SPARC Workshop SHARP2016

The value of Swiss long-term ozone measurements for atmospheric research

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The longest series of total ozone observations in the world was started in 1926 in Arosa, Switzerland. Reliable and representative surface ozone have been measured since the 1950s at the Light Climatic Observatory ("Lichtklimatisches Observatorium", LKO). The measurements were originally performed to study environmental factors important for the recovery from tuberculosis since at the time therapy with antibiotics did not exist. We present a historical overview of ozone measurements at Arosa, highlighting the value of these measurements in terms of modern atmospheric research, including documentating the effects of anthropogenic ozone depleting substances (ODSs) which began affecting the ozone layer at the beginning of the 1970s. The total ozone series shows the decrease of stratospheric ozone in the northern mid-latitudes and more recently documents the slow beginning of the ozone layer recovery as ODS emissions decrease. The unique length of the Arosa total ozone series, which covers several decades before the start of anthropogenic ozone depletion, allows an estimation of natural variability for comparison with the slow upward trend since peaking anthropogenic ozone depletion in the second half of the 1990s. Furthermore, interannual variability of total ozone contains valuable information of long-term climate variability. In the second half of the 21st century the effect of enhanced Brewer Dobson circulation is expected to dominate stratospheric ozone changes from ODSs. The Arosa measurements are expected to be relevant to quantitatively document the expected "super recovery" in the northern mid-latitudes resulting from climate change. Surface ozone measurements from Arosa are not only important for comparison with present day values but also valuable for the evaluation with chemistry-climate models.