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Formaldehyde source apportionment and photochemical simulation in the city air of Santiago, Chile

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During the extensive summer measurement campaign carried out from the 8^{th}-20^{th} March, 2005, the oxidation capacity evaluation study has revealed HCHO as a main photochemical oxidation precursor contributing by about 17 % of the total radical sources in the city air of Santiago. In this work, HCHO source apportionment and photochemical simulation analysis and its main precursors have been determined. The pair O_3 – NO_x has been used as tracer for the photochemically formed and primary emitted HCHO, respectively. The photochemical HCHO has been simulated using a photochemical box model based on the Master Chemical Mechanism, MCM (MCMv3.1, http://mcm.leeds.ac.uk/MCM/) constrained with simultaneous measurements of HONO, O_3, CO, NO, NO_2, J(O^1D), J(NO_2), VOCs and meteorological parameters. The photochemically formed HCHO comprises up to 70 % of the observed HCHO in the afternoon, while the primary HCHO comprised more than 90 % during the early morning rush hour. The oxidation of alkenes contributes to photochemical HCHO formation by 70 % followed by aromatics 17% and alkanes 11 %. Oxidation of isoprene contributes alone by 23 %. The contribution of each oxidant (OH, O_3 and NO_3) to photochemical HCHO formation has been determined. The OH is the major oxidant responsible to about 85 % of the total HCHO produced by the oxidation of the

hydrocarbons followed by O_3, 14 %, while the NO_3 contributions are negligible.