

Results from stratospheric and mesospheric wind measurement campaigns from tropical, polar and mid-latitudes by microwave radiometry

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Passive Doppler microwave wind radiometry is a unique method to continuously measure wind profiles in the stratosphere and mesosphere. Currently, two instruments are operational, namely WIRA (WIInd RAdiometer) and WIRA-C (WIInd RAdiometer for Campaigns). Both instruments observe the rotational emission line of ozone at 142 GHz and exploit the classical Doppler shift introduced to this emission line due to the movement of the emitting molecules with the air flow. Thanks to the pressure broadening effect, altitude resolved wind profiles can be obtained between 30 and 70 km altitude. Currently, WIRA and WIRA-C are operated in the frame of the ARISE2 project that is funded by the European Commission Horizon 2020.

Since the development of microwave wind radiometry, the two instruments WIRA and WIRA-C have accomplished several campaigns in tropical, polar and mid-latitudes. We present a total of over 60 months of zonal and meridional wind measurements acquired between 2012 and 2018. This includes measurements from campaigns at the Observatoire de Haute-Provence (44° N), the Maïdo observatory on La Reunion island (21° S) and the ALOMAR observatory in Andenes (67° N). We sum up the atmospheric events represented in our dataset like for example sudden stratospheric warmings, the annual cycle and signatures of tropical dynamics. Further we elaborate on the differences between our measurements and the ECMWF model data when comparing the continuous time series for the different latitudes. In addition we compare our measurements to point-in-time measurements from the co-located lidar systems.