1 INTRODUCTION

Most of the emphasis in the analysis of transboundary pollution problems has been on the transport, diffusion, transformation and deposition of atmospheric pollutants over distances of the order of 1,000 kilometers (km). However, the understanding and prediction of atmospheric processes occurring in the local to mesoscale range (up to 300 km from the source) are also important for the following reasons:

(a) There are many important instances of transboundary transport of air pollution which occur over local and mesoscale distances. Examples are sulfur dioxide, oxidants, particulates and hazardous hydrocarbons in the Detroit, Michigan--Windsor, Ontario area; hydrocarbons and particulates in the Sarnia, Ontario-Port Huron, Michigan region; fluorides on Cornwall Island, Ontario, near the New York border; sulfur dioxide in the Edmundston, New Brunswick-Madawaska, Maine region; and sulfur dioxide from Poplar River, Saskatchewan, near the Montana border.

(b) There are sensitive areas such as national park lands located at or near the international boundary which could be adversely affected by pollutants undergoing local or mesoscale transport. For example, Glass and Loucks (1981) report potential effects of the proposed Atikokan power plant on the Boundary Waters Canoe Area and Voyaguers National Park in Minnesota. Stottlemyer (1981) has limited data that indicates reduced pH in watersheds in Isle Royale National Park resulting from local and regional transport.

(c) Concentration and deposition effects from sources within 300 km augment and sometimes dominate those from the long-range transport of air pollution depending on location and meteorological conditions.

(d) With respect to emissions from a given source region, the existing LRTAP models are not always suitable for predicting concentrations and depositions within the source region itself. One reason is that these models by design do not resolve horizontal and vertical details within the mesoscale range. Another reason is that the models may not adequately represent the detailed chemistry occurring in the first few hundred kilometers