Comparison of ozone profiles from the Ozone Mapping and Profiles Suite with ozonesonde measurements over Antarctica during 2012-2019

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The Ozone Mapping and Profiles Suite (OMPS), in orbit since October 2011 as a part of the Suomi National Polar-orbiting Partnership (Suomi NPP) Satellite includes three different spectral instruments for retrieving ozone distributions globally. One of those is the Limb Profiler (LP), which has made measurements since February 2012. The LP retrieves ozone profiles between approximately 12 km and 55 km of height.

Here we compare the OMPS LP version 2.5 ozone profiles with Electrochemical Concentration Cell (ECC) ozonesonde measurements from three Antarctic stations during the period 2012-2019: Marambio Station (-64.2413, -56.6266) on the Antarctic Peninsula, and Syowa Station (-68.3040, 49.6443) and Davis Station (-68.3110, 75.0222) in East Antarctica. The ozonesonde profiles include ozone concentration from the surface to an altitude of about 30 km. Thus, our comparisons are for altitudes of about 12 to 27 km.

During the period of highest ozone concentration (December – April), mean relative differences between OMPS LP and ozonesonde concentration typically change with height, ranging from -10% at 12-17 km altitude to 10% at 27 km altitude with slight variation between the three sites (e.g. Marambio has a higher standard deviation of 35% at 12 km). A mean relative difference of -5% is found for Syowa from about 15 km to 24 km, unlike Marambio and Davis, which have no clear difference at these heights.

Relative differences were also examined in September, when ozone concentrations are significantly lower due to the formation of the ozone hole, except for September 2019, which is excluded because a sudden stratospheric warming effect occurred. A mean relative difference of almost 30% is found in Marambio and Davis from about 12 km to 21 km, with a standard deviation of 100% at 18 km. The mean relative difference at Syowa is similar except that the relative difference peaks at almost 60% at 16 km. Marambio and Davis have similar biases above 21 km (10%), while the bias at Syowa is -5%.

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