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The impact of biogenic VOC emissions on photochemical ozone formation in a high ozone pollution episode in the Iberian Peninsula for the 2003 summer season.

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The summer of 2003 was exceptionally warm in Central and North Europe, specially in July and August. The European Environment Agency (EEA) reported several ozone episodes, mainly in the first half of August. These episodes were exceptionally long-lasting, spatially extensive, and associated to high temperatures. In this paper, the 10 - 15 August 2003 ozone pollution event will be analized using modeling techniques. During this period the threshold values of the European Directive 2002/3/EC were exceed in various areas of the Iberian Peninsula.

Ozone is a secondary pollutant. As such, it is not emitted directly, but is generated in the atmosphere through a complex series of chemical reactions initiated by absorption of solar energy. Its generation is typically favored in high-pressure, stagnant atmospheric systems at locations with substantial concentrations of oxides of nitrogen (NOx) and volatile organic compounds (VOCs). Both NOx and VOCs originate either from anthropogenic sources, e.g., industries and vehicles, or from biogenic sources. This indicates that both anthropogenic and biogenic sources play roles in ozone formation and accumulation. A successful ozone control strategy therefore requires taking into account the two source categories.

The aim of the current study is to computationally estimate the influence of biogenic volatile organic compound (BVOC) emissions on the formation of tropospheric ozone during this high ozone episode. A meteorological prognostic simulation is performed

as a first step, reproducing successfully the typical sea-breeze situation. A BVOC emissions inventory is constructed for the Iberian Peninsula with an hourly resolution. The anthropogenic emissions are based on the EMEP inventories and also have an hourly resolution. Based on the meteorological simulation and emissions inventories, a photochemical dispersion simulation is performed for different emissions scenarios. The impact of biogenic emissions is investigated on ozone values by performing simulations with and without biogenic emissions, while keeping anthropogenic emissions constant. A factor separation technique is applied to isolate the impact due to biogenic emissions from the overall impact due to biogenic and anthropogenic emissions together. The impact on ozone formation is also studied in combination with some anthropogenic emissions reduction strategies, i.e. when anthropogenic VOC emissions and/or NOx emissions are reduced.

The inclusion of BVOC emissions has a noticiable effect on the calculated ozone concentrations. If only biogenic emissions are considered, modeled ozone concentrations remain near background levels (around 35 ppb). By adding anthropogenic emissions of VOC and NOx, modeled ozone concentrations exceed the Air Quality Thresholds across much of the Iberian Peninsula. The synergy between anthropogenic and biogenic emissions must be considered when examining anthropogenic emission control strategies.