

Impacts of Increasing Aridity and Wildfires on Aerosol Loading in the Intermountain Western U.S.

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Feedbacks between climate warming, land surface aridity, and wildfire derived aerosols represent a large source of uncertainty in future climate predictions. Here, long-term observations of aerosol optical depth (AOD), surface level aerosol loading, fire-area burned, and hydrologic simulations are used to show that regional scale increases in aridity and resulting wildfires have significantly increased summertime aerosol loading in remote high-elevation regions of the Intermountain West of the U.S. Surface summertime organic aerosol loading and total AOD were both strongly correlated ($p < 0.05$) with aridity and fire area burned at high-elevation sites across major western U.S. mountain ranges. These results demonstrate that surface level organic aerosol loading is dominated by summertime wildfires at many high-elevation sites. This analysis provides new constraints for climate projections on the influence of drought and resulting wildfires on aerosol loading. These empirical observations will help better constrain projected increases in organic aerosol loading with increased fire activity under climate change.

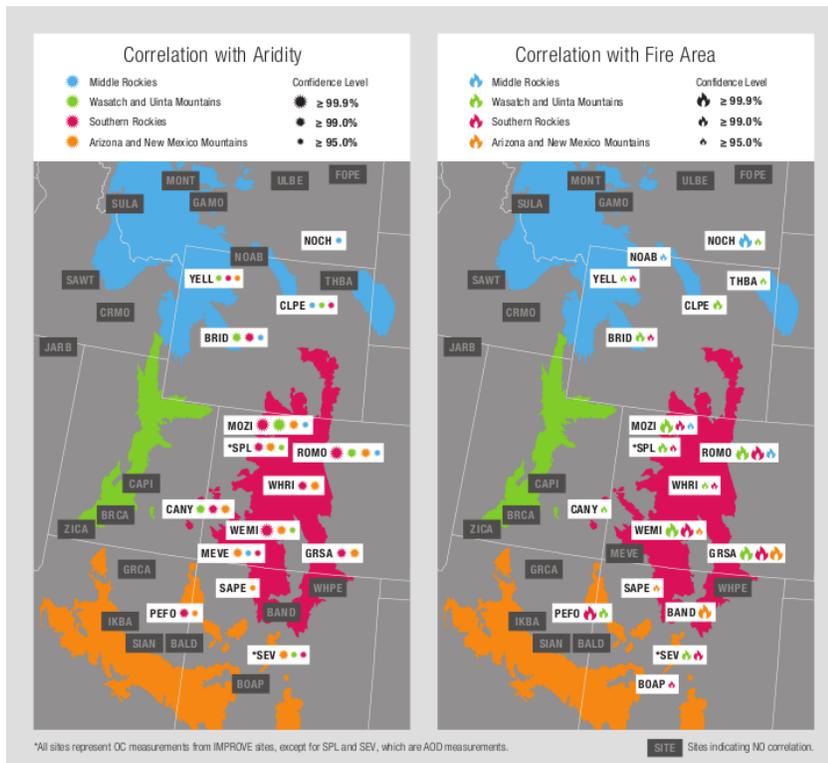


Figure 1. The correlation between summertime annual organic aerosol loading (OC) or AOD across the Intermountain West and (a) annual summertime aridity (b) total fire area burned across the Intermountain West. White boxes denote sites where a significant correlation [$p < 0.05$] was observed. The color indicates the specific mountain range. Dark grey boxes represent sites where no correlation was observed.