Trends in remote and rural speciated particulate concentrations from the IMPROVE network (1989-2011)

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The Interagency Monitoring of Protected Visual Environments (IMPROVE) network has monitored speciated aerosol concentrations at remote and rural sites across the United States since 1988. One of the main objectives of the program is to document trends for assessing progress towards national visibility goals in national parks and visibility-protected federal class I areas. To meet this objective, daily samples (24-hr) are collected every third day and analyses are performed to determine concentrations of particulate anions (e.g., sulfate, nitrate), organic and light absorbing carbon, elemental concentrations, and $PM_{2.5}$ and PM_{10} gravimetric mass. To evaluate changes in these species over the past two decades, trends were computed at approximately 50 long-term (1989-2011) and 150 short-term (2000-2011) sites. In particular, we focused on monthly, seasonal, and annual mean trends for sulfate ion, nitrate ion, and mineral dust concentrations. Results of statistically significant short- and long-term trends suggest that concentrations of most species have decreased across the country, although concentrations of some species have actually increased during specific seasons. For example, since 2000 sulfate concentrations have increased at many sites in the West in spring, and both sulfate and nitrate concentrations have increased at sites in the central and northern Great Plains in winter. Mineral dust has increased across the west in spring and the Midwest in fall. Trends in EPA's National Emission Inventory SO_2 and NO_x emissions suggest that for sulfate and nitrate, influences other than regulated emissions appear to be influencing rural concentrations in the West, which has implications for the effectiveness of current emission mitigation strategies in meeting goals for improving air quality, especially in the West.

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