ABSTRACT

The application of CALMET/CALPUFF modelling system is well known, and several validation tests were performed until now. However, most of them were based in specific experiments with a large compilation of surface and aloft meteorological measurements, not always available. In addition, the use of an operational large smokestack as tracer source is not so usual. In this work, CALPUFF model is applied to simulate the local dispersion of SO$_2$ (as tracer) from the smokestack (356.5 m height) of a large coal-fired power plant located in NW of the Iberian Peninsula. Considering both different stack configurations and meteorological inputs, as follows: (1) This stack includes four independent liners in the same structure, so either a single virtual point source or four sources at the same location were tested. (2) As CALMET input, the use of surface and aloft meteorological measurements vs. WRF meteorological model outputs are compared.

CASE STUDY: AS PONTEs POWER PLANT

As Pontes Power Plant is a 1400 MWe coal-fired power plant located in the Northwest of the Iberian Peninsula, at the South of Europe. Until year 2006, this facility burnt a mix of local lignite (26% in S) and foreign subbituminous coal (0.1% in S) (Dios et al., 2013) with a typical 70:30 weight ratio. Its smokestack (356.5 m height) is composed by four liners (one per boiler) in the same concrete shaft (Figure 1). As the largest source in this area, SO$_2$ pollutant can be considered as a tracer of this power plant emissions. An air quality network with 17 glc sites (Figure 2) monitors the power plant emissions impacts, as these sites are distributed considering the most frequent winds combined to sporadic stability conditions which are favorable to fumigation episodes.

RESULTS

Comparison Method (De Castro, 2001)

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<th>X Stack</th>
<th>Max. glc</th>
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Conclusions

Results of CALPUFF model using different configurations for the simulation of a large smokestack emission show that CALMET meteorological output based in a regional numerical meteorological simulation, using WRF, provides better glc results than using a limited meteorological measurements dataset input; especially, due to the limited aloft measurements available. In a more realistic smokestack (which is actually divided in four independent liners) provides higher and more realistic glc than a virtual one liner-chimney, although some simulated glc peaks could not be detected, due to the limited air quality network. This better agreement is more apparent comparing the travel distance values to the maximum glc locations, which are usually using higher CALPUFF results that applying glc measurements interpolation; this result enforces the possibility of none detected SO$_2$ peaks.

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