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Nighttime chemistry in DOMINO: Variable lifetimes and loss mechanisms for NO_3 and N_2O_5

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Gas-phase and heterogeneous reactions of NO_3 and N_2O_5 at night play an important role in degradation of several organic trace gases and also in the removal of NO_x. Application of a steady-state analysis to N_2O_5 and NO_3 measurements during DOMINO allows estimation of the lifetime of NO_3 and its role in nightime oxidation. NO_3 lifetimes were highly variable, with values approaching 20 min, but frequently less than 10 seconds. Long lifetimes were associated with air masses which had spent several days over the Atlantic ocean, whereas the shortest lifetimes were associated with air masses arriving from the oil-refining and industrial centre of Huelva. Intermediate lifetimes were observed for continental air from central Spain. Nighttime chemistry, including heterogeneous and gas-phase processes that regulate the NO_3 and N_2O_5 lifetimes is assessed for the various air-mass types.