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Calibration and validation of an air quality finite element model around an electric power plant in Gran Canaria island

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This work presents the calibration and validation of an air quality finite element model applied to the surroundings of Jinamar electric power plant in Gran Canaria island (Spain). The model involves the generation of an adaptive tetrahedral mesh, the computation of an ambient wind field, the inclusion of the plume rise effect in the wind field, and the simulation of transport and reaction of pollutants. The main advantage of the model is the treatment of complex terrains that introduces an alternative to the standard implementation of current models. In addition, it improves the computational cost through the use of unstructured meshes [1].

In order to prove the usefulness of the proposed methodology, it is validated against measurements provided by Endesa Electric Company. The data contains the emission rates at one emission point, and the immission concentrations and the wind velocity at five measurement stations in the surroundings of Jinamar plant. To compute the wind field in the studied region, the measured data has been complemented with results of forecasting meteorological models given by the Spanish Meteorology Agency (AEMET).

There are several parameters to be estimated for the air quality simulation. However, in order to calibrate the model, the most important ones are the pollutant diffusions. The numerical results present different approximations of the solution and the sensibility of the model to these parameters.

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[1] A. Oliver, G. Montero, R. Montenegro, E. Rodríguez, J.M. Escobar, A. Pérez-Foguet. Adaptive finite element simulation of stack pollutant emissions over complex terrains. Energy, Volume 49, 1 January 2013. http://dx.doi.org/10.1016/j.energy.2012.10.051