statistical characteristics of the data obtained. It is then possible to relate the observations for a given sector to the pollutant sources upwind in that same sector. Since it is unlikely that the air arriving at a station has followed a straight line path over the whole region of interest such an analysis might identify the wrong contributing upwind sources. A refined, and more realistic approach, is therefore to calculate the pathway followed by the air parcels using one of the models discussed in Chapter 7 and to classify by sector according to air parcel history during the previous 24 to 48 hours (the typical time required for the air parcel to traverse the major emission and receptor regions of interest). Errors in trajectory calculations tend to be random and thus, when averaged over a large number of cases, tend to cancel out giving a more reliable mean value.

This technique was first applied in southern Norway where the results clearly identified the major emission source regions in western Europe as lying in those wind sectors associated with the greatest deposition of acidity. In North America the technique has been used at several locations where the appropriate daily sampling of air and precipitation concentrations is carried out. The results of these studies are given in Section 4.4 of MOI Report 2F-I and are briefly summarized here, first for air concentrations and then for precipitation.

6.5.1 Air Concentrations

A study in Toronto, Ontario, during the summer of 1976 showed that all the episodes of high sulfate, ozone and low visibility occurred with winds in the sector between west and south, with summertime sulfate concentrations averaging about 10 times those with winds in other sectors. A similar study in July 1976 and in July 1975 showed that in upper New York State the highest sulfate concentrations were associated with winds from direction of the upper Ohio River valley.