Högström (1979) found that dry deposition would deposit only about 5 to 10% of the sulfur emitted by a city within a 70 km travel distance, for deposition velocities in the reasonable range of 0.8 to 1.6 cm s^{-1}. In agreement also with Bolin et al. (1974), he found that increasing city size (increasing roughness) led to a decrease in local deposition (or an increase in residence time) because the increased mechanical turbulence would lead to greater vertical dilution, decreased concentrations near the surface and, therefore, slower dry deposition.

Removal by precipitation has the same effect as a large increase in deposition velocity or removal rate (McMahon and Denison, 1979). The probability of emitted sulfur being deposited by wet processes within a few hours' travel of the source will depend upon the probability of the sulfur being irreversibly absorbed into cloud and/or rainwater and the probability of precipitation occurring during the initial travel. Rodhe and Grandell (1972) estimate, by taking into account the mean length of wet and dry periods, that the lower limit of the average turn-over time of sulfur in Europe is of the order of 50 hours.

Högström (1978) used a simple model and observations of sulfur in air and precipitation to estimate the wet fallout parameter $\underline{k}$ in Sweden, i.e., the fraction of pollutant removed per unit time by precipitation. Interestingly, $\underline{k}$ varied geographically. Over much of southern Sweden, it had a value of 1 to 2 x 10^{-4} s^{-1} (corresponding to 2/3 fallout within 50 to 100 km from the source) but, along a strip 100 km wide along the west coast, $\underline{k}$ had a value of approximately 2 x 10^{-5} s^{-1} (corresponding to 2/3 fallout within 500 to 1,000 km). His estimates were in good agreement with the observational studies of Högström (1974), Enger (1977) and Granat and Söderlund (1975). In his opinion, inaccuracies in air quality and precipitation chemistry data, emission esimates, or meteorological data could not account for the geographical variation in the estimates of $\underline{k}$. Högström (1974) alludes to the possibility that the chemical composition of the air is the cause of the geographical variation; the chemical makeup of cloud and rainwater will have a pronounced influence on the rate of oxidation of sulfur dioxide.