

# WegenerNet Climate Station Network: Recent developments and results

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A R S C I S Y S

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## WegenerNet - Brief Overview

### a) Feldbach Region (FBR)

- 153 meteorological stations within ~22 km x 15 km area
- parameters: air temperature, relative humidity, precipitation, wind and soil moisture
- 5 minute sampling
- automatic processing system (data transfer, quality control, generation of weather and climate data products)
- interpolated regular grids for main parameters (200 m x 200 m UTM)
- data provided at data portal ([www.wegener.net](http://www.wegener.net))
- data available since January 1, 2007

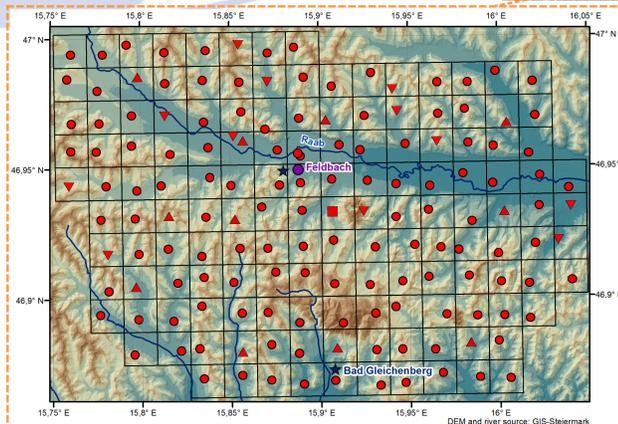


Fig. 2a: WegenerNet Feldbach Region (~22 km x 15 km, mean alt. ~330 m) and station locations in the station grid. ZAMG stations are marked by stars, stations with wind sensors by upward looking triangles and stations with soil sensors by downward looking triangles.

### b) Johnsbachtal (JBT)

- 11 meteorological stations (plus 1 hydrographic station)
- stations operated by Wegener Center and several partner organizations
- alpine setting, altitudes ranging from below 700 m to over 2100 m
- parameters: air temperature, relative humidity, precipitation, wind, radiation, and snow depth
- 10 minute sampling
- quality controlled data provided via data portal
- data available since January 1, 2007

Fig. 1: Location of study areas (JBT: yellow rectangle, FBR: orange) and weather radar Zirbitzkogel (blue dot).

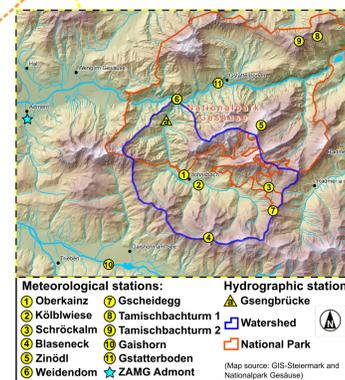


Fig. 2b: WegenerNet Johnsbachtal area (~22 km x 17 km) and station locations.

Further information, data access and references: [www.wegcenter.at/wegenernet](http://www.wegcenter.at/wegenernet)

## Evaluation of high-resolution Precipitation Data (rapid-INCA)

A ZAMG-led study<sup>1</sup>, published in spring 2015, takes advantage of the high station density of the WegenerNet FBR to evaluate the skill of high-resolution and frequently updated precipitation analyses (rapid-INCA). Rapid-INCA combines weather radar data with rain gauge data to get 5-minute precipitation sums at a higher accuracy than radar or gauge data alone would achieve.

An evaluation over the convective season 2011 found a general underestimation of rapid-INCA with a relative bias exceeding -50 % for precipitation rates >0.5 mm/5 min, resulting from an even larger bias in the underlying weather radar data.

Figure 3 to the right shows examples of rapid-INCA based 2 h precipitation sums on 4 different days. The WegenerNet FBR is marked by a small black rectangle. The images demonstrate WegenerNet's ability to cover the details of convective precipitation structures.

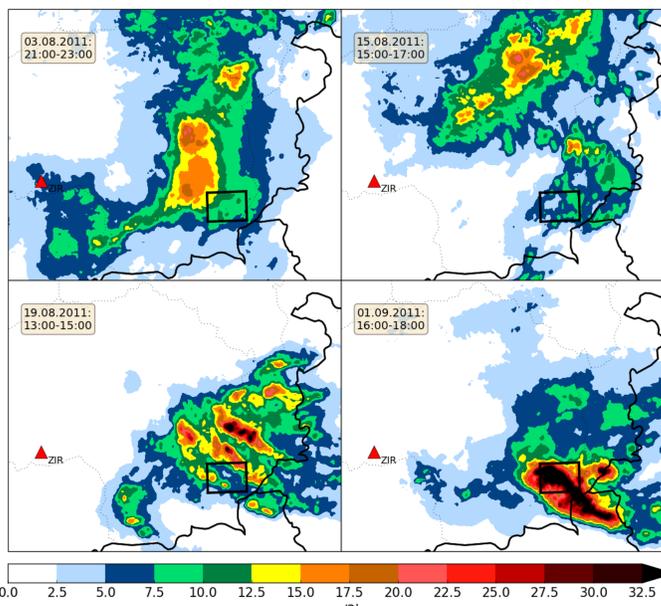


Fig. 3: 2 h rapid-INCA based precipitation sums on 4 different days. The WegenerNet FBR is marked by a small black rectangle, the red triangle represents the weather radar (Zirbitzkogel) within this zoom (from the study<sup>1</sup> of Kann et al., 2015).

<sup>1</sup>Kann, A., I. Meirold-Mautner, F. Schmid, G. Kirchengast, J. Fuchsberger, V. Meyer, L. Tüchler, and B. Bica (2015): Evaluation of high-resolution precipitation analyses using a dense station network. Hydrol. Earth Syst. Sci., 19, 1547-1559, doi:10.5194/hess-19-1547-2015

## Network Cooperations

- Long-Term Ecosystem Research Network (LTER), [www.lter-europe.net](http://www.lter-europe.net)
- International Soil Moisture Network (ISMN), [ismn.geo.tuwien.ac.at](http://ismn.geo.tuwien.ac.at)
- Precipitation Measurement Missions (PMM), [pmm.nasa.gov](http://pmm.nasa.gov)
- LINET lightning detection network ([www.nowcast.de](http://www.nowcast.de))



## Calibration of Weather Radar Data

Using the FBR network's high resolution, the relation between Weather Radar reflectivity (Z) and rain rate on the ground (R) can be derived for single radar images (5-minute time step). Figure 5 (below) shows an example of such a Z-R-relation. In this example, data from the C-band Zirbitzkogel radar are used. The radar is located at an altitude of 2372 m at a distance of about 100 km west of the study area (location see Figs. 1 and 3).

The results, radar-derived precipitation data, visible in the lower row of Figure 4, resemble the spatial structure and intensity of the ground data (upper row of Fig. 4), which is indicated by the high correlation between the two datasets ( $r > 0.8$ ).

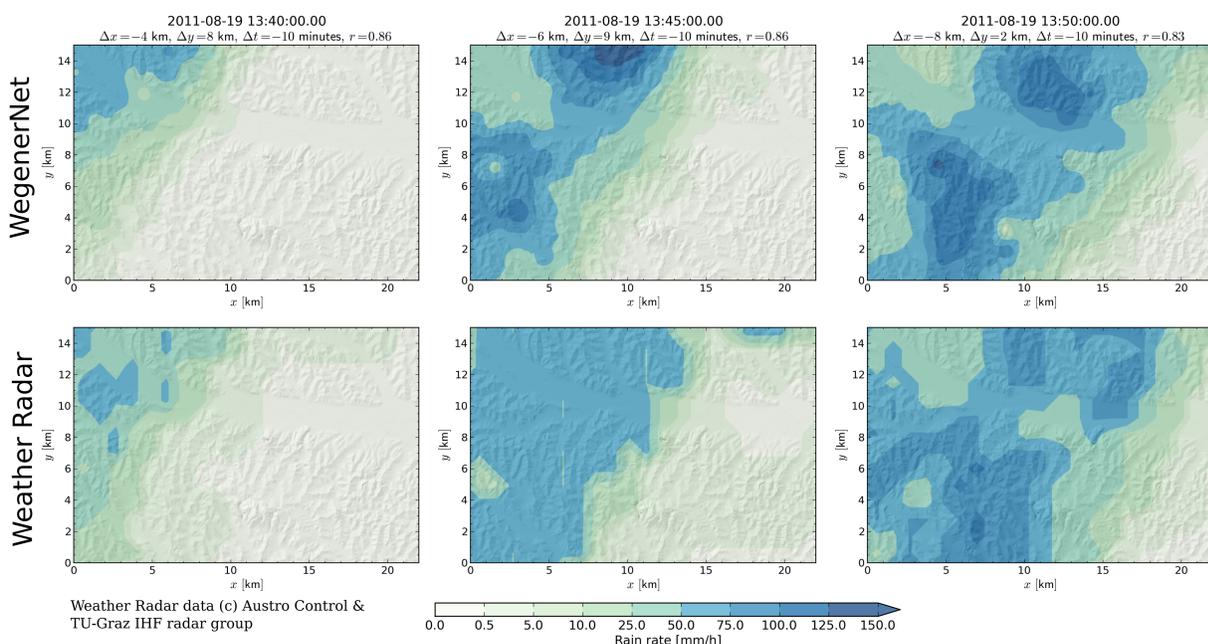


Fig. 4: Spatial grids of WegenerNet precipitation data (upper row) and radar-derived precipitation data (lower row) for a convective event on Aug. 19, 2011, 13:40 - 13:50 UTC. Spatial ( $\Delta x$ ,  $\Delta y$ ) and temporal ( $\Delta t$ ) shift of radar images w.r.t. the ground data, and correlation ( $r$ ) between images are noted above.

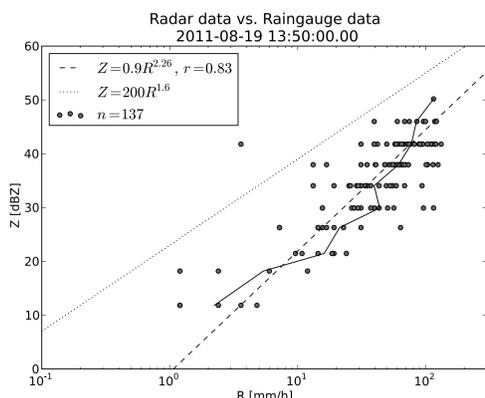


Fig. 5: Relation between raingauge data (R) and radar-reflectivity (Z) for a radar image from Aug. 19, 2011, 13:50 UTC. Each dot corresponds to a single WegenerNet station ( $n=137$ ). The solid line resembles the mean Z-R relation. The dashed line shows the linear regression over all values ( $Z=0.9R^{2.26}$ ,  $r=0.83$ ). For comparison, the Marshall-Palmer standard relation of  $Z=200R^{1.6}$  is plotted as a dotted line.