

Davies (1976), found that the precipitation scavenging of SO_2 in a 12 km^2 area around the industrial city of Sheffield, U.K., was quite small in that only 0.3% of the emitted SO_2 was removed during precipitation. However, sulfate in the precipitation was not measured and may have accounted for a much greater fraction of emitted sulfur being deposited in the industrial area.

Högström (1979), examined in a theoretical manner the dry deposition of sulfur in the first few kilometers downwind of an urban source, before complete mixing in the vertical had been established. He came to the conclusion that, because of the much more rapid rate of vertical dispersion over the relatively rough surface of a large city compared to that in a rural area, the proportion of sulfur dioxide deposited locally should be larger for a small city than for a large one. From measurements of SO_2 at Vert-le-Petit, 37 km south of Paris, he concludes that only a small fraction (5 to 10%) of SO_2 emitted in Paris was deposited during the first few kilometers of travel. It should be stressed, however, that Högström's study dealt with dry, and not wet, deposition.

Benarie (1976) used measured concentrations of SO_2 and sulfate, also at Vert-le-Petit, to estimate that 50% of the sulfur emitted in Paris is deposited within a 37 km circle surrounding the city. The difference between this estimate and that of Högström (1979) has sparked an ongoing debate in the literature. Benarie's analysis assumed vertical and cross-wind uniformity of SO_2 and sulfate concentrations in the plume, and that the size of and concentrations in the Paris plume as it passed over Vert-le-Petit were representative of all wind directions. In addition, the budget calculations are highly dependent upon the value assumed for the deposition velocity. Nevertheless, the approach has possibilities and should be extended with monitoring stations in all directions from a major urban or industrial source.

Other studies also seem to indicate that local emissions may be important. Many of these studies have taken place at the same locations where some of the above-mentioned studies have indicated a small local effect. For example, in a 400 km^2 area around Uppsala, Sweden, Andersson (1969) examined the deposition by rain of S, H^+ , Ca, Na, K, and Cl from July to October 1962,