WegenerNet Climate Station Networks: Overview and Examples

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WegenerNet - Brief Overview

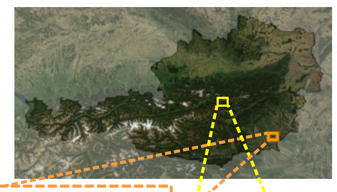

Fig. 1: Location of study areas (JBT: yellow rectangle, FBR: orange rectangle)

a) Feldbach Region (FBR)

LTER_EU_AT_029_002

- 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.wegenernet.org)
- data available since January 1, 2007

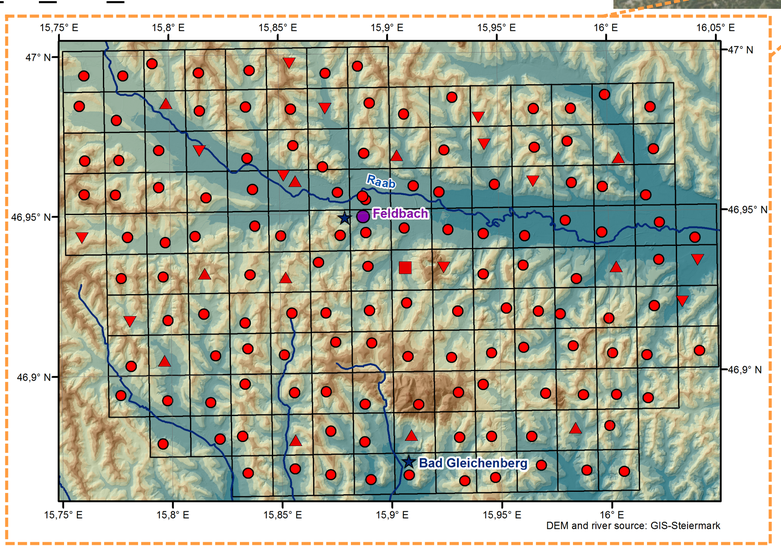

Fig. 2a: WegenerNet Feldbach Region (~22 km x 15 km, mean alt. ~330 m) and station locations in the station grid. ZAMG stations are marked by stars, stations with wind sensors by upward looking triangles and stations with soil sensors by downward looking triangles.

b) Johnsbachtal (JBT)

part of LTER_EU_AT_029_001

- 11 meteorological stations (plus 1 hydrographic station)
- stations operated by Wegener Center and several partner organizations (see logos below)
- 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 partly since October 2010, partly since January 1, 2007

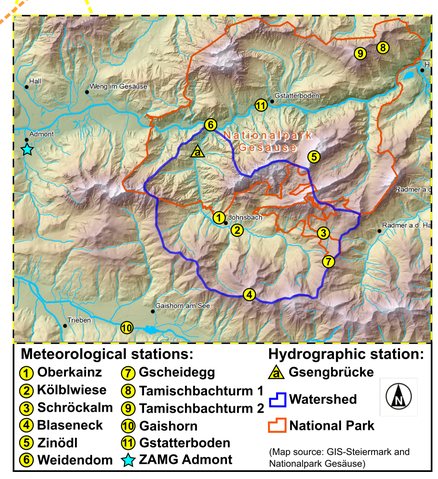

Fig. 2b: WegenerNet Johnsbachtal area (~22 km x 17 km, blue), station locations (yellow), and border of the Gesäuse National Park (red).

Further information, data access and references: www.wegcenter.at/wegenernet

Example 1: High-res Precipitation Data

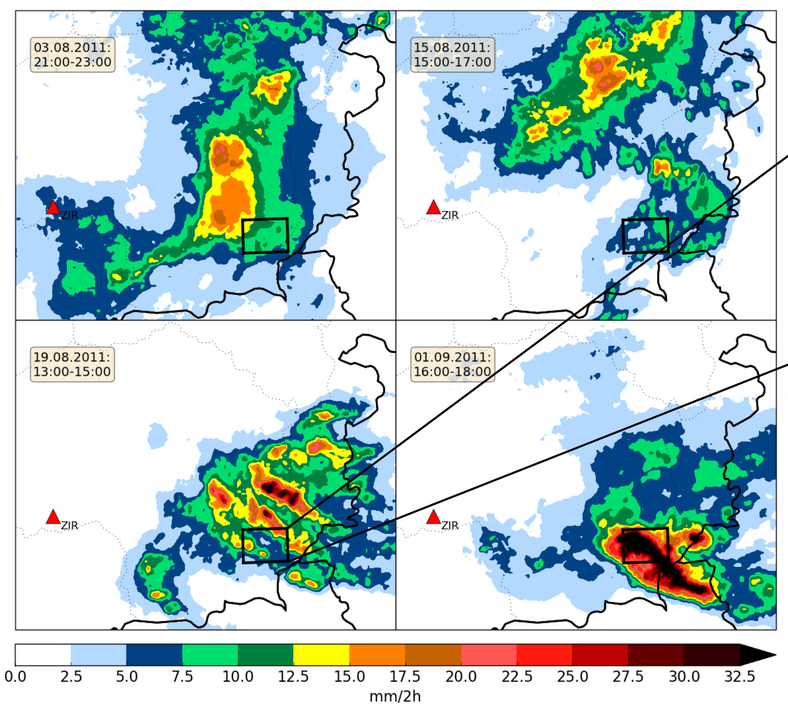

Fig. 3: 2-h precipitation sums based on ZAMG's rapid-INCA product. 4 different days in summer 2011 are shown. The WegenerNet FBR is marked by a small black rectangle. A direct comparison to WegenerNet data for Aug. 19 can be seen in Fig. 4 to the right.
The red triangle represents the weather radar Zirbitzkogel. This radar data, together with station data of ZAMG's TAWES-stations provide the source for rapid-INCA. Image taken from the study[1] of Kann et al., 2015.

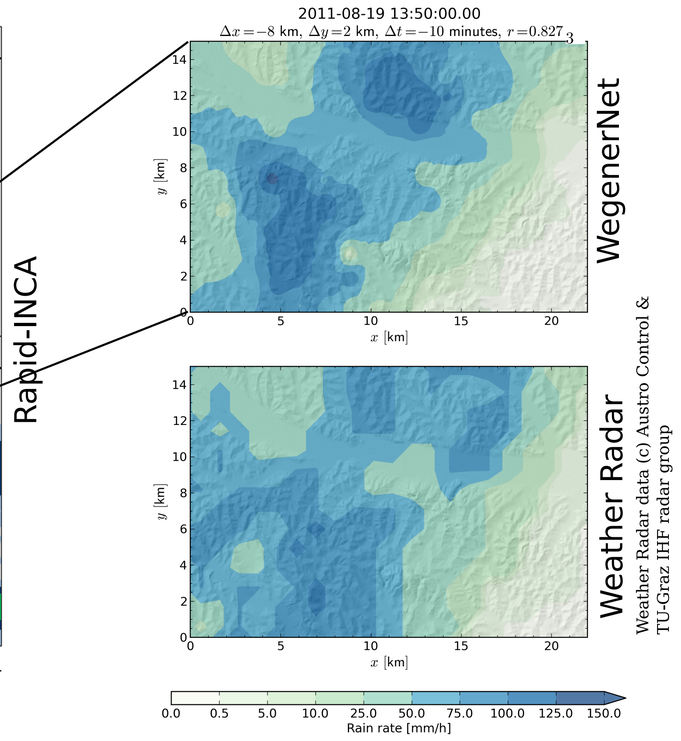

Fig. 4: Spatial grids of WegenerNet FBR precipitation data (upper image) and calibrated radar-derived precipitation data (lower image) for a convective event on Aug. 19, 2011, 13:50 UTC. Rain rates of more than 125 mm/h are reached for this 5-minute time period. A 2-h rainsum of this event can be seen in the lower left image of Fig. 3 to the left.

Johnsbachtal Partners

Grazer Integrative Geographie
Institut für Geographie und Raumforschung

NATIONALPARK GESÄUSE

ZAMG
Zentralanstalt für Meteorologie und Geodynamik

Das Land Steiermark

ÖBB

WegenerNet Cooperations

LTER Austria
Austrian Long-Term Ecosystem Research Network

NASA

LTSER Forschungsplattform Eisenwurzen

International Soil Moisture Network

References

Kirchengast, G., T. Kabas, A. Leuprecht, C. Bichler, and H. Truhetz (2014): WegenerNet: A pioneering high-resolution network for monitoring weather and climate. Bull. Amer. Meteor. Soc., 95, 227-242, doi:10.1175/BAMS-D-11-00161.1

[1]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

Example 2: Windfields

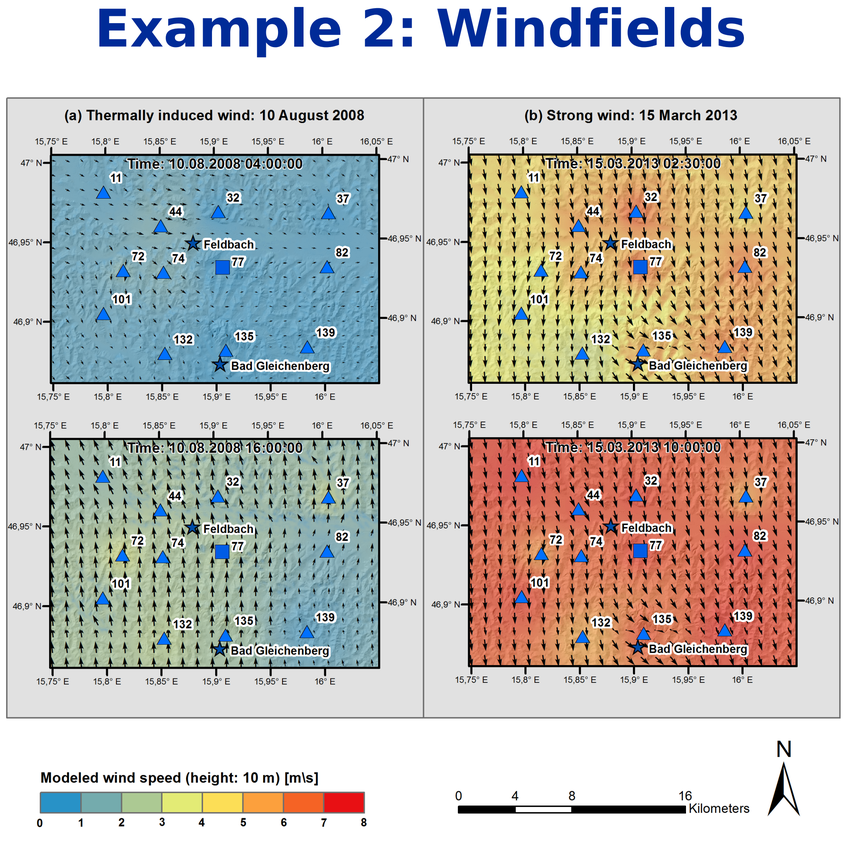

Fig. 5: High-resolution windfields derived from data of the 12 WegenerNet FBR wind stations (blue symbols). (a) Thermally induced (weak) wind on Aug. 10, 2008. Upper image: morning - down-valley mountain winds visible. Lower image: afternoon - wind flow towards the mountains of the eastern alps ('Antirandgebirgswind') visible. (b) Strong north wind on March 15, 2013. Upper image: 02:30 a.m., lower image: 10:00 a.m. Maximum mean wind speeds of around 8 m/s (28.8 km/h) at 10:00 a.m.

Example 3: Climatological Temperature Data

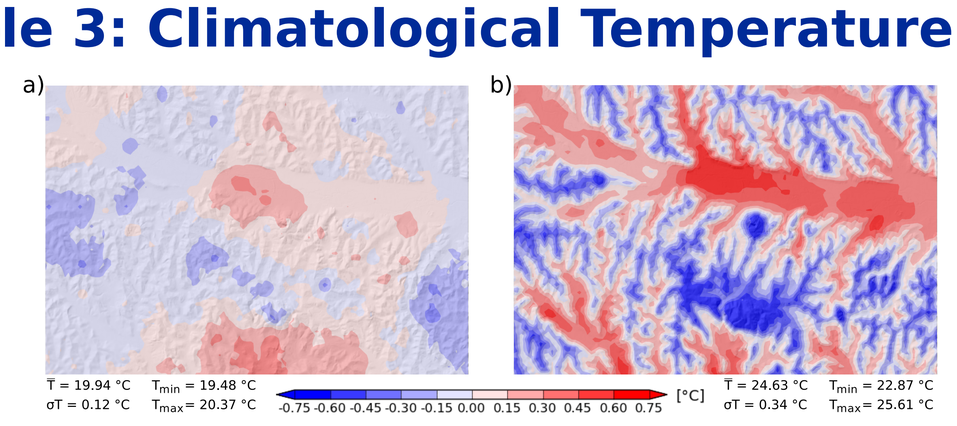

Fig. 6: Spatial grids of WegenerNet FBR climatological temperature data for July 2008. (a) Monthly-mean temperature anomaly. Urban heat island effects around cities of Feldbach (center) and Bad Gleichenberg (south) are visible. (b) Monthly-mean temperature anomaly after noontime (13:00-14:00 LT). Topography is clearly visible, with hotter valleys and cooler hilltops.

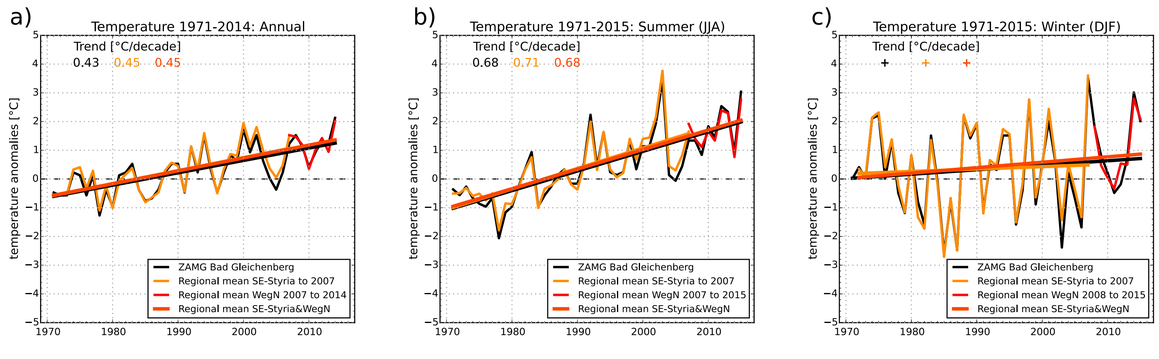

Fig. 7: Temperature anomalies and trends from 1971-2015. (a) Annual, (b) Summer (JJA), and (c) Winter (DJF). WegenerNet FBR data (red) was used for the time series since 2007. Summer trends are most pronounced (around 0.7 °C/decade, compared to 0.45 °C/decade annual trend, both statistically highly significant) while winter trends are not statistically significant having only a slight positive tendency.