

PRECIPITATION SCAVENGING PROCESSES

The complex process of precipitation scavenging can be subdivided into a number of distinct steps, which occur interactively within a composite storm system. These are itemized as follows:

- o intermixing of pollutant and condensed water within the same airspace,
- o attachment of pollutant to the condensed water elements,
- o chemical reaction of pollutant within the aqueous phase, and
- o delivery of pollutant-laden water elements to the surface via the precipitation process.

Each of these steps can be associated with a corresponding processing time that is dependent upon the pollutant, synoptic circumstances, and storm type. In the most simple sense the scavenging process occurs as a forward progression through these steps; reverse processes are common, however, and a pollution element may experience several cycles through segments of this process before its ultimate wet deposition to the earth's surface.

Circumstances often exist wherein one or more of the above steps occur considerably more slowly than the rest. Under such conditions these steps dominate the processing time of the scavenging phenomenon; these are known as rate-limiting steps. Individual processing times, as noted previously, are strongly dependent upon pollutant type and meteorological conditions; these are discussed sequentially in the following paragraphs.

Pollutant-condensed-water intermixing, the process that introduces pollutant to the immediate vicinity of cloud and precipitation systems, can involve considerable time lags between a pollutant's emission and its subsequent processing by the storm. Usually it is not cloudy or raining in the vicinity of a pollutant's release point, and often several days may occur before a storm is encountered. During this period the pollutant may become involved in a variety of processes (e.g., dry deposition, chemical reaction) that may alter its concentration and physical state, and consequently alter