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Explicit analysis and simulation of an ozone photochemical episode in Santiago, Chile

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Santiago experiences frequent pollution episodes and as a consequence very high ozone concentrations. Health problems associated with these ozone episodes include daily mortality and hospital admissions for respiratory illnesses. The development of ozone abatement strategies requires the determination of the contribution of each hydrocarbon to ozone formation, taking into account the kinetic and mechanistic properties in addition to the air matrix structure. In this work, the photochemical formation of ozone during a summer campaign, carried out from the 8^{th}-20^{th} March 2005, has been simulated using a photochemical box model based on the Master Chemical Mechanism (MCMv3.1, http://mcm.leeds.ac.uk/MCM). The MCM model has been constrained with ten minutes average of the simultaneously measured HONO, HCHO, CO, NO, J(O^1D), J(NO_2), VOCs and meteorological parameters and the O_3-NO_x-VOC sensitivity has been studied by simulating the ozone at different VOC and NO_x concentrations. Ozone production model sensitivity showed that photochemical ozone formation is VOC-limited. Reduction in levels of ozone during episodic pollution events in Santiago requires the concurrent reduction of both VOC and NO_x emissions. The results of the model simulations have been compared with a set of potential empirical indicator relationships including H_2O_2/HNO_3, H_2O_2/NO_z, O_x/NO_z. The individual contributions of each hydrocarbon to ozone formation has been determined from the photochemical MCM model and compared with those calculated using the

photochemical ozone creation potential, POCP.