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Quantification of the net HONO daytime source and its relation to NO2

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Tropospheric nitrous acid (HONO) undergoes rapid photolysis to OH and NO during daytime and is thus known to be an efficient OH source especially in the early morning hours. During the DOMINO (Diel Oxidant Mechanism in relation to Nitrogen Oxides) campaign in southwest Spain in November/December 2008, we simultaneously measured the concentrations of OH, NO, and HONO and the photolysis frequency of NO_2, $j(NO_2)$, as a proxy for j(HONO). These quantities are necessary to calculate a photostationary state for HONO in the gas phase, and allowed to calculate a net HONO daytime source. This net HONO daytime source sustains HONO levels above the PSS, and thus serves as an additional OH source even during day. The net HONO source, normalized by NO_2 mixing ratios and expressed as a conversion frequency (% h^{-1}), showed a clear dependence on $j(NO_2)$ with values up to about 50 % h^{-1}at noon. We compared our net HONO source with values calculated from the measured field data for two recently proposed processes, the light induced NO_2 conversion on soot surfaces and the reaction of electronically excited NO_2 with water vapour. These two reactions normally contributed less than 10 % to our net HONO daytime source.

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