# DRY DEPOSITION OF ACID SUBSTANCES

Recent workshops and committee deliberations have agreed that it is not possible to monitor the dry deposition of acidic atmospheric materials directly. Several factors combine to cause this problem. Flat plate collectors, buckets, and other similar devices fail to collect small particles in a manner that can be related in a direct fashion to natural circumstances. Moreover, these artificial collecting devices give no indication of the rate of gaseous deposition, especially of species such as $SO_2$ and vapor phase $HNO_3$ that are likely to contribute significantly to the net acidic flux. However, it is possible to measure the flux of some airborne quantities by micrometeorological means (e.g., Droppo, 1980; Shepherd, 1974; Fowler, 1978; Wesely et al. 1977), without interfering with the natural processes involved. These studies, and laboratory and wind tunnel investigations (Chamberlain, 1967; Hill, 1971; etc.), provide convincing evidence that the controlling properties in the deposition of many gaseous pollutants are associated with surface structure, rather than with atmospheric properties. Exceptions to this generalization are the nocturnal case and the winter-time case in which atmospheric stability may often be sufficient to impose a severe restriction on the rate of delivery of all airborne quantities to the surface below.

Recent field studies investigating the fluxes of small particles have also confirmed wind tunnel results which point to a surface limitation. Studies of the rate of deposition of particles to the internal walls of pipes (e.g., Friedlander and Johnstone, 1957) and investigations of fluxes to surfaces more characteristic of nature, exposed in wind tunnels, tend to confirm theoretical expectations that surface uptake is controlled by the ability of particles to penetrate a quasi-laminar layer adjacent to the surface in question. The mechanisms that limit the rate of transfer of particles involve their finite mass. Particles fail to respond to the high frequency turbulent fluctuations that cause transfer to take place in the immediate vicinity of a surface. However, the inertia of particles also causes an inertial deposition phenomenon that serves to enhance the rate of deposition of particles in the 10 to 20 μm size range (q.v. Slinn, 1976).

The general features of the question of particle deposition to smooth surfaces are fairly well understood. All studies conducted so far