

File Revision Date:

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Data Set description:

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Instrument: WInd RAdiometer for Campaigns WIRA-C
Measurement Quantities: Horizontal wind speed profiles

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Reference Articles:

Rüfenacht, R.; Kämpfer, N.; Murk, A. First Middle-Atmospheric Zonal Wind Profile Measurements with a New Ground-Based Microwave Doppler-Spectro-Radiometer. *Atmospheric Measurement Techniques* 2012, 5, 2647-2659.

<https://doi.org/10.5194/amt-5-2647-2012>.

Rüfenacht, R.; Murk, A.; Kämpfer, N.; Eriksson, P.; Buehler, S. a. Middle-Atmospheric Zonal and Meridional Wind Profiles from Polar, Tropical and Midlatitudes with the Ground-Based Microwave Doppler Wind Radiometer WIRA. *Atmospheric Measurement Techniques* 2014, 7 (2012), 4491-4505.

<https://doi.org/10.5194/amt-7-4491-2014>.

Rüfenacht, R.; Hocke, K.; Kämpfer, N. First Continuous Ground-Based Observations of Long Period Oscillations in the Vertically Resolved Wind Field of the Stratosphere and Mesosphere. *Atmospheric Chemistry and Physics* 2016, 16 (8), 4915-4925. <https://doi.org/10.5194/acp-16-4915-2016>.

Rüfenacht, R.; Kämpfer, N. The Importance of Signals in the Doppler Broadening Range for Middle-Atmospheric Microwave Wind and Ozone Radiometry. *Journal of Quantitative Spectroscopy and Radiative Transfer* 2017, 199, 77-88.
<https://doi.org/10.1016/j.jqsrt.2017.05.028>.

Rüfenacht, R.; Baumgarten, G.; Hildebrand, J.; Schranz, F.; Matthias, V.; Stober, G.; Lübken, F.-J.; Kämpfer, N. Intercomparison of Middle-Atmospheric Wind in Observations and Models. *Atmos. Meas. Tech.* 2018, 11 (4), 1971-1987.
<https://doi.org/10.5194/amt-11-1971-2018>.

Instrument description:

The WInd-RAdiometer (WIRA) is a microwave radiometer developed at the University of Bern which observes the pressure-broadened emission line of ozone at 142.2 GHz. It needs only a power and internet connection for its automated and remote controlled operation. The instrument has an uncooled heterodyne receiver with an SSb noise temperature of 800 K. The spectral analysis of the signal is performed with a FFT spectrometer based on a Universal Software Radio Peripheral (USR P X310) receiver. It has two independently tuneable input channels with 2x120 MHz instantaneous bandwidth and 12.2 kHz resolution. One of these channels remains tuned to the center of the Ozone line, while the second observes the line wing for the tropospheric correction. The spectrometer and measurement PC are operated in the laboratory. The instrument's field-of-view is switched alternating between the four cardinal directions (N, E, S, W) at 22' elevation, and it is calibrated using an external hot load and a zenith view.

Retrieval algorithm:

The Doppler shift of the pressure broadened ozone lines is used to retrieve vertical profiles of the zonal and meridional wind speeds at altitudes between 35 to 70 km. The retrieval is based on the radiative transfer program ARTS2 (Eriksson et al., 2011) using an optimal estimation method (Rodgers, 1976). The standard retrieval uses an a-priori wind speed of 0 m/s and an a-priori Ozone profile based on WACCAM simulations. The retrieval has a vertical resolution in the order of 15 km and a time resolution of 12 h.

Accuracy:

The uncertainty of the retrieved wind profiles is in the order of 15 - 25 m/s.
The results have been validated by comparisons with Doppler wind lidar and ECMWF data.

Instrument History:

Haute Provence:	11/2012 - 06/2013
Maido, La Reunion:	08/2013 - 02/2015
Andoya:	04/2016 - 01/2018
Bern:	04/2018 - ongoing