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Ozone trend analysis from 1980 to 2010: Simulations vs observations

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Ozone (O_3), a secondary pollutant, is one of the main oxidant species in the atmosphere, affecting ecosystems and human health. Its secondary nature and the non-linear dependence of its production on nitrogen oxides (NO_x) and volatile organic compounds (VOC) concentrations challenges the accuracy of chemistry - transport model (CTM) simulations but also the definition of emission control strategies to reduce its concentrations in the troposphere. Thus, while for primary pollutants emissions reductions have been shown efficient to reduce pollutant levels for ozone concentrations the picture remains unclear.

Both anthropogenic activities and weather conditions are shown to affect tropospheric ozone long-term and seasonal variability. Moreover, the air quality improvement strategies of the last decades also affect the ozone trends and seasonality.

For this study, the chemistry and transport model TM4-ECPL is used to simulate global ozone concentrations in the troposphere and study the temporal and spatial trends for the years between 1980 and 2010. The model is validated against near surface measurements conducted at urban and remote areas, ozonesondes and satellite data.

Decanal changes in southern hemisphere surface ozone seasonality are calculated to be impacted by changes in the downward flux of stratospheric ozone. The importance of stratospheric ozone for the surface ozone seasonality changes in the southern hemisphere is also investigated based on multi- year ozonesondes from the Easter Island.