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Aerosol Characterization in the Sonoran Desert of Arizona

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Aerosol effects on atmospheric radiative transfer and on cloud microphysics still present one of the biggest uncertainties in understanding global climate. In this study, the first results of aerosol characterization at two different sites – urban and high altitude - in the Sonoran desert of Southern Arizona will be presented. Measurements from a third site dominated by an active mining and smelting operation will be shown as well. The urban site located within the city of Tucson serves to characterize anthropogenically influenced boundary layer aerosol. The high altitude site on Mt. Lemmon (2790 m a.s.l.) is exposed to two different regimes: in summer the planetary boundary layer is deep and convection transports urban air from Tucson up to Mt. Lemmon. In winter, the boundary layer is below the summit, making the site a free troposphere location. Data collected at times when the boundary layer is shallow therefore most often represent free tropospheric aerosol and provide insight into the vertical distribution of the atmospheric aerosol. The characterization includes continuous size distribution measurements (SMPS), size resolved chemical characterization (MOUDI) and measurement of aerosol precursor gases. For the urban site, comparison of calculated extinction coefficients with solar radiation measurements show the variation of normal and diffuse solar radiation due to varying aerosol loadings.