UC **SANTA BARBARA**
Department of Earth Science

Earth Science Colloquium

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Deep-time (U-Th)/He thermochronology, the missing sedimentary record, and the Great Unconformity

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Advances in (U-Th)/He thermochronology now allow us to decipher continuous thermal histories over billion-year intervals and push our understanding of surface histories deeper into the geologic past. We can use this information to better understand the coupling of deep Earth and surface processes and their potential links with environmental and biological change. Here I'll describe several of our "deep-time" (U-Th)/He thermochronology studies in this realm. First, I'll summarize our work to decipher the thickness, spatial extent, and evolution of Phanerozoic sedimentary sections now missing from the stratigraphic record of the North American continental interior. These data indicate substantial continental burial during Pangea supercontinent assembly and reveal an intriguing relationship between cratonic burial phases and gaps in the kimberlite magmatic record. Next, I'll present data from the Kaapvaal craton of southern Africa that record a substantial Mesoproterozoic burial phase during Rodinia supercontinent assembly for which the sedimentary evidence has since been removed. I'll conclude by outlining our new studies to decipher the timing, magnitude, and spatial heterogeneity of erosion that lead to the development of the Great Unconformity (GU). This iconic geologic feature separates Precambrian basement from Phanerozoic sedimentary rocks and has been associated with a variety of changes in the Earth System including the Neoproterozoic Snowball Earth, oxygenation of the ocean and atmosphere, and the Cambrian Explosion. New data from the Pikes Peak batholith of the Colorado Front Range provide evidence that most erosion below the GU occurred here prior to the late Neoproterozoic Snowball Earth events, inconsistent with recent proposal that the GU represents a single, immense, global exhumation pulse during the Snowball glaciations. Ongoing work on the GU in the Grand Canyon and other localities is underway to better constrain the age, duration, and spatial extent of GU formative events and develop a more global understanding of its significance.