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A 1-D model evaluation of OH regeneration mechanisms from isoprene oxidation for use in global models.

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Hydroxyl radical (OH) is one of the main oxidants in the troposphere. It drives photochemistry and thus cleaning the troposphere from ubiquitous reactive compounds that impact on the environment and the ecosystems. Due to the high reactivity of OH, both its atmospheric measurements and the simulations of its concentrations remain challenging. Recent measurements have shown significant mismatch with atmospheric simulations based on current knowledge of organic atmospheric chemistry. New degradations pathways in the oxidation chemistry of isoprene, initiated by OH radical, have been proposed based on chamber experiments and theoretical calculations. These pathways regenerate OH and are actually missing from global chemistry and transport models (CTMs) that show an underestimation of OH when compared to the limited number of observations. In this study we use the 1-dimensional model Wageningen University Single Column Model (WUSCM) to investigate, evaluate and reduce for use in global CTMs, isoprene oxidation pathways that are leading to OH regeneration and were recently proposed in literature applied on the PEGASOS 2012 campaign over Cabauw, Netherlands. The WUSCM simulates boundary layer meteorology (radiation, land-atmosphere interaction and mixing) and can support different chemistry schemes coupled with the KPP solver. The chemistry scheme used in the TM4-ECPL global model chemical scheme is the basis for the development and testing of the new pathways of isoprene chemistry.