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Coherence of longterm stratospheric ozone time series for the study of ozone recovery in the northern mid-latitudes

Prijitha J. Nair, Sophie Godin-Beekmann, and Andrea Pazmino
LATMOS/CNRS, UPMC, Paris, France (gopalapi@aero.jussieu.fr / 00 33 1 44 27 37 76)

Since mid-to late 1980s decreasing amounts of ozone concentration has been observed in northern mid-latitudes mainly due to the ozone depleting chlorofluorocarbon loading in the stratosphere. Recent works indicate the stabilization of ozone loss in the mid-latitudes, in the upper stratosphere in particular. In order to further investigate the evolution of ozone in the mid-latitudes, a coherent dataset is required. As a first step, we diagnose the long term evolution of ozone at Observatoire de Haute Provence (OHP – 43.93°N, 5.71°E), one of the northern mid-latitude stations. In this study, we present the inter comparison of ozone measurements from OHP LIDAR with collocated SBUV, SAGEII, HALOE, MLS and GOMOS satellite observations as well as the ground based Ozonesondes and Umkehr measurements. A detailed statistical study on the relative differences of the compared measurements is performed to check any specific drifts with time. In addition, the seasonal and annual averages of the relative deviations are also checked to quantify agreement among the data. On average, all instruments show their best agreement with LIDAR between 20 and 40 km, where the differences are within 5%. The agreement with SAGEII measurements are remarkably good since it falls within 1% at 17-41 km. A similar result is also found from the Ozonesondes comparison at 22-31 km. Most comparisons exhibit slightly larger deviations below 20 and above 42 km, of about 10%. The LIDAR masurements are also compared to Umkehr measurements by converting its ozone number density to Dobson units for each Umkehr layer. The analysis reveals a negative bias in Umkehr data within -10% except at layer 6 (around 30 km).