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How climate change affects tropospheric O_x budget?

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Tropospheric ozone (O_3) is of particular interest for climate and air quality studies. O_3 is a radiatively active gas and, in urban areas, O_3 is a surface pollutant. Key drivers of future O_3 abundances and distributions are thought to be ozone precursors, ozone depleting substances and climate (Banerjee et al., 2016; Iglesias-Suarez et al., 2018). Changes in climate impact O_3 and its budget - chemical production and loss, deposition to the surface, and stratosphere-troposphere exchange - through changes in dynamics and chemistry. Hence, its evolution during the next century is of important interest for climate change and air quality.

The three-dimensional chemistry-climate model CAM-Chem (Community Atmospheric Model with Chemistry, version 4.0)(Lamarque et al., 2012), included in the CESM framework (Community Earth System Model, version 1.1.1) is used to investigate the impact of climate change on tropospheric odd oxygen (O_x) budget - defined here as the sum of species that rapidly interconvert with O_3 - from present day to 2100 for both, the Representative Concentration Pathways (RCP) 6.0 and 8.5 scenarios. Our model set-up includes a full halogen chemistry mechanism (in the troposphere and the stratosphere) along with varying oceanic emissions of Very Short Lived Halocarbons (VSLH) and zonally averaged distributions of long-lived halocarbons (Ordóñez et al., 2012; Fernández et al., 2017; Saiz-López 2014).

Here we present a comprehensive analysis of the main chemical channels for each term of the O_x budget (over space, time and altitude) and identify geographical areas where climate change plays a key role on the evolution and partitioning of the O_x family.

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