Title: What aerosols can tell us about the past and future of the climate system

Abstract:
Aerosol particles like dust, sea salt, sulfates, and soot are small but mighty players in climate variability and change. Their human sources have acted as the main climate offset to greenhouse gases over the industrial era. Their natural sources have both signaled and potentially driven important shifts in the paleoclimate record. Because their atmospheric distribution and radiative effects are regionally confined, aerosols also have fundamental lessons to teach us about how the atmosphere, land, and ocean process spatially inhomogeneous climate forcing. In this talk, I will outline what we have learned via global climate model simulations, atmospheric theory, and observational datasets about how aerosol particles impact regional and global climate. I will share new work unraveling differences in how major modern-day anthropogenic source regions contribute to both the magnitude and spatial distribution of aerosols’ climate effects and associated societal impacts. Lastly, we will explore how the insights built through this work could open up novel avenues for our understanding of topics ranging from abrupt Holocene warming events in the paleoclimate record, to land-atmosphere interactions in the world’s agricultural breadbaskets, to how future climate shifts will impact regional groundwater hydrology and water resources.