

Ozone trends (1975-2000) in the northern hemisphere UTLS using measurements from ozone sondes and regular aircraft

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Ozone is a particularly strong greenhouse gas in the tropopause region, and therefore trends in this altitude are important for changes in radiative forcing. The knowledge of ozone trends in the UTLS is mostly based on a confined number of stations operating regular ozone measurements from balloons with the longest measurement series starting in the late 1960s. In this study we use ozone measurements from regular aircraft of the GASP project (Global Atmospheric Sampling Program) providing ozone data from four B-747 aircraft operated from USA from 1975 to 1979 in comparison with measurements of the ongoing MOZAIC project.

For building climatologies of the two ozone data sets and hence their comparison, the data were binned relative to the dynamical tropopause, and coordinates in equivalent latitudes are used for analysis of stratospheric data. Additionally, in the upper troposphere, averages were computed for specific regions of the world such as, for example, North America, Europe, or Japan. The analysis shows that ozone increased in the lowest part of the stratosphere over northern midlatitudes since the late 1970s in summer, while it decreased in the other seasons. In the upper troposphere, the long-term changes differ depending on the region considered.

In addition, to verify if the GASP ozone data yield realistic ozone values and seasonal cycle, a comparison between the above-mentioned regular aircraft measurements and ozone sondes is presented. Computed differences between the climatologies of the late 1970s and 1990s for the aircraft data over Europe and ozone sonde measurements at European stations show differing long-term changes, which will be discussed.