

A unique dataset for investigating hydrological extremes: WegenerNet and the research laboratory region Raab catchment in southeastern Austria

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1 WegenerNet - Brief Overview

1.1 Feldbach Region (FBR)

- 154 meteorological stations within 23 km x 18 km area
- main 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 gridded data for main parameters (200 m x 200 m UTM)
- data provided at data portal www.wegenernet.org
- data available since January 1, 2007

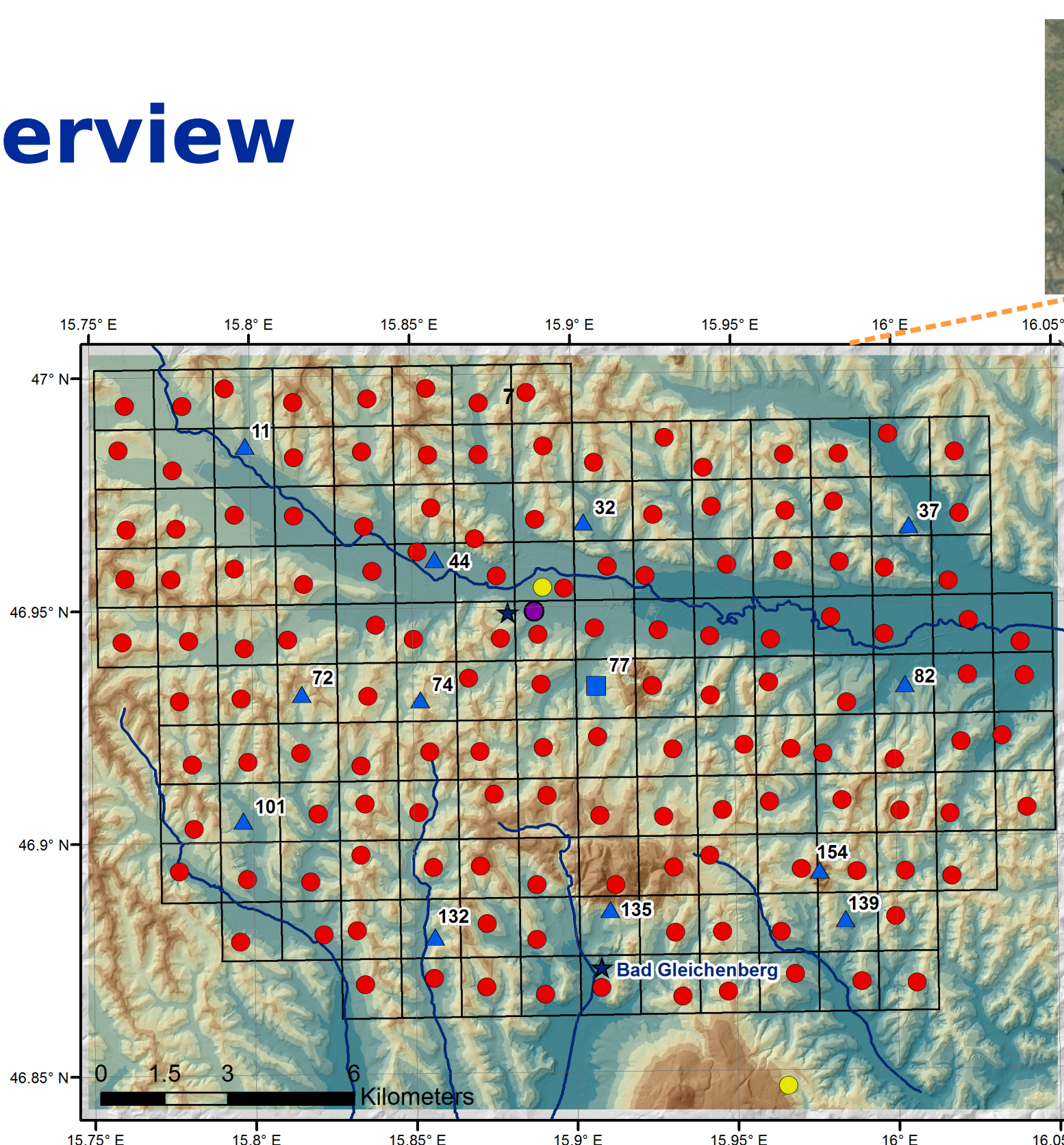


Fig. 1.1: WegenerNet Feldbach Region (23 km x 18 km, mean alt. ~330 m) and station locations in the station grid.



Fig. 1.3: Location of study areas in Austria (FBR: orange rectangle, JBT: yellow rectangle, Raab catchment: gray rectangle)

1.2 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
- main parameters: air temperature, relative humidity, precipitation, wind, radiation, and snow depth
- 10 minute sampling
- automatic processing system
- quality controlled data provided at data portal www.wegenernet.org
- data available partly since October 2010, partly since January 2007

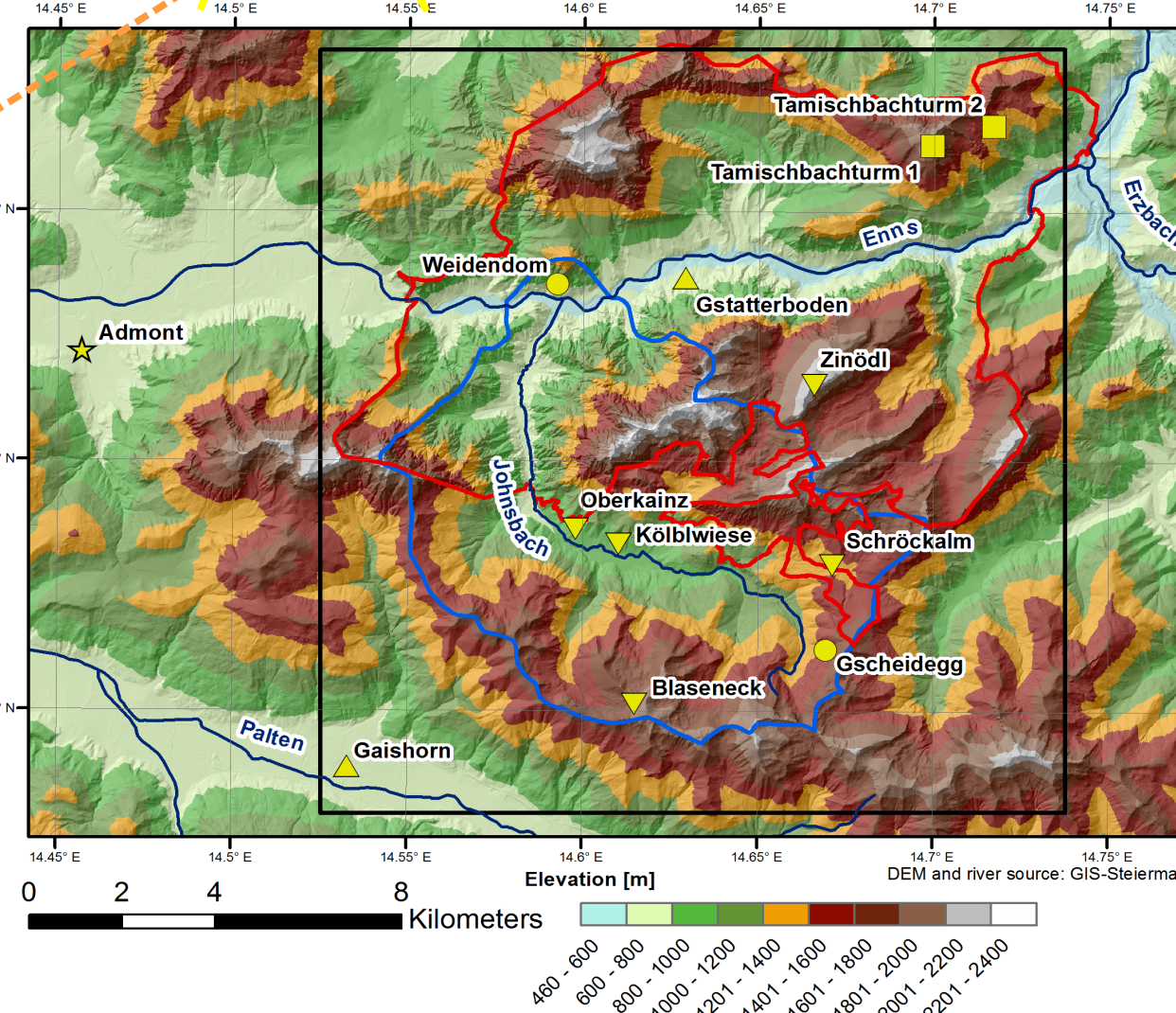
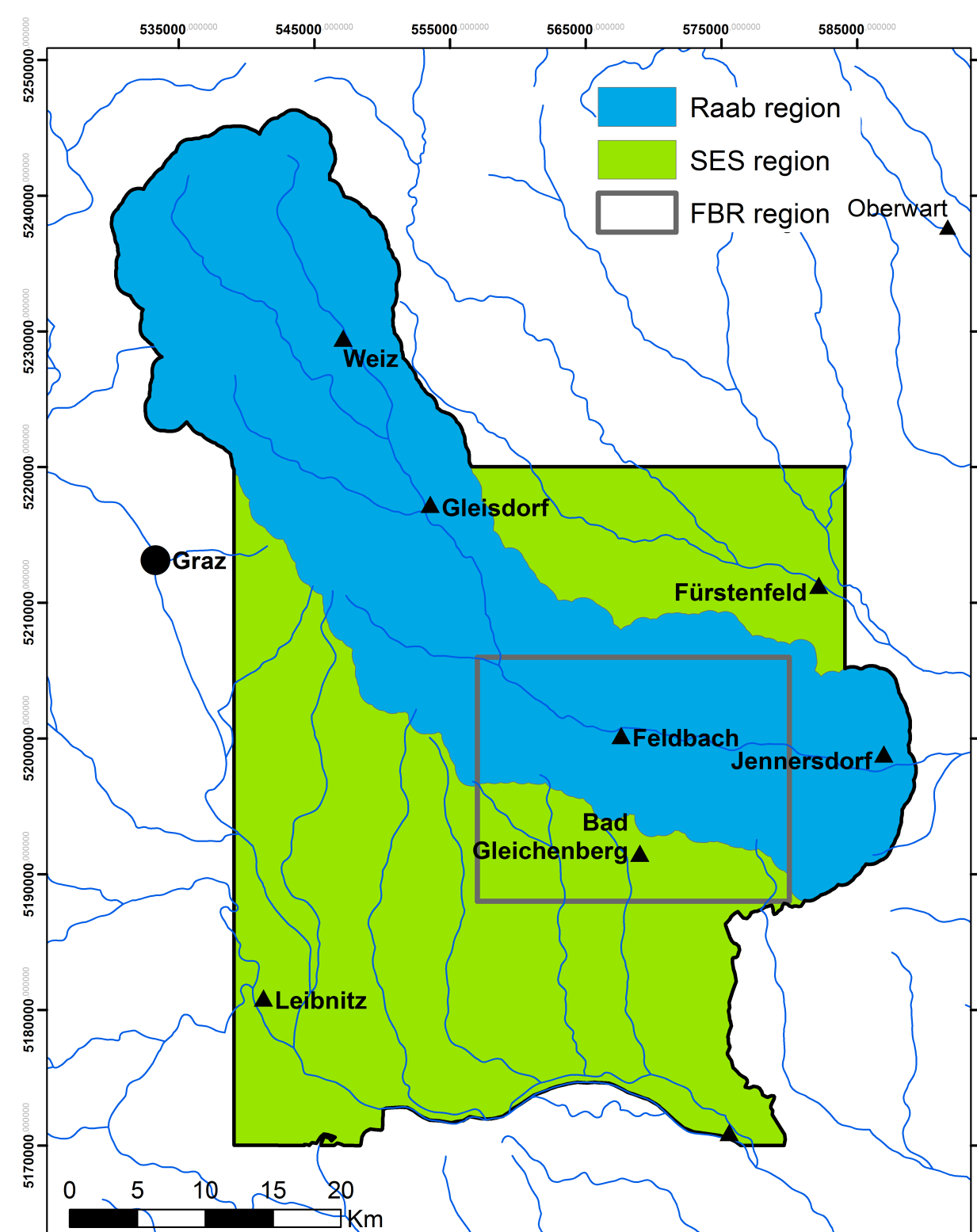


Fig. 1.2: WegenerNet Johnsbachtal area (16 km x 17 km, black rect.), station locations (yellow), catchment (blue), and border of Gesäuse National Park (red).

2 The Raab Catchment Hydro-pedologic Dataset (RCHD)

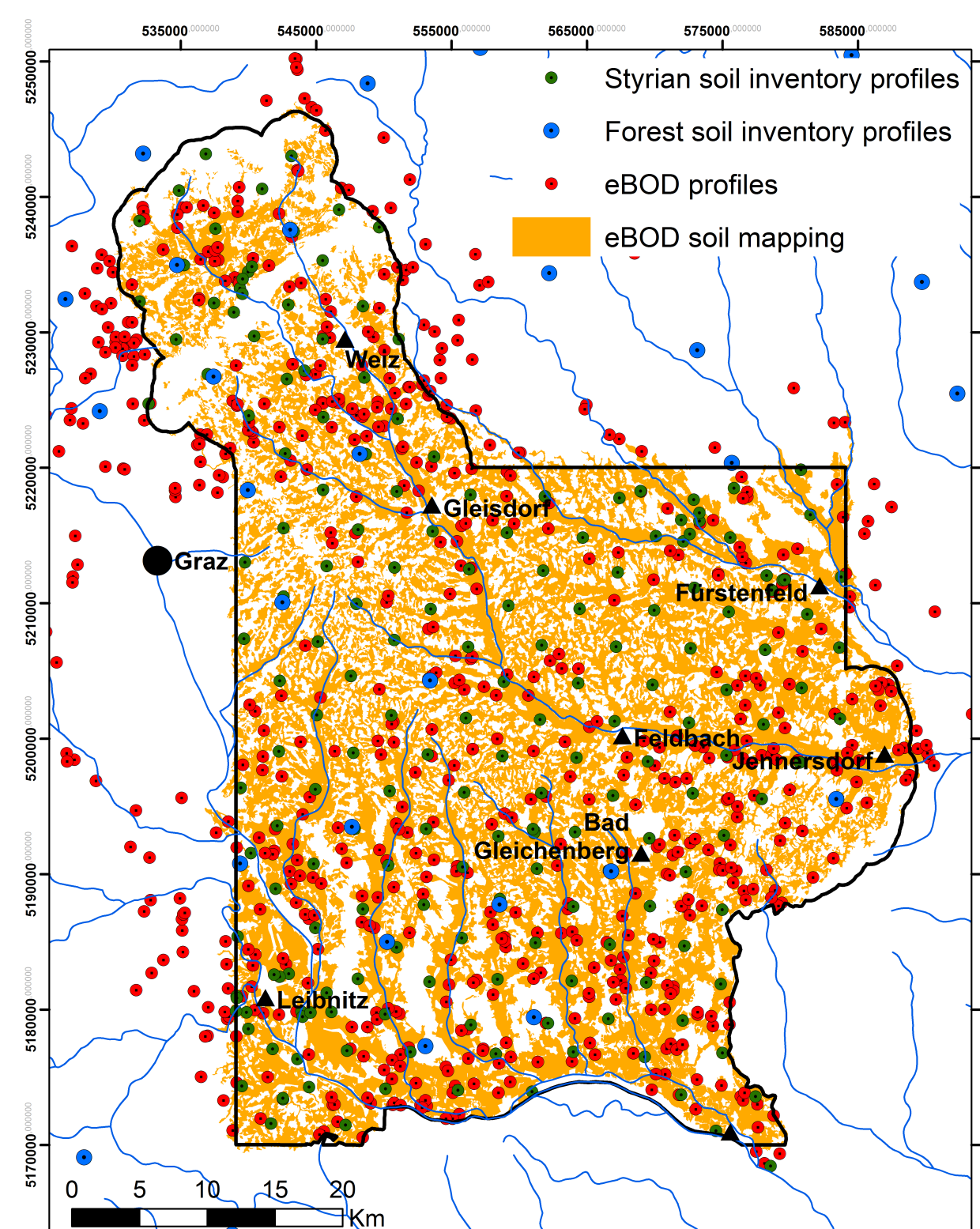
The **RCHD** is a set of hydrological and hydro-pedological characteristics with a resolution of 100 m x 100 m for the Raab catchment and the surrounding South-eastern Styria (SES) region.

2.1 Raab Catchment overview RCHD study areas



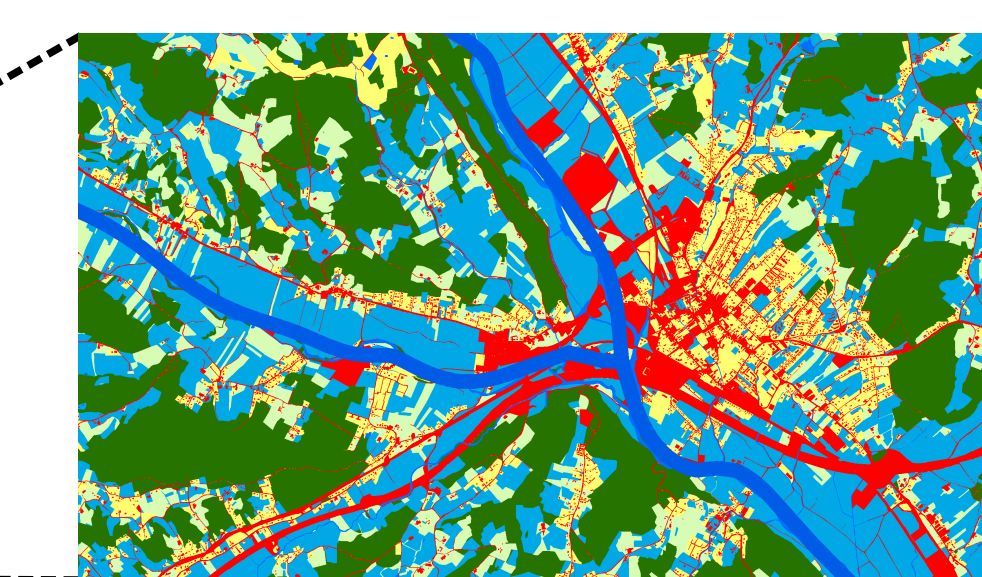
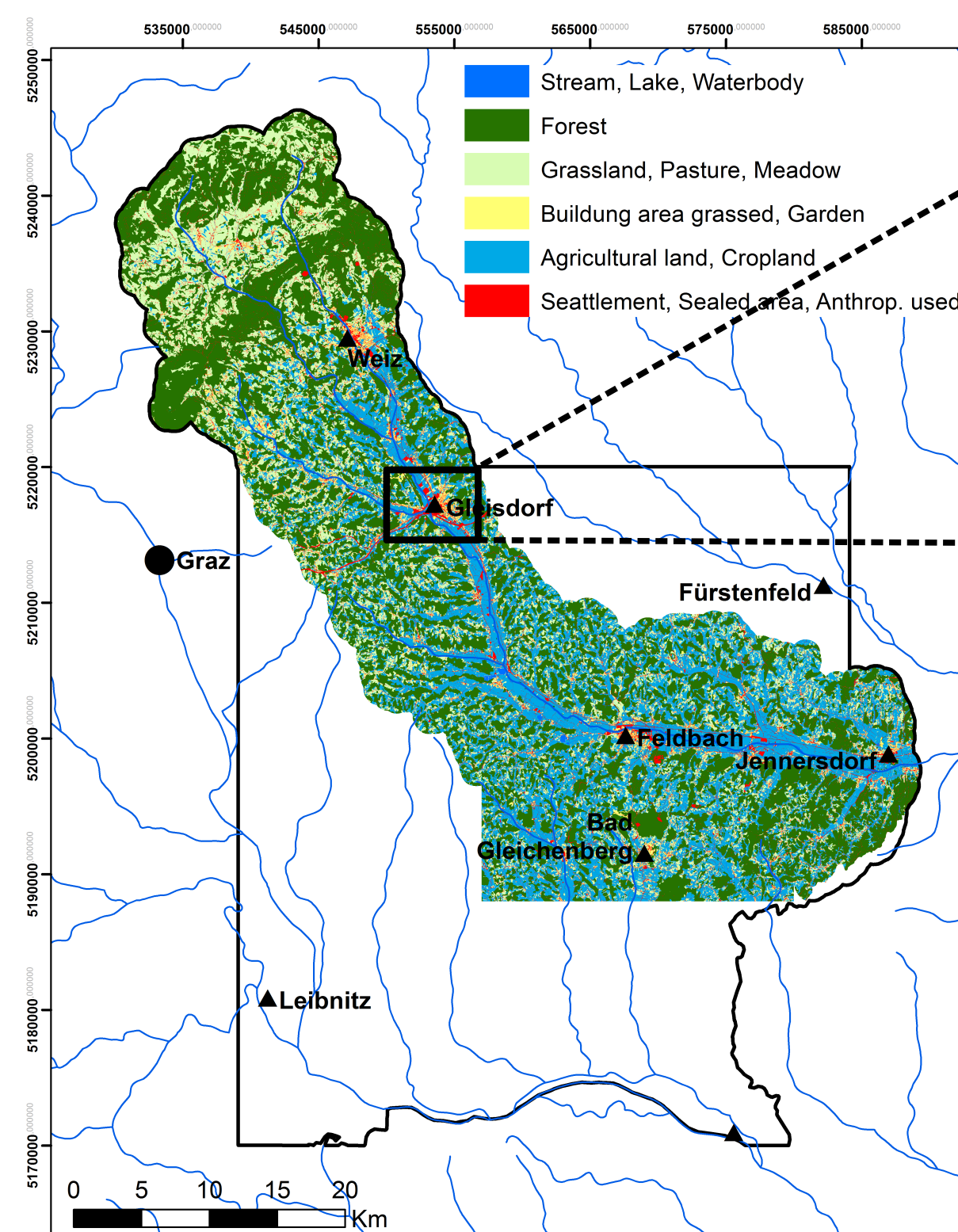
The Raab catchment (marked in blue in the above figure) covers an area of 987 km². It includes the highly instrumented WegenerNet FBR (gray rectangle) and is surrounded by the South Eastern Styria (SES) region. They serve as focus regions for investigating hydrological extremes.

2.2 Input Data Soil profiles and data



Soil data for the RCHD are taken from the digital soil archive eBod (yellow color and red circles, respectively), from the Styrian government's soil inventory profiles (Bodenzustandsinventur BZI, green circles), and from forest soil inventory profiles (Waldbodenzustandsinventur WBZI, blue circles).

Land use and land cover



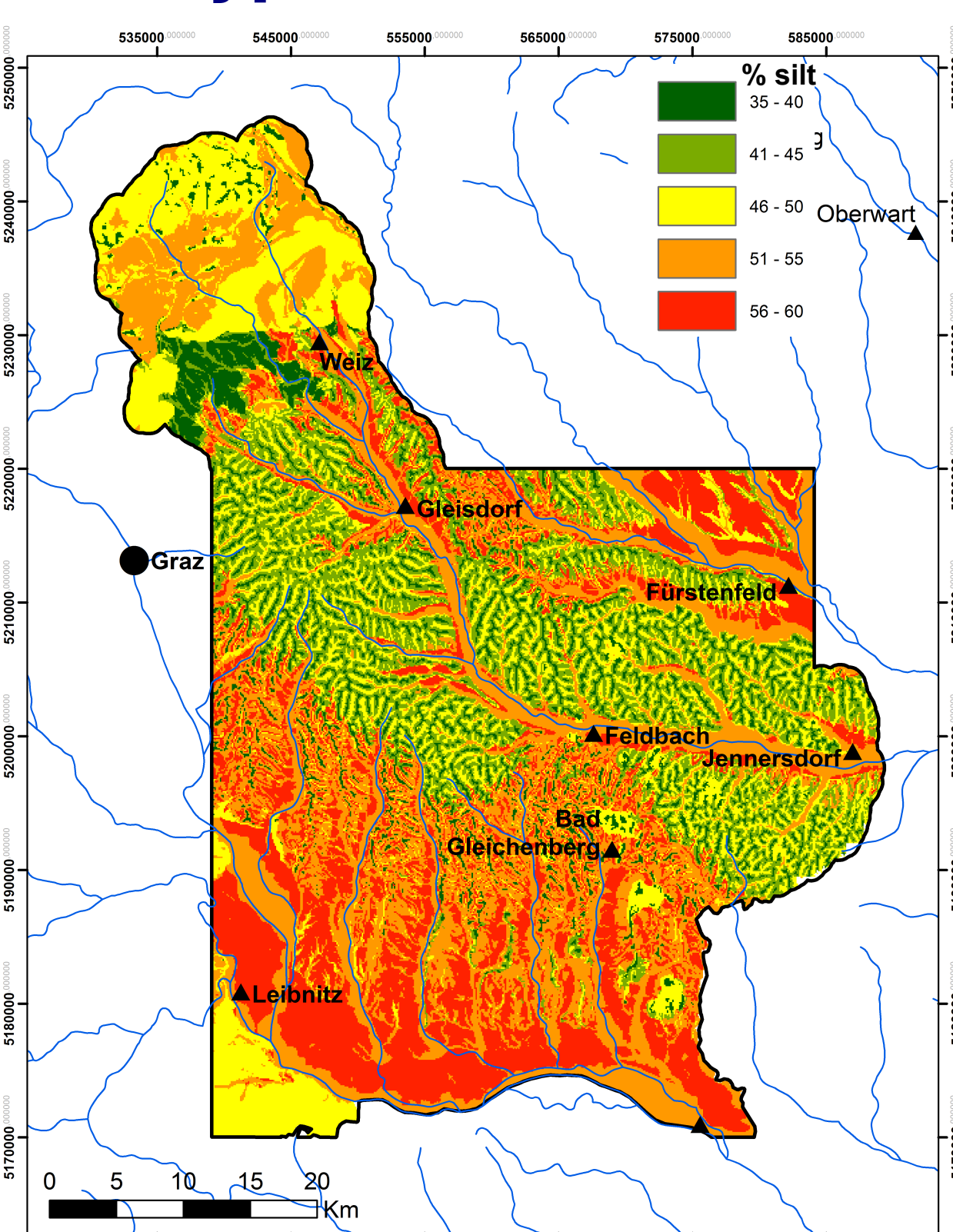
Detail of land use / land cover data for the city of Gleisdorf and surroundings

Further input data

- Geological data with 125 geological/lithological classes
- Austrian forest map (ÖWK) with 5 classes
- Digital elevation model (10 m resolution)

2.3 Output data

Soil type (silt content shown)



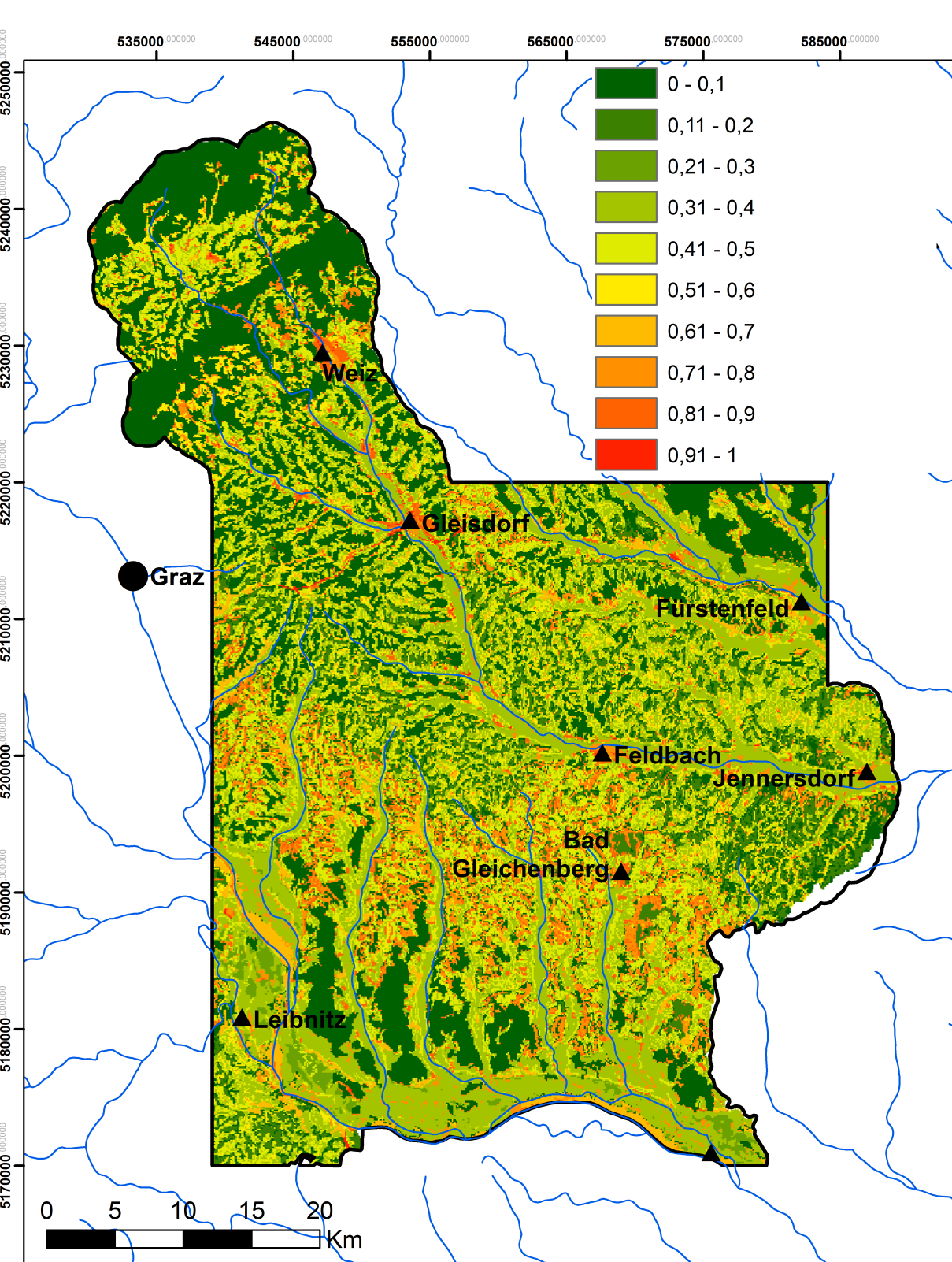
Soil type has been calculated as content of silt, clay and sand for three depth layers (0-20 cm, 20-50 cm, and >50 cm). The above image shows the modeled silt content of the 20-50 cm soil layer.

Hydro-pedologic data

- Saturated hydraulic conductivity k_{sat}
- Total pore volume
- Air capacity ($pF < 1.8$)
- Permanent wilting point ($pF = 4.2$)
- Available water capacity (nutzbare Feldkapazität nFK , $1.8 < pF < 4.2$)
- Mualem-Van Genuchten parameters Θ_r , Θ_s , α , and n
- Runoff coefficients
- Soil moisture distribution

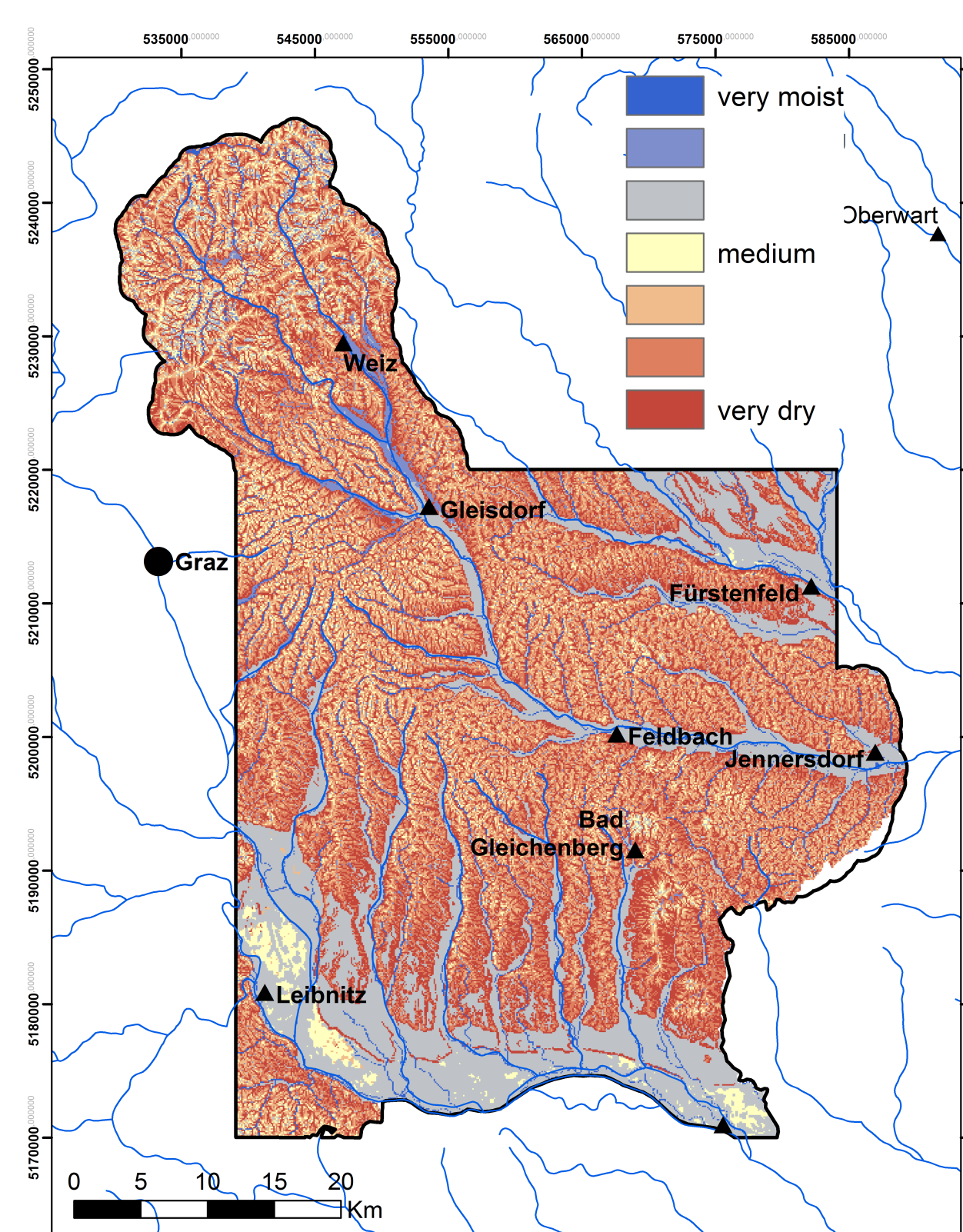
The values have been derived using a special pedotransfer function (see Klebinder et al. 2017 for references).

Surface runoff coefficient



Runoff coefficients were modeled using the HYDROBOD model (see Klebinder et al. 2017 for references). The model calculates runoff for various layers (infiltration, soil, and geology), for instance, surface runoff coefficients for a rain event (1 h, 64 mm) in the above map.

Soil moisture distribution



Distribution of soil moisture was also calculated using the HYDROBOD model. The final runoff coefficients were modeled using different precipitation and soil moisture scenarios including heavy precipitation with a frequency of up to 100 years.