

Aerosol major ion record at Mount Washington

E. V. Fischer, L. D. Ziemba, R. W. Talbot, J. E. Dibb, R. J. Griffin, L. Husain, and A. N. Grant

Abstract

This study examined the seasonal cycles and regional-scale meteorological controls on the chemical properties of bulk aerosols collected from 1999 to 2004 at Mount Washington, the highest peak in the northeastern United States. The concentrations of NH_4^+ and SO_4^{2-} peaked during summer months. The pattern for aerosol NO_3^- was more complicated with relatively high median concentrations characterizing spring and summer months, but with major elevated events occurring during fall, winter, and spring. The seasonal relationship between NH_4^+ and SO_4^{2-} indicated that during warmer months a mixture of $(\text{NH}_4)_2\text{SO}_4$ and NH_4HSO_4 was present, while it was mainly the latter in winter. More acidity and higher concentrations of the major species were generally associated with winds from the southwest and west sectors. The highest (≥ 95 th percentile) concentrations of SO_4^{2-} and NH_4^+ were associated with air mass transport from major upwind source regions in the Midwest and along the eastern seaboard. The ionic composition and seasonal cycle observed at Mount Washington were similar to those measured at other northeastern sites, but the range and average concentrations were much lower. These differences were exaggerated during wintertime. Included in this paper are several Eulerian case studies of SO_2 conversion to SO_4^{2-} during transit from Whiteface Mountain, New York, to Mount Washington. The calculations suggest a gas-phase SO_2 oxidation rate of $\sim 1\text{--}2\%$ per hour and demonstrate the possibility of using these two sites to investigate the chemical evolution of air masses as they move from Midwestern source regions to northern New England.