Aerosol Parameterization And Its Impacts in Regional Climate Model (RegCM3)

Abstract

Aerosols are known to influence significantly the Earth/atmosphere radiative budget. Aerosol radiative effects occur in two distinct ways: (i) the direct effect, whereby aerosols themselves scatter and absorb solar and infrared radiation, and (ii) the indirect effect, whereby aerosols modify the microphysical and hence the radiative properties and amount of clouds.

Aerosols are produced by a variety of processes, both natural (including dust storms and volcanic activity) and anthropogenic (including fossil fuel and biomass burning). Most aerosols are found in the lower troposphere (below a few kilometers), but the radiative effect of many aerosols is sensitive to the vertical distribution (IPCC Third Assessment Report).

My present work aims to study the aerosol parameterization and its impacts in RegCM3 . To achieve this goal aerosol optical properties results from the model is compared by measurements from Cairo Aerosol CHaracterization Experiment (CACHE) that was performed in the Egyptian capital from the end of October 2004 to mid April 2005. Another case study has been taken into consideration; a sever dust storm in July, 2003 over North Africa passed through the Mediterranean and reached several parts of Europe.

Aerosol- Cloud interaction must be realistically considered in any significant and comprehensive study of climate change. The radiative effects of clouds play a dominant role in climate and climate change. The aerosol environment of the clouds, besides having a direct radiative effect, have very significant interactions with the cloud radiative properties (albedo) through the cloud microphysics, and, in addition, important interactions on the resultant tropospheric heating profiles through the precipitation formation and evolution.

The biggest aim of my work is to introduce the effect of mineral dust on clouds in the RegCM3. Since this work is initialized few months ago, I expect to present the preliminary results in the workshop.