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SA of a Multi-scale Atmospheric Composition Model on the Grid

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We consider the multi-scale atmospheric composition modeling application (MSACM), which produces an integrated multi-scale Balkan region oriented modeling system and enables to track and characterize the main pathways and processes that lead to atmospheric composition formation in different scales and to provide high quality scientifically robust assessments of the air quality and its origin. This model requires high amount of CPU and storage resources for studying the air pollution pattern response to different scale processes, using MPI on medium-sized clusters.
Sensitivity analysis (SA) deals with the question of how the variations in the input of a model impact the output of the model, providing qualitative and/or quantitative measures.
Monte Carlo methods are one of the most used classes of methods for Sensitivity Analysis. One such scheme was first proposed by Sobol, and then developed by Saltelli et al. In our work we adapt the general Saltelli procedure for SA in order to be able to asses the impact of changes in concentrations of some air pollutants in particular countries to the outputs of the model. These computations require outputs of the model to be computed under various sets of input conditions.
In this work we present our Grid implementation scheme, which allows scientists to perform the computation and analysis of the indices leveraging the power of the national and regional Grid resources.