

Source tracing of atmospheric sulphur: Newfoundland perspective

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Sulphur in the atmosphere is derived from both natural and anthropogenic sources. A proper assessment of the relative importance of these sources in any area requires the ability to differentiate between them. Stable sulphur isotopic signatures can achieve this differentiation. Newfoundland lies directly in the path of prevailing air mass movement transporting pollutant sulphur eastward from the large emission sources on the eastern North American mainland. The overall objective of this work was to measure the sulphur isotopic composition of the atmosphere across the island of Newfoundland in order to assess the degree to which the island is being affected by long-range transport of anthropogenic sulphur from eastern North America, and/or

local pollution sources. A contour map based on the analysis of over 100 samples of epiphytic lichen and precipitation shows a gradient of sulphur isotopic composition, with values decreasing from the coast to the interior of the island. It also shows regions of low isotopic composition, typical of anthropogenic emissions, corresponding to the city of St. John's, the Come-By-Chance oil refinery, mining areas, and fossil fuel powered pulp and paper mills in central and western Newfoundland. The study strongly suggests that the isotopic composition of sulphur in the Newfoundland atmosphere is influenced more by the ocean (sea salt sulphate) and local anthropogenic activities in the province, than by long-range transport of continental North American sulphur.