SIMULATION OF ATMOSPHERIC DISPERSION CHARACTERISTICS FOR OZONE AND PARTICULATE MATTER OVER THE MISSISSIPPI GULF COAST REGION DURING CONTRASTING MONTHS OF MAY AND OCTOBER

Anjaneyulu Yerramilli\(^1\), Hari Prasad Dasari\(^1\), Venkata Bhaskar\(^1\) Rao Dodla\(^1\), Challa Venkata Srinivas\(^1\), François Tuluri\(^1\), Julius M. Baham\(^1\), John H. Young\(^1\), Robert Hughes\(^1\), Chuck Patrick\(^1\), Mark G. Hardy\(^2\) and Shelton J. Swanier\(^2\)

\(^1\)Trent Lott Geospatial Visualization Research Centre, Jackson State University, 1230 Raymond Road, Jackson MS 39204, USA
\(^2\)College of Science, Engineering & Technology, Jackson State University, 1400 Lynch Street, Jackson MS 39217, USA

Abstract: This study demonstrates the application of high resolution atmospheric prediction models and atmospheric dispersion models to determine the Lagrangian motion and dispersion of pollutants. The study is confined to the Mississippi Gulf Coast region as this region houses many industrial sources of atmospheric pollutants which have profound impact on the quality of life for millions of people living in the Gulf Coast region. The study consists of two parts, one towards generating the atmospheric fields at desired high resolution using atmospheric model (ARW) and the other to generate atmospheric dispersion characteristics of pollutants using atmospheric dispersion model (HYSPLIT). Two episodic events of high ozone and particulate matter concentrations over the Gulf Coast region were identified, from the public domain data sources, during May and October 2003. These two episodes were chosen as high concentrations were reported for 5-7 days and that the time periods of May and October show contrasting atmospheric circulations. As first step, ARW (Advance Research WRF) model was used to perform integrations for 48 hours from 00 UTC of each day to generate the necessary atmospheric fields at a horizontal resolution of 4 km. This was repeated for 5 consecutive days of each event. The ARW model was designed to have three two-way interactive nested three domains with 36-12-4 km resolutions with the inner most domain covering the Gulf Coast region (90.28-84.77W; 29.38-32.54N). The initial and time varying boundary conditions were taken from NCEP FNL data available at 1 degree latitude-longitude resolution. The land use and terrain fields were generated from USGS data at the nearest corresponding resolution. HYSPLIT atmospheric dispersion model, driven by the output from ARW model, was used to obtain the path of the trajectories and spatial distribution of dispersion from the source location. The trajectories were generated at every 1 hr interval for a 24 hr prediction period and the spatial distribution of the dispersion of the pollutants is generated at different time intervals. These were produced separately for each of the two pollutants of ozone and particulate matter. An analysis of the trajectories shows the distinct characteristics of the atmospheric dispersion over the Gulf Coast region during the May and October periods.