

PRECIPITATION AS A CHEMICAL AND METEOROLOGICAL PHENOMENON

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ABSTRACT

Sequential rain and snow sampling has been performed at Burlington and Concord, Massachusetts. The samples have been collected during 1974 and 1975 in one-quarter inch and one inch rain equivalents and chemical analysis performed on the aliquotes. Meteorological data was documented at the time of collection.

The time variations of pH, conductivity, acidity, chloride, and sulfate have been measured for several storms. A chemical procedure for sampling and analyzing SO_2 dissolved in rain and snow has been developed. The method utilizes a swinging door rain collector, a chemical complexing solution, and a modified West-Gaeke SO_2 analysis procedure.

The analytical methodology utilizes a pararosaniline dye to measure the SO_2 colorimetrically and a complexing solution of sodium tetrachloromercurate to collect and preserve the rain samples. The sensitivity of the technique is 0.3 ppm. Data is presented for several storms in which both SO_2 and SO_4^{2-} results have been tabulated. The amount of sulfate ion present at the time of collection is 5 - 10 ppm whereas, the SO_2 concentrations measured in the same rain are generally less than 1 ppm.

The concentrations of ionic species in snow are significantly less than in rain. An explanation of this phenomenon is offered relative to precipitation formation theory, washout phenomenon, and chemical reaction rates.