Chapter 4 : Measuring Airborne Particulates

Measuring Airborne Particulates

Monitoring airborne particulates has been the primary approach to collecting data on spatial and temporal patterns of wind erosion for decades.[39] Monitoring in the US is coordinated through meteorological observation networks and aerosol measurement networks. Indicators of airborne particulates used by these networks include: dust event frequencies obtained from visual observations made by the National Weather Service; atmospheric particulate matter (PM) concentrations measured using high volume air samplers, lidar, and light-scattering laser photometers (e.g., Hand et al.[40]); and aerosol optical depth (AOD) obtained from ground-based sun photometers and satellite observations (e.g., Holben et al.;[41] Prospero et al.;[42] Ginoux et al.[43]). Each of these indicators provides different information about airborne particulates. Dust event frequency data by event type (e.g., locally blowing dust, dust storm, dust haze) can be used to understand the timing of wind erosion and dust emission around an observation site and regional dust event patterns and trends. Atmospheric PM concentrations and AOD provide additional information on how much airborne particulates are at a sampling location or through the vertical column of atmosphere over an observation location or area. PM concentrations and AOD directly inform air quality, human health and climate impacts of blowing dust. Spatial patterns and temporal trends of PM and AOD have been used to interpret the very general location of dust sources, and dust emission responses to climate variability, but do not inform which landscapes are eroding and why with enough accuracy to inform land management. Site-specific information about soils and vegetation are needed to identify why particular landscapes are eroding and when they are most susceptible.

Nationally, airborne particulates are monitored by federal, state and county networks, with data accessible online through the US Environmental Protection Agency (EPA) Interactive Map of Air Quality Monitors.[44] This tool provides access to concentration data for PM_{10} and $PM_{2.5}$ in addition to other aerosols and enables users to identify mapped non-attainment areas and Federal Class 1 Areas. Interagency Monitoring of Protected Visual Environments (IMPROVE) Program data that include PM and haze composition can be accessed through the EPA or dedicated IMPROVE Program data portal.[45] The National Wind Erosion Research Network[31] is actively incorporating PM_{10}, PM_4, $PM_{2.5}$ and PM_1 concentration monitoring at sites, including measurements at two levels (2 m and 4 m above ground level) to enable estimates of vertical dust flux across agroecosystems and support calibration of predictive models.