QOS2016-83, 2016
Quadrennial Ozone Symposium of the International Ozone Commission

Ozone measurements at Arosa (Switzerland): Scientific value and history

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Reliable long-term measurement series are vital for evaluating long-term changes in key environmental quantities. The world's longest total ozone series has been measured at Arosa, Switzerland (starting in 1926) and allows the documentation of the downward trend in stratospheric ozone caused by the anthropogenic release of ozone depleting substances (that started to reach the stratosphere around 1970) as well as the slow recovery (starting around 1995 as a consequence of the Montreal Protocol). Additionally, the unique length of the series from Arosa allows the determination of long-term variability in stratospheric ozone, which is mainly attributable to climate variations such as the North Atlantic Oscillation and the El Niño Southern Oscillation. The measurements of tropospheric ozone from Arosa also go back to 1930, with reliable and representative observations of surface ozone measured in the 1950s providing the possibility to document the large increase in surface ozone in the decades following World War II.

Long-term changes and trends started to be important only since the large paradigm change that occurred in ozone science in the 1970s (both, concerning stratospheric and tropospheric ozone). The original motivation for the "Light Climatic Observatory" (LKO) in Arosa was related to medical applications, namely the study of "biologically active" solar radiation, which at the time was thought to be important in the treatment of tuberculosis, so-called "heliotherapy" (modern treatment with antibiotics only became available after World War II). F.W.P. Götz, who founded the LKO in Arosa, realized that stratospheric ozone determines the UV-part of the solar spectrum reaching the surface. Subsequently, he became a leading scientist in the field of ozone research. He provided the first reliable ozone profile data using Umkehr measurements, which continue to be routinely measured at Arosa since the 1950s. Our study of the changeable history of Swiss ozone measurements demonstrates that the continuation of ozone measurements over this long period is remarkable. Among the most important factors are the strong engagements of atmospheric scientists, such as F.W.P. Götz and his graduate student H.U. Dütsch, both of whom made important contributions to ozone research.