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Long-term total column ozone changes over the Tibetan Plateau during 1979-2018

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Using satellite and ozonesonde data, previous studies have found a persistent summertime low ozone over the Tibetan Plateau (TP). The long-term evolution of this low in the context of global ozone recovery is an interesting and important topic, and will reveal information on the processes which are important at controlling column ozone at the regional level. We use the ozone dataset from the Copernicus Climate Change Service (C3S) from 1979-2018 to investigate the long-term variation of the ozone low over the Tibetan region in different seasons. The factors responsible for the variations are analyzed using a multiple linear regression model. The regression results quantify the relative contributions of the individual processes, including equivalent effective stratospheric chlorine (EESC), solar cycle, quasi-biennial oscillation (QBO), El Nino southern oscillation (ENSO) signal, aerosol loading as well as the local climate impact factors, e.g. surface temperature and geopotential height over the TP. The possible role of temperature and geopotential height in long-term changes of the ozone low is studied in both the troposphere and lower stratosphere through the changes in the South Asian High (SAH) due to the thermal-dynamical effect of the TP.

We have also used different state-of-the-art global models (chemical transport models TOMCAT and SLIMCAT, UM-UKCA chemistry-climate model) to investigate the different processes controlling the stratospheric and tropospheric ozone over the TP. These models have been run from 1979-2018 at different resolutions with detailed chemistry in the troposphere and stratosphere. The modelled ozone will be compared with available measurements over the TP and these results will also be discussed.