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Comparison of ground-based 11.072 GHz microwave observations of Arctic polar MLT ozone with SABER datasets

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Ground-based observations of the ozone (O_3) emission line at 11.072 GHz have been made using the Ny Ålesund Ozone in the Mesosphere Instrument (NAOMI) at the UK Arctic Research Station (latitude 78°55'0" N, longitude 11°55'59" E). Seasonally-averaged O_3 vertical profiles in the mesosphere-lower thermosphere (MLT) region from 15 August 2017 to 15 March 2020 have been retrieved over the altitude range 62–98 km. NAOMI measurements are compared with overlapping Sounding of the Atmosphere using Broadband Emission Radiometry (SABER) satellite observations. The NAOMI and SABER data are binned into 3-month nominal 'winter' (15 December–15 March), 'autumn' (15 August–15 November), and 'summer' (15 April–15 July) periods. The NAOMI observations show the same year-to-year and seasonal variabilities as the SABER 9.6 μm O_3 data, and winter night-time and twilight volume mixing ratio (VMR) profiles agree to within the measurement uncertainties. However, for autumn twilight conditions the SABER 9.6 μm O_3 secondary maximum VMR is more than 50% higher than NAOMI. Comparing the two SABER channels which measure O_3 at different wavelengths and use different processing schemes, the 9.6 μm O_3 autumn twilight VMR values for 2017–19 exceed the corresponding 1.27 μm data with the largest difference (58%) in the 65–95 km altitude range similar to the NAOMI observation. Summer daytime SABER 9.6 μm mesospheric O_3 VMR is also consistently higher than the 1.27 μm measurement, confirming previously reported differences between SABER 9.6 μm measurements and those made by other satellites.