Evaluation of Ozone Impact due to New Industrial Facilities in the Southwestern Iberian Peninsula

E. Mantilla, N. Castell, R. Salvador, A. Stein, L. Hernández, and M. Millán

Centro de Estudios Ambientales del Mediterráneo, Valencia, Spain.(enrique@ceam.es)

High surface ozone levels have harmful effects on human health and plants, what makes it critical understanding the influence of anthropogenic activities on the tropospheric ozone distribution. One of the industries with major impact in atmospheric pollution is, in fact power generation from fossil fuels. Lately, increasing demand of electric supply is being supported by an increase of new combined cycle electric power plants, using natural gas. In spite of many advantages of this technology (greater power efficiency, smaller installation cost, less carbon dioxide emission,.etc), greatest rates of nitrogen oxides emissions can have an increment of ozone formation.

In the troposphere, ozone is formed as a result of complex chemical reactions, which include the presence of nitrogen oxides (NOx) and volatile organic compounds (VOC) precursors. Chemical production of O3 in the atmosphere is highly non-linear, what makes it difficult to estimate the behavior (both qualitative and quantitatively) of ozone levels in response to new emissions. Under some conditions, O3 concentrations increase largely with increasing NOx, remaining quite insensitive to VOCs, while for other scenarios the rate of O3 formation will rise mainly with increasing VOCs, under the dynamics of a non-linear chemistry, very sensible to initial conditions.

In this context, the perspective of a new natural gas power plant in a region can have a great challenge for air quality surveillance authorities.

In this paper, an objective estimation of the impact of a new thermal power plant in the surroundings of Huelva city, placed in the south-west corner of the Iberian Peninsula, under an intense industrial activity, is presented. It is proposed a methodology based on the use of chemical transport models (CAMx was used in the present work), to deal with such kind of problems. The emission and meteorological model results are presented in separated papers. The lack of knowledge of some critical inputs data required by the photochemical model, particularly emissions and chemical and physical processes involved, put a high degree of uncertainty in simulations results. On the other hand, ozone networks rarely provide experimental support for model validation. In this study, a methodology based on a matrix of potential emission scenarios to manage and delimit such uncertainty in the expected ozone impact from a new power plant is analyzed . This kind of study could be use as an effective tool to support environmental managing policies in the context of the actual Directive 2002/3/EC of tropospheric ozone.