

Aerosol Optical Depth in the Atacama Desert: ground-based measurements versus satellite-derived estimates

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The Atmospheric Chemistry and Climate Model Intercomparison Project (ACCMIP) examined the short-lived drivers of climate change in the Coupled Model Intercomparison Project Phase 5 (CMIP5) climate models. While model-based estimates of the aerosol optical depth (AOD) are roughly in good agreement with observations, they tend to underestimate AOD in many regions such as in South America. More definitive constraints require additional ground-based observations and validated satellite-derived data. Validation of satellite-derived estimates of the optical properties of aerosols over the Andean region is also needed.

In this context, ground-based measurements of AOD conducted by using AERONET and SKYNET-affiliated instruments at several location in the Atacama Desert (Arica, Chajnantor, Paranal, and Crucero), have been used for testing AOD estimates retrieved from the Moderate Resolution Imaging Spectroradiometer (MODIS) (aboard the Aqua satellite), the Multi-angle Imaging SpectroRadiometer (MISR) (aboard the Terra satellite), and the Ozone Measurement Instrument (OMI) (aboard the Aura satellite).

Our preliminary analysis shows the MISR estimates closer to the ground-based measurements than other satellite products (that deviates from photometers especially in austral winter). Our findings reinforce previous results that have shown poor correlations when comparing MODIS-derived estimates of AOD with AERONET measurements. Inconsistencies between ground-based and satellite data may be linked with the surface reflectance of the area and the influence of the complicated topography; additional long-term ground-based observations are needed to confirm this hypothesis. The inconsistencies underscore the need for ground-based measurements for validating satellite-derived products and for more definitive model constraints.