Geophysical Research Abstracts
Vol. 18, EGU2016-17820, 2016
EGU General Assembly 2016

20 years of surface ozone measurements at El Tololo, Chile (2200 m asl)

Julien Gérard Anet, Martin Steinbacher, Lukas Emmenegger, and Brigitte Buchmann
Empa, Laboratory for Air Pollution/Environmental Technology, Dübendorf, Switzerland (julien.anet@empa.ch)

Globally consistent in situ-observations of high precision and known quality are one key element in understanding global climate change and effects of human activity on the Earth's atmosphere. The spatial coverage of available data strongly depends on the species of interest and varies highly around the globe. In case of surface ozone (O_3), the observational network is particularly sparse in Africa, Asia, and South America.
The southern hemispheric pristine GAW-regional station "El Tololo", located in the foothills of the Chilean Andes (30.17° S, 70.80° W, 2220 m asl), has been equipped with an ozone photometer in 1995 and has since then been measuring tropospheric ozone permanently. However, these measurements were neither entirely systematically processed nor quality-controlled until recently. This situation was drastically improved in 2015 the framework of the Capacity Building and Twinning for Climate Observing Systems (CATCOS) project (www.meteoswiss.ch/catcos). Empa, in coordination with the local operator, Dirección Meteorológica de Chile (DMC), and the University of Santiago, revised the entire surface ozone measurements. The unique 20-year-long ozone data-set has been made publicly available on the World Data Centre for Greenhouse Gases (WDCGG, Japan) in mid-2015 and represents an exceptional piece of information on the southern hemispheric surface ozone distribution.
In contrary to northern hemispheric stations, the positive trend in the measurements of tropospheric ozone at "El Tololo" did not level off in the recent past. More specifically, "El Tololo" shows a steady positive trend of 0.7 ppb/decade in agreement with other stations on the Southern hemisphere. However, the seasonal cycle differs strongly in behaviour, as maximum values in ozone do not peak in austral winter, but in austral spring – most probably due to stratospheric influence. We also find that the spring maximum has a retrograding tendency of around 5 days per decade. A combined analysis of SHADOZ ozone soundings and GAW surface ozone measurements of the southern hemisphere shows two general trends, which are confirmed by the El-Tololo-dataset: With increasing altitude, the maximum values of the seasonal cycle occur earlier in the year. On the other hand, the amplitude between lowest and highest values decreases with increasing latitude.
The presentation will provide a comprehensive overview of the extensive analysis of the perennial O_3 record at "El Tololo" in comparison with other southern hemispheric monitoring stations. The contributions from stratosphere-troposphere-exchange, from variations in the tropospheric background, and from photochemical production will be discussed to identify and quantify the key processes driving the variations of surface ozone concentrations at this remote and elevated location in the southern hemisphere.