It would appear from the above discussion, therefore, that local effects from area sources (and possibly point sources) may vary a great deal geographically and temporally in that they may be quite episodic. The study of Shaw (1982), indicates that, during a one-year period, about 10% of sulfur emissions from Halifax were deposited within a 25 km radius of the city. During individual storms, the deposition within 25 km was of the same order as the emissions. Similarly, Hales and Dana (1979), observed that, during summer convective storms, the deposition of $SO_4^=$ and NO_3 to the observational network in the vicinity of St. Louis was comparable in magnitude to the emissions of SO_x and NO_x from that urban source. It appeared that the pollutants in the urban plume were very efficiently removed. Hales and Dana suggest that this may have been due to aqueous phase oxidation of SO_2 to $SO_4^=$ by oxidants such as ozone and hydrogen peroxide, with assistance from catalytic metals that may be found in the urban plume. Penkett et al. (1979), concluded that O_3 and H_2O_2 were potentially the most important aqueous phase oxidants for SO_2 and that, in the absence of catalysts, oxidation by H_2O_2 would dominate over that by O_3 for droplet pH values of less than 5. Conversion of SO_2 to sulfate in cloud water would, in contrast to the dissolution of SO_2 alone, amount to an irreversible removal of SO_2. Similarly, rapid conversion of NO and NO_2 to NO_3^- may be due at least partly to photochemical oxidants in the urban plume.

It is possible that alkaline pollutants may offset the acidification taking place in cloud and raindrops. Kemmerer and Jackson (1973), observed alkaline rain in the immediate vicinity of Syracuse, New York, and concluded that calcium oxide and other neutralizing particulates from industrial and incinerator emissions were causing the pH to be higher near the city than at the rural sampling sites.

As far as oxidation of sulfur dioxide in urban plumes is concerned (in the absence of precipitation), Alkezweeny (1980) has given a good summary of most of the available data. These data suggest that oxidation rates in urban plumes are somewhat higher than those in chimney plumes, possibly by a factor of two or more (values greater than 10% h^{-1} have been reported by several workers), and that heterogeneous mechanisms may play a greater role in urban than in chimney plumes. Little data is available on nitrogen oxides