Bulgarian system for emergency response to accidental release of hazardous pollutants in the atmosphere

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The present work demonstrates some preliminary results produced by the Bulgarian system for emergency response. The system should supply the authorities, the relevant international organizations and the public with information, which will make possible proper measures for diminishing the damages, caused by accidental harmful releases in the atmosphere, to be planned. The planned modeling system will have the potential to assist emergency managers in three stages:

In preparedness mode, "risk analysis" will be performed. It will result in a set of risk assessments for different emergency scenarios for selected "hot spots". These assessments can be of a direct use for immediate emergency response (for example evacuation of people from the pollution exposed regions, proper assignment of medical teams) in order to minimize the pollution impact on human health.

In the operational mode the system will produce fast short-term forecast of the pollutant propagation in local and regional scale. This information will help the authority decisions about the immediate measures and activities to be carried out. This information will also warn the international community of possible trans-boundary harmful pollutant transport.

In the off-line mode the modeling system will produce a more detailed and comprehensive analysis of the possible longer-term impact of the harmful releases on the environment and human health in local to regional scales, including the whole Balkan region.

The intension is to elaborate a system based on up-to date and complex meteorological and pollution transport models with proved high-quality simulation performance and possibility to follow the accidentally released harmful gases from local to European scale, accounting for the mesoscale dynamic phenomena, to 'zoom-in' and obtain a detailed air pollution evaluation in the particularly damaged regions.

The system is based on the following models: WRF - (Shamarock et al. 2007), used as meteorological pre-processor; CMAQ (Byun and Ching 1999) - the Chemical Transport Model (CTM) of the system. A chlorine chemical mechanism has been added to CMAQ based on (Tanaka et al. 2003); SMOKE (CEP 2003) – the emission pre-processor.

For the needs of the emergency response preparedness mode the risk is defined as probability the national regulatory threshold values for toxic gases to be exceeded. For risk assessment a large number of simulations of the toxic gases dispersion around the potentially dangerous site under comprehensive set of meteorological conditions should be made and treated as an ensemble.

Maps of the risk around some potential sources of emergency toxic gas releases are constructed and demonstrated in the current paper.

Some examples of the system "operational mode" results are demonstrated as well.

References:

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