THE USE OF A MESO-GAMMA SCALE MODEL FOR EVALUATION OF POLLUTION CONCENTRATION OVER AN INDUSTRIAL REGION IN ISRAEL (HADERA)

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Abstract. A model was developed for pollutant dispersion from a point source simulating the Hadera (Israel) power plant stack. The model is based on the NCAR mesoscale meteorological MM4 model that provides the wind fields and coefficients of turbulent diffusion. The model was implemented using an implicit numerical scheme with changing directions. A comparison between the model calculations and an analytical solution for the advection-diffusion equation shows good agreement. Relatively low numerical diffusion of the adopted advection scheme was noted. Results for the hilly region of central Israel are presented for a summer case.

1. Introduction

The problem of environmental pollution is an important one, even for such relatively unpolluted countries as Israel. Measurements show that there is an urgent need to control emissions over urban and industrial areas and to monitor the dispersion of pollutants. In this paper we develop a model for the evaluation of pollution concentrations; the model has promise of providing reliable forecasts of air pollutant dispersion. An attempt has been made to calculate fields of air pollution concentrations for typical meteorological conditions encountered in Israel. The model can predict pollution levels at different heights under a variety of meteorological conditions. The model was implemented for the 108 by 90 km region with the Hadera power plant in its center. Topography was included. The PSU/NCAR mesoscale numerical model MM4 (Anthes *et al.*, 1987) with 31 height levels and fine 2 km resolution was adapted to fit the Israeli conditions.

In the near future it is planned to upgrade the MM4 model using a non-hydrostatic approximation.

2. Model Description

The development of a pollution dispersion model requires the inclusion of atmospheric dynamics, advection and turbulent diffusion as well as microphysical transformations of pollutant species produced by of different processes like nucleation, condensation, photochemical reactions, etc.

As a starting point, the problem of pollution dispersion due to atmospheric dynamics is studied. A three-dimensional region with dimensions of X_{max}=108 km, Y_{max}=90 km and Z_{max}=2 km was considered. It is assumed that pollutants do

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