which the eruption occurs is also of key importance, particularly within the first 12 months after the event. Finally, the implications of climate change for risks associated with volcanic events are assessed with CESM: in the future, we can expect more extreme climate impacts from 'Tambora-like' eruptions, due to changes in the stratification of the equatorial Pacific.