East vs. West in the US: Chemical Characteristics of $PM_{2.5}$ during the Winter of 1999.

Abstract.

The chemical composition of $PM_{2.5}$ was investigated at four sites (Rubidoux, CA, Phoenix, AZ, Philadelphia, PA, and RTP, NC) in January and February of 1999. Three samplers were used to determine both the overall mass and the chemical composition of the aerosol. Teflon filters were weighed for total mass. Ions were analyzed using ion chromatography. Elements were determined using X-Ray fluorescence. Organic and elemental carbon were measured using a thermo-optical method. At all of the sites, reconstructed mass was observed to be greater than or equal to the measured mass. Good ionic balance was found for ammonium, nitrate and sulfate at each of the sites. Overall, the chemical composition of the aerosol for each site was in good agreement with the expected composition based upon previous studies, with the exception of relatively high nitrate contribution to the total mass at Philadelphia. Good agreement was found between the predicted amount of sulfate by XRF analysis of sulfur and the sulfate measured by ion chromatography. As expected, sulfate was a more important contributor to the total mass at the East Coast sites. Nitrate contributed more to the total mass at the west coast sites and was an important factor in the highest observed mass concentration at Rubidoux,. Teflon filters appear to lose nitrate to a greater extent than heat-treated quartz fiber filters. Organic carbon was also found to be the largest part of the aerosol mass on minimum days for all sites and a significant portion of the mass on other days with 25-50% of the total mass at all of the sites. At three of the sites, OC collected on denuded filters was less than that found on non-denuded samples, indicating an absorptive artifact on the quartz fiber filters. It was also found that the crustal component to $PM_{2.5}$ was highest at Phoenix. $PM_{2.5}$ was also found to contribute significantly to the PM_{10} particle mass at all the sites.