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Modelling aerosol pollution over Athens, Greece using grid technology

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This scientific work aims at studying aerosol pollution over Athens, through an on-going modeling effort using grid technology. Aerosol predictions by the eulerian model CAMx, will be obtained for different emission scenarios. Focus is given on the role of conventional anthropogenic emissions versus natural emissions (sea-salt and Aeolian dust) on aerosol pollution. Predictions will be evaluated against aerosol measurements by the National Ministry of the Environment.

Detailed analysis

This study involves air quality modeling, applied on HellasGrid CA through SEE user interface. Two domains are simulated for 5 days of 2007, which results in 45,375,120 spatial-temporal “points”, where input-output data are treated. The computational time for this job could reach 30 days on a conventional local computational unit. The motive for using grid technology was a more efficient system for such simulations.

CAMx has no software requirements. Thus, the executable file was locally, statically and serially compiled and then imported into the grid system along with meteorological and pollution inputs, through gLite middleware.

Accidental run abortion results in job submission from scratch, which leads to delay of output retrieval. Corruption problems are better manipulated on local units, since the model can be restarted from where it stopped. A local, static but parallel CAMx compilation is a further step, so as to take advantage of more computational units of the grid system.

Conclusions and Future Work

A first attempt to use grid technology for aerosol simulations over Greece and Attica is presented. Anticipated results will offer scientific knowledge of the impact of different emission scenarios on aerosol chemistry and concentrations.

No substantial effort was needed to incorporate a CAMx model run into the grid. On-going simulations are based on a local, static and serial compilation. Parallel job compilation and execution will definitely give a boost in job evolution and output retrieval.

Impact

Aerosol is an important contributor of pollution over the highly populated Attica peninsula, according to measurements. Aerosol sources are not only transportation and industry, but also Aeolian erosion, sea and re-suspension. Greece is an area with extended Archipelago and wind produces sea-salt particles. Additionally, the land surface is dry enough to offer dust bursts by the action of wind.

The contribution of each source to aerosol concentrations necessitates the modeling approach. In the current study performed in a PhD research, CAMx is applied over Greece, with a fine grid nested over Attica. Different emission scenarios show the importance of each source to aerosol predictions.

The on-going simulations are one with all emissions, and one without Aeolian erosion emissions. Their difference shows the role of Aeolian erosion on the atmospheric chemistry and on aerosol concentrations. Further simulations will be treated in analogy, so as to study sea and re-suspension contribution.

Keywords

aerosol, modeling, Athens

URL for further information

http://env.mg.uoa.gr/index.php?option=com_content&view=article&id=57&id=57&Itemid=72

Author: Dr ATHANASOPOULOU, Eleni (NKUA, GREECE)

Co-authors: Dr DANDOU, Aggeliki (NKUA, GREECE); Prof. TOMBROU, Maria (NKUA, GREECE)

Presenter: Dr ATHANASOPOULOU, Eleni (NKUA, GREECE)

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