I - SOME ASPECTS OF NUMERICAL SOLUTION OF THE ATMOSPHERIC TRANSPORT-DIFFUSION EQUATION

INTRODUCTION

A complete treatment of atmospheric concentration dynamics involves the full three dimensional turbulent planetary boundary layer equations for conservation of mass,momentum and energy. However il we suppose that we deal with a passive contaminant (neglecting in a first step chemical reactions) it is possible to focus ourselves on the numerical aspect of the transport-diffusion equation, supposing in that approach that we decouple the mass conservation equations from the equation of motion of the air. So, for the purpose of the present study we will consider as a requirement the knowledge of the wind-field , in order to emphasize choice and testing of suitable techniques for solving the transport diffusion equation.

The purpose of these two lectures is to give an idea of the state of the art in the area of Eulerian and quasi Lagrangian modeling of transport-diffusion of pollutants. However, our aim is not to describe the whole set of available numerical techniques (i.e. Lagrangian, spectral and pseudo-spectral, stochastic... for Lagrangian technique see lecture of Pr. BENOCCI) but to assess some classical and recent approaches we have, for the most, used at EDF (or we are using) to study the transport and diffusion of pollutants at mesoscale.