

in the level of research devoted to the atmospheric nitrogen compounds. Nevertheless, at present, relatively little has been published on deposition and chemical transformation rates of nitrogen oxides. Most information we are aware of is summarized in the present chapter.

Since many of the general physical and chemical considerations regarding deposition and transformation (outlined in Sections 2.1.1, 2.2.1, and 3.1) also apply to nitrogen oxides, some speculation is possible in the absence of field data regarding their transformation and deposition rates and the seasonal dependence of these rates, but this has been kept to a minimum in the discussion below. The situation is somewhat more complicated than for the sulfur oxides, because the behavior of more species must be considered. Thus, although anthropogenic emissions are primarily in the form of nitric oxide (NO), this compound is converted relatively rapidly to nitrogen dioxide (NO₂), nitric acid (HNO₃) and particulate nitrates, and peroxyacetyl nitrate (PAN) (see Spicer, 1979; Spicer et al., 1980). The chemical reactions and atmospheric deposition of each of these species will be considered separately below.

Nitric oxide has a very low solubility in water (Sherwood and Pigford, 1952). Since the rate of wet deposition, especially under the "equilibrium scavenging" conditions of relevance to long-range transport (Hales, 1978), is directly dependent on the solubility of the gas under consideration, the wet scavenging coefficient of NO is also expected to be low. As far as dry deposition is concerned, a number of investigators, working with different types of surfaces (see Table 7), have found the deposition velocity of NO to be very small--about one-tenth that for SO₂ over the same surface. Moreover, NO is oxidized to products fairly rapidly (in the order of a few hours) in the summertime, so the short lifetime and low wet and dry scavenging rates of this gas suggest that its contribution to deposition is small. Under wintertime conditions, at latitudes where photochemical reactions are of relatively little importance (see Section 3.1), the atmospheric lifetime of NO could be increased considerably, and the amount deposited by wet and dry removal processes could become important. However, no information is available on scavenging coefficients and deposition velocities of NO under these conditions, especially to snow surfaces.