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# Stratospheric and mesospheric diurnal wind cycle from microwave Doppler wind measurements

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The microwave wind radiometers WIRA and WIRA-C are capable of measuring horizontal wind speeds between 30 and 70 km altitude. They observe the 142 GHz ozone rotational emission line and exploit the Doppler shift introduced by the moving air as well as the pressure broadening effect to retrieve altitude resolved wind profiles. Passive microwave instruments work independent of daylight and clouds and operate autonomously, which makes them especially suitable for continuous observations. Since 2015, both instruments have provided continuous time-series from campaigns at tropical, arctic and mid- latitudes (La Réunion Island, 21 °S; Andøya, 69 °N; Bern, 46 °N). These continuous wind measurements have proven to coincide well with models and Doppler-Lidar measurements. Due to receiver noise, the time resolution for these instruments is typically limited to 12 to 24 hours, which is well-suited to observe seasonal cycles and extreme events like sudden stratospheric warmings.
Because WIRA and WIRA-C operate independent of daylight and are not influenced by light clouds, it is compelling to further use their measurements to gain characteristics of the daily cycle of horizontal wind speeds. Using different integration schemes and retrieval methods, we now extract seasonally averaged diurnal wind patterns from existing microwave measurements in altitudes between 30 and 70 km.
We present the extracted parameters of the diurnal wind cycle as well as the underlying measurements from different campaigns and compare those to the ECMWF, MERRA and SD-WACCM atmospheric models.