In the case of dry deposition the complete pathway is simulated (that is, atmosphere plus near-surface layer plus surface). Micrometeorological theory and measurements have provided a sound basis for the parameterization of atmospheric transfer commonly used in models. Experimentation has provided confidence in this approach for gases, but difficulties remain in the case of particle deposition. One of the major unknowns for both particle and gas deposition is the behavior of different surface types. The efficiency of the deposition pathway depends upon such factors as time of day, season, stability and surface type. Several of the models have included some of these functional dependences on the appropriate model scale.

The models also simulate the overall wet deposition pathway. However, in this case there are two additional difficulties. The first is that scientific knowledge is less advanced, for example about nucleation scavenging and the in-cloud scavenging and oxidation of SO_2. The second is that precipitation is by nature episodic; the time scale of precipitation and scavenging processes is of the order of minutes to a few hours, generally less than the input-data resolution or time step in models. In view of this discrepancy, models must attempt to simulate the average behaviour or the dominant processes, in a system where great variability occurs. Wet deposition depends upon the constituent being studied and a number of variables related to storm type. These latter factors are both time (season) and space (location) dependent. Models have begun to attempt to include some of these dependences, for example by the various formulations of scavenging rate coefficient. However, this is an area where considerable refinement is anticipated in the next few years.

In summary, it appears that large-scale models are inherently limited in their capability to simulate a variety of processes which are of smaller time and space scales. Thus, effective parameterization of the most important features of the several processes is required. With