Geophysical Research Abstracts
Vol. 20, EGU2018-17896-1, 2018
EGU General Assembly 2018

Stability of Network for the Detection of Atmospheric Composition Change ground-based measurements of stratospheric ozone

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For more than 25 years, stations of the Network for the Detection of Atmospheric Composition Change (NDACC, www.ndacc.org) have been running differential absorption lidars and microwave radiometers. These provide routine ground-based measurements of stratospheric ozone profiles. Here, based on time series of monthly mean ozone from 1997 to 2017, we look at long-term stability and consistency for the instruments at the NDACC stations Lauder (New Zealand, 45.0°S, 169.7°E, microwave since 1992, lidar since 1994), Mauna Loa (Hawaii, 19.5°N, 155.6°W , lidar since 1993, microwave since 1995), Haute Provence (France, 43.9°N, 5.7°E, lidar since 1985), Bern (Switzerland, 46.9°N, 7.5°E, microwave since 1994), Payerne (Switzerland, 46.8°N, 7.0°E, microwave since 2000), and Hohenpeissenberg (Germany, 47.8°N, 11.0°E, lidar since 1987). Generally, good agreement is found at altitudes between 25 and 40 to 45 km. The best consistency, agreement within ±5 to 10% or better, and the best stability, non-significant drifts smaller than 3% per decade, are found for Mauna Loa and Lauder, where lidars and microwaves are operated at the same station. Most lidars become less reliable above 40 to 45 km altitude. Comparison between the Central European stations indicates consistency of monthly means within ±5 to 15% in most cases and inter-instrument drifts that are usually not significant and smaller than 5% per decade. However, geophysical differences do influence these estimates, even though the European stations are all within a few hundred kilometres. In the presentation we will try to identify problematic time periods that appear consistently for specific instruments and periods. We will also discuss the achievable accuracy for ozone trend analyses using these ground-based data, and their use in the validation of satellite instruments and chemistry-climate-prediction models.