4.1.7. ATMOSPHERIC TRANSPORT

The CMDL isentropic trajectory model continues to be a valuable tool for diagnosis of the origins of air parcels measured at the CMDL observatories, as well as those measured on ships, aircraft, and at miscellaneous experimental sites. The atmospheric transport project in CMDL is designed for a high volume of output. Improvements made over 1998 and 1999 enhanced this capability. The standard gridded meteorological data used as input to the CMDL trajectory model come from the European Centre for Medium Range Weather Forecasts (ECMWF) through the U.S. National Center for Atmospheric Research (NCAR). These data have become available in a more timely fashion, reducing the lag time of the data to about 1 month. Another factor that has greatly improved the speed at which trajectories can be produced is accessing the input data in direct access mode on disk rather than accessing these data sequentially from magnetic tape. Fifteen years of meteorological data (1985-1999) are now readily available on disk, eliminating the need for magnetic tapes. The trajectory program is automated so that obtaining large volumes of trajectories (e.g., for a site climatology) is straightforward.

The trajectory input data are fairly coarse because of storage and processing constraints. The data have a horizontal resolution of 2.5 degrees latitude $\times$ 2.5 degrees longitude, a vertical resolution of 14 levels (from surface to 10 hPa) and a temporal resolution of 12 hours. Trajectories produced with these data are not suitable for diagnosis of mesoscale transport, but rather they track large-scale regional air flow. The gridded winds are interpolated kinematically to isentropic surfaces with the specification of arrival height, arrival pressure, or potential temperature. The method of wind interpolation to the isentropic surface is detailed in section 3.13.4 of Summary Report No. 11 [*Harris and Bodhaine*, 1983]

Aside from the standard ECMWF trajectories, trajectories are provided in real-time on the trajectory web site (http://www.cmdl.noaa.gov/ozwv/traj). These trajectories are made with meteorological data downloaded twice daily from the National Centers for Environmental Prediction (NCEP). The differences between the ECMWF and NCEP data sets are usually slight, but to avoid confusion, it is recommended that the real-time trajectories be used only as a first look. Trajectories for publication should be based on the ECMWF data.

Trajectories have been used to investigate the relationships of trace gas and aerosol measurements to their sources and sinks. Published transport studies for each of the four CMDL observatories are cited in section 4.1.7 of CMDL Summary Report No. 24 [*Hofmann et al*., 1998]. A special project, in section 4.2.3 of this report, presents some highlights of a new transport study for BRW that was recently completed. Section 4.2.4 presents an analysis of O_3 and CO at Cape Point Observatory that also uses trajectories.