An Aerosol Optical Depth Climatology for the SURFRAD Network

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Over the past four years, an aerosol optical depth (AOD) algorithm has been developed for the SURFRAD network. Each SURFRAD station has a visible Multi-Filter Rotating Shadowband Radiometer (MFRSR) that monitors six narrowband channels. A unique automated calibration method has been developed that cross references absolutely clear periods from the SURFRAD clear-sky product with MFRSR data to isolate data suitable for calibration Langley plots. Mean Langley calibrations for each channel that represent one or two-month periods are plotted in time series and fit to periodic functions. Those fits are used to interpolate daily channel calibrations for aerosol optical depth calculations. AOD can only be computed for times when the MFRSR has a clear view of the sun, therefore, cloudy periods need to be screened out. A hybrid cloud screen method that combines a stability-based algorithm using the 500-nm channel and the method of Alexandrov et al. (2004) has been successfully implemented. 500-nm AOD stability works well, except that on occasion thin cirrus will erroneously pass. The Alexandrov method, which uses a channel that is highly sensitive to clouds (870 nm), is then applied to screen out the cirrus cases. The result is a robust 10-year AOD record that will aid in the application of SURFRAD data to model and satellite validation. The long-term time series of daily-mean 500-nm AOD for Fort Peck, Montana is shown below. The poster will show these results for all stations, as well as aerosol trend analyses, and inferences on particle size as a function of season.

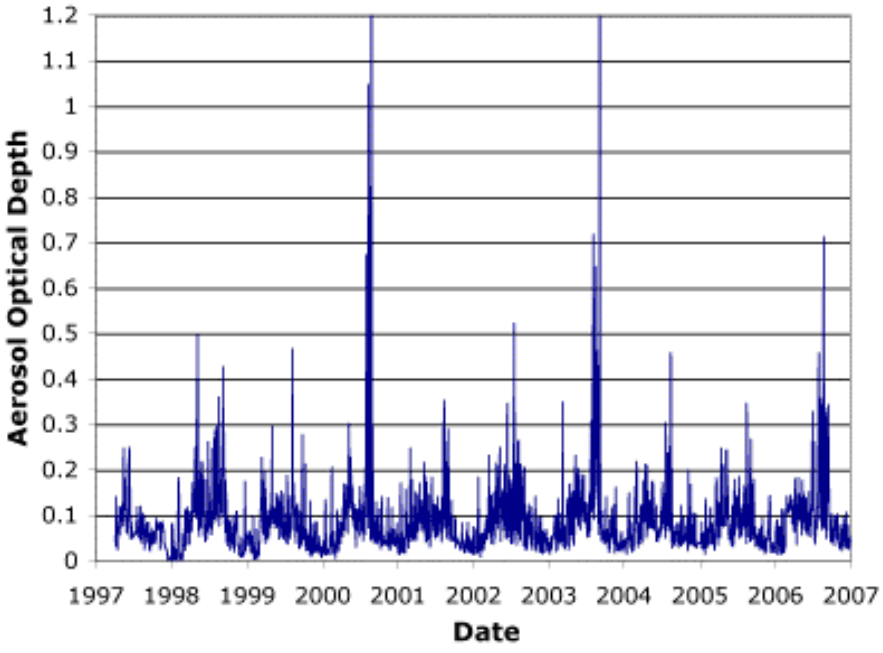

Figure 1. Time series of 500-nm aerosol optical depth for Fort Peck, Montana. The large spikes in the summers of 2000, 2003 and 2006 are anomalies caused by persistent forest fires during those years.