Atmospheric Science

Chemistry and Deposition of Acidifying Substances by Marine Advection Fog in Atlantic Canada.

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Coastal ocean surface temperatures generally remain at or below 10OC throughout the year which cools warm, moist air masses which transit the region leading to the formation of marine fog. At Cape Forchu (Nova Scotia) and Cape Race (Newfoundland), fog is reported over 2029 and 2126 hr/yr., respectively. Fog frequency in the region is well documented but less is known about fog chemistry or deposition. Acidification of ecosystems in this region is an environmental concern and to assess the role of acid deposition via fog, passive collectors were installed at these two coastal sites to collect samples for analysis of major ionic constituents. Median pH of fog at Cape Forchu and Cape Race in 1992-93 was 3.86 (n=51) and 3.71 (n=74), respectively (5-6 times lower than measured in precipitation). Nitrate, total SO4 and xSO4 concentrations in fog were also greater than those measured in precipitation. A turbulence model was used to estimate fog deposition to two surface types. Modeled fog deposition to grassy surfaces was typically less than to forests primarily due to differences in wind speed and surface roughness characteristics. Fog deposition to grass surfaces amounted to an average of 26 mm/yr. compared to 240 mm/yr. to forested areas (approximately 1.6% and 16% of total annual precipitation, respectively). Hydrogen ion, total SO4, xSO4 and NO3 deposition via fog water to a grass surfaces was estimated to be 9%, 41%, 19% and 11% of that contributed by precipitation, respectively. The same ion deposition to forests was estimated to be 79%, 394%, 176% and 101% of that via precipitation. Thus, although fog contributes smaller amounts of moisture to coastal ecosystems that precipitation, substantially larger

proportions of hydrogen ion and acid anions can be deposited.

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