Competing droughts affect dust delivery to the Sierra Nevada

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Dust production, transport and deposition are preserved in both paleoclimate and modern records, with transport and availability closely linked to environmental conditions at the source area and atmospheric circulation regimes. In nutrient-limited deposition areas, dust can be an important source of critical nutrients (such as P, Fe, and Si) and enhance primary productivity [1, 2], important factors in ecosystem development and landscape evolution. Documenting the dust cycle response to different climate scenarios is important to accurately predict the biogeochemical response to an increasing dust flux.

Previous research investigated provenance and nutrient content of dust delivered to an altitudinal transect of the Sierra Nevada, California mountains during a catastrophic drought year (2014), and found that contributions from the Central Valley grew significantly throughout the sampling interval [1]. This geochemical evidence suggested that a significant portion of dust and nutrients contributed to mid-elevation sites was attributable to an extreme regional drought. To probe the sensitivity of the dust cycle to regional and global droughts, we conducted a dust sampling along the same altitudinal transect in 2015, a period of decreasing drought in California and increasing drought in Asia.

We observe a correlation between radiogenic isotope composition and elevation, highlighting the stronger influence of local dust sources at lower elevations and the connection between regional climate and dust generation. We also find a progressively increasing input from Asian dust over the summer, coinciding with a catastrophic drought across Southeast Asia and Mongolia. Our results reflect regional and global variations in the dust cycle, both having implications for predicting future dust inputs to nutrient depleted areas under climate change and associated heightened drought intensity.

[1] Aciego et al. (2017) *Nat. Comm.* 8(14800).

[2] Arvin et al. (2017) *Sci. Adv.* 3(12), eaao1588.