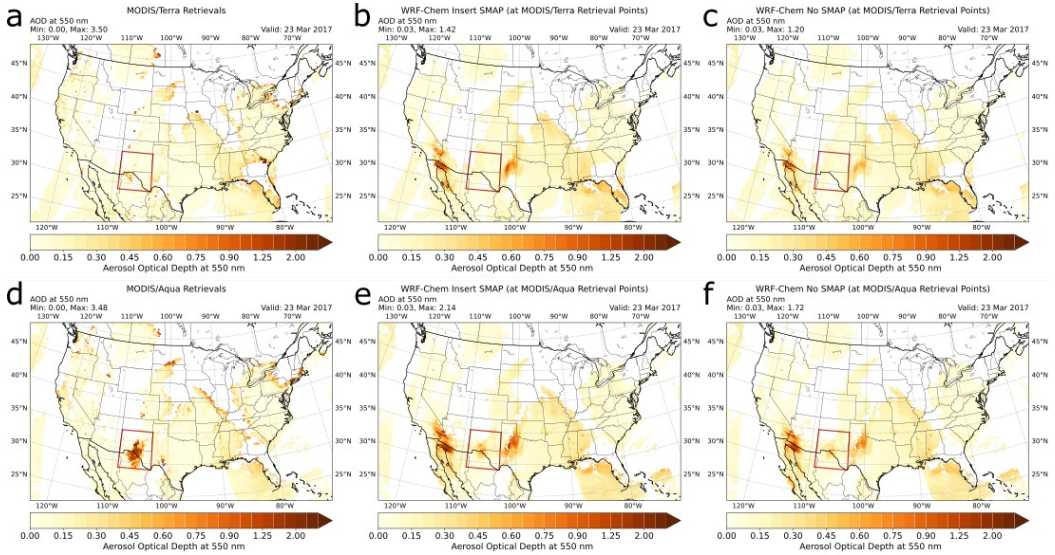
# Impact of direct insertion of SMAP soil moisture retrievals in WRF-Chem for dust storm events in the western U.S.

**Problem:** Our goal in this study was to advance our understanding of the role of soil moisture (SM) on dust emissions. To do this, we used a numerical weather prediction (NWP) model (WRF-Chem) to simulate eight dust storm events from 2015–2021, and quantified the changes in the model caused by constraining the model-predicted SM content with SMAP retrievals.




**Finding:** Correcting WRF-Chem SM with SMAP retrievals generally led to more dust in the model, as WRF-Chem soils are typically too wet in the southwestern U.S. compared to obs. However, errors in the dust emission scheme and/or dust erodibility dataset in WRF-Chem contribute more to errors in dust concentration and aerosol optical depth (AOD) than does SM.

*Matched-pair instantaneous $AOD_{550}$ MODIS retrievals and WRF-Chem predictions from 23 Mar 2017, a dust event day. (a,d) MODIS/Terra and MODIS/Aqua retrievals; (b,e) WRF-Chem Insert SMAP; (c,f) WRF-Chem No SMAP.*

**Impact:** Other larger sources of model error (e.g., dust emission scheme, erodibility dataset) must be dealt with first before the full value of SMAP retrievals can be leveraged for improving dust storm prediction in WRF-Chem.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