Geophysical Research Abstracts, Vol. 8, 10991, 2006
SRef-ID: 1607-7962/gra/EGU06-A-10991

Weather modeling for support hazard and consequence assessment operations during the 2006 Winter Olympic Games

P. Hayes (1), J. Trigg Jr. (2), D. Stauffer (3), G. Hunter (3), J. McQueen (4), M. Milelli (5)

(1) Northrop Grumman Corp, Virginia, USA, (2) U.S. Defense Threat Reduction Agency, Virginia, USA, (3) Pennsylvania State University, Pennsylvania, USA, (4) U.S. National Centers for Environmental Prediction, Maryland, USA, (5) ARPA-Piemonte, Torino, Italy (Patrick.Hayes@ngc.com / Fax: +1 703-971-4654 / Phone: +1 703-971-3107)

Consequence assessment (CA) operations are those processes that attempt to mitigate negative impacts of incidents involving hazardous materials such as chemical, biological, radiological, nuclear, and high explosive (CBRNE) agents, facilities, weapons, or transportation. Incident types range from accidental spillage of chemicals at/en route to/from a manufacturing plant, to the deliberate use of radiological or chemical material as a weapon in a crowded city. The impacts of these incidents are highly variable, from little or no impact to catastrophic loss of life and property.

Local and regional scale atmospheric conditions play a critical role in determining the extent and scope of damage due to the release of dangerous materials into the atmosphere. Important meteorological mechanisms that affect the concentration of hazardous substances include advection, dispersion, diffusion, photochemical reactions and precipitation scavenging. Additionally, local circulations induced by topography, landuse and land/water interfaces strongly influence atmospheric transport and dispersion (AT&D) processes in the boundary layer.

Therefore, CA personnel charged with managing the consequences of CBRNE incidents must have detailed knowledge of current and future weather conditions to accurately model potential effects on human populations. They must have timely and reliable access to such data in a format that can be readily used by AT&D models, e.g., SPRAY and SCIPUFF. Due to the potentially large quantity of meteorological

data that can be available for any given time period (i.e., observations, global forecasts, regional forecasts, climatology), CA managers using AT&D models also require expert meteorological guidance to make intelligent choices and to provide consistent products.

A meteorology team was established at the U.S. Defense Threat Reduction Agency (DTRA) to provide weather support to CA personnel operating DTRA's CA tools, such as the Hazard Prediction and Assessment Capability (HPAC) tool. The meteorology team is comprised of meteorologists with a wide variety of experience and expertise from operational forecasting to numerical weather prediction modeling and research and development. The meteorology team performs three main functions: 1) regular provision of meteorological data for use by personnel using HPAC, 2) determination of the best performing medium-range model forecast for the 12 – 48 hour timeframe and 3) provision of real-time help-desk support to users regarding acquisition and use of weather in HPAC CA applications. The DTRA meteorology team provides these services to DTRA CA operators and anyone else using DTRA CA tools.

The normal meteorology team operations were expanded during a recent modeling project which took place during the 2006 Winter Olympic Games. The purpose of the modeling project was to improve DTRA's ability to predict atmospheric transport and dispersion of hazardous materials. The HPAC and other tools use high-resolution weather data along with other environmental and source term information to produce estimates of the spread of accidentally or intentionally released hazardous material, such as CBRNE agents.

The meteorology team took advantage of special weather observation datasets available in the domain of the Winter Olympic venues and undertook a project to improve weather modeling at high resolution. The varied and complex terrain provided a special challenge to the modelers on the meteorology team. Half of the Olympic venues were located in the mountains to the west of Torino, while the rest were located on the relatively flat plain in and around the cities of Pinerolo and Torino to the east.

DTRA partners at Pennsylvania State University (PSU) and the U.S. National Center for Atmospheric Research (NCAR) established data collection and assimilation, and forecast modeling processes that used special weather station observations provided by the Area Previsione e Monitoraggio Ambientale of Italy's ARPA Piemonte. At PSU a version of the Mesoscale Model-5 (MM5) was especially prepared to use the special observation data to forecast weather in a four-nest configuration. At NCAR versions of MM5 and the Weather Research and Forecast (WRF) models were integrated into a real-time four-dimensional data assimilation program which used the special Olympic

weather data to initialize these models.

Two other DTRA partners provided independent weather forecast models against which the PSU and NCAR model data were compared. The U.S. Air Force Weather Agency provided its MM5 forecast model data and the U.S. National Oceanic and Atmospheric Administration's National Weather Service and National Centers for Environmental Prediction provided data from a special version of their WRF model.

The project produced many opportunities to improve the modeling and forecasting capability at DTRA. Also, the team learned several important lessons about providing operational weather support. The meteorology team used this experience to improve several areas of its weather support operations. DTRA and its partners plan to expand upon this experience during upcoming field tests, and to further improve and expand the capability to provide accurate high-resolution weather forecast information to hazard and consequence assessment operations.