



The WegenerNet 3D Open-Air Laboratory for Climate Change Research:

Data availability and case studies of extreme precipitation events

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2) Institute of Physics, University of Graz

3) Department of Geography and Regional Sciences, University of Graz



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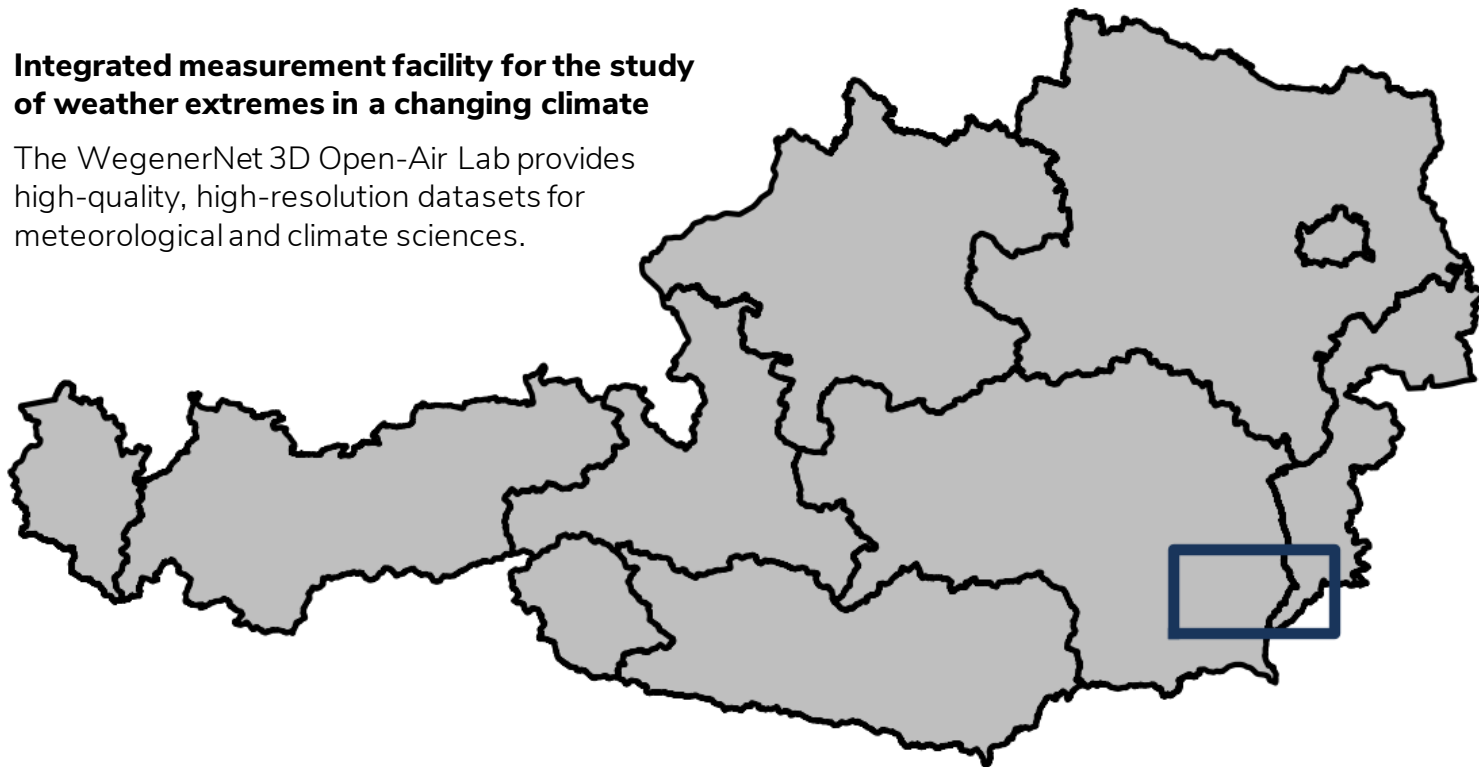
WegenerNet 3D Open-Air Lab

WegenerNet 3D Open-Air Lab



Integrated measurement facility for the study of weather extremes in a changing climate

The WegenerNet 3D Open-Air Lab provides high-quality, high-resolution datasets for meteorological and climate sciences.

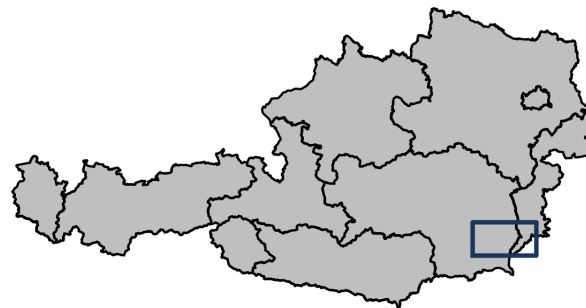


WegenerNet 3D Open-Air Lab



Integrated measurement facility for the study of weather extremes in a changing climate

The WegenerNet 3D Open-Air Lab provides high-quality, high-resolution datasets for meteorological and climate sciences.



X-Band Precipitation Radar (XPR)



WEGN GNSS StarNet (WSN)



Climate Station Network (CSN)



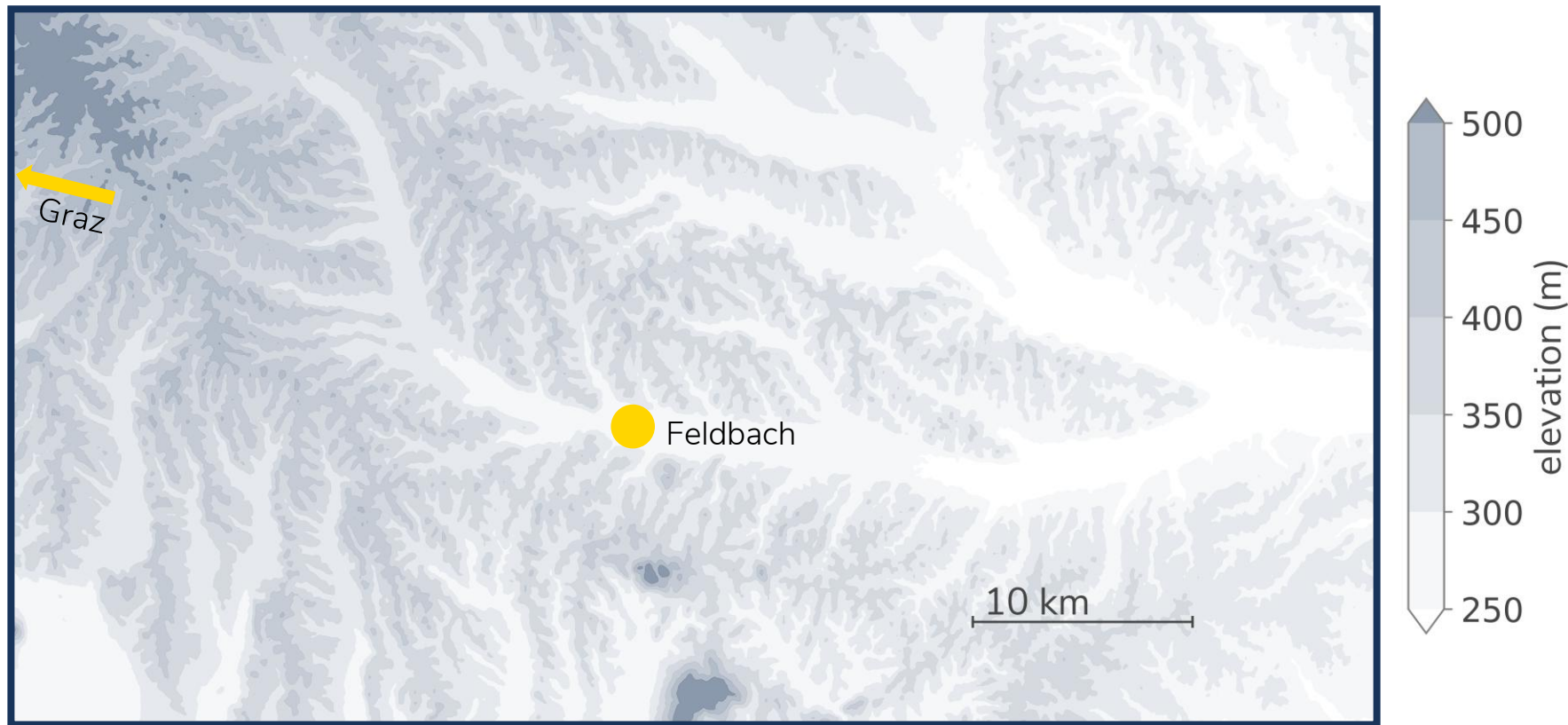
Tropospheric Sounding Radiometer (TSR)



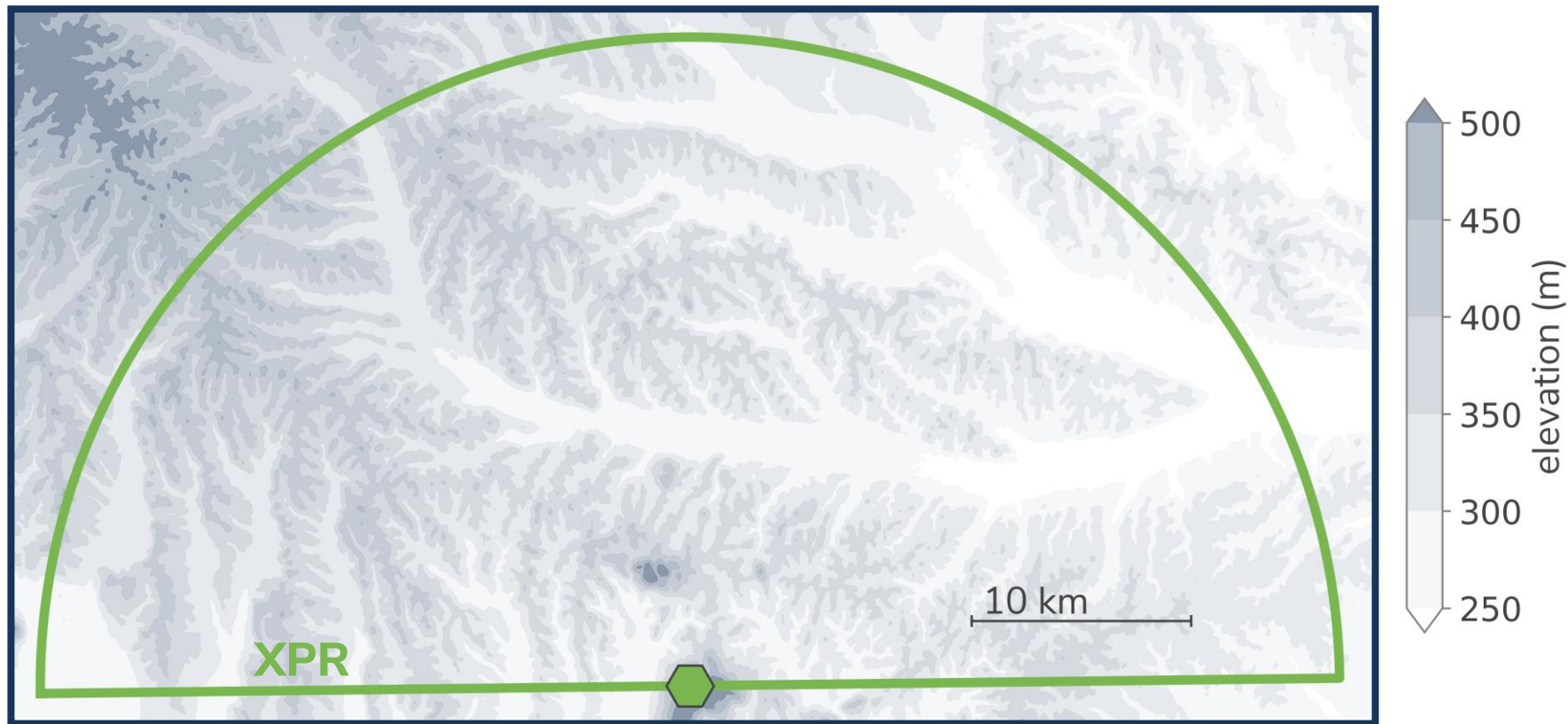
Cloud Structure Radiometer (CSR)



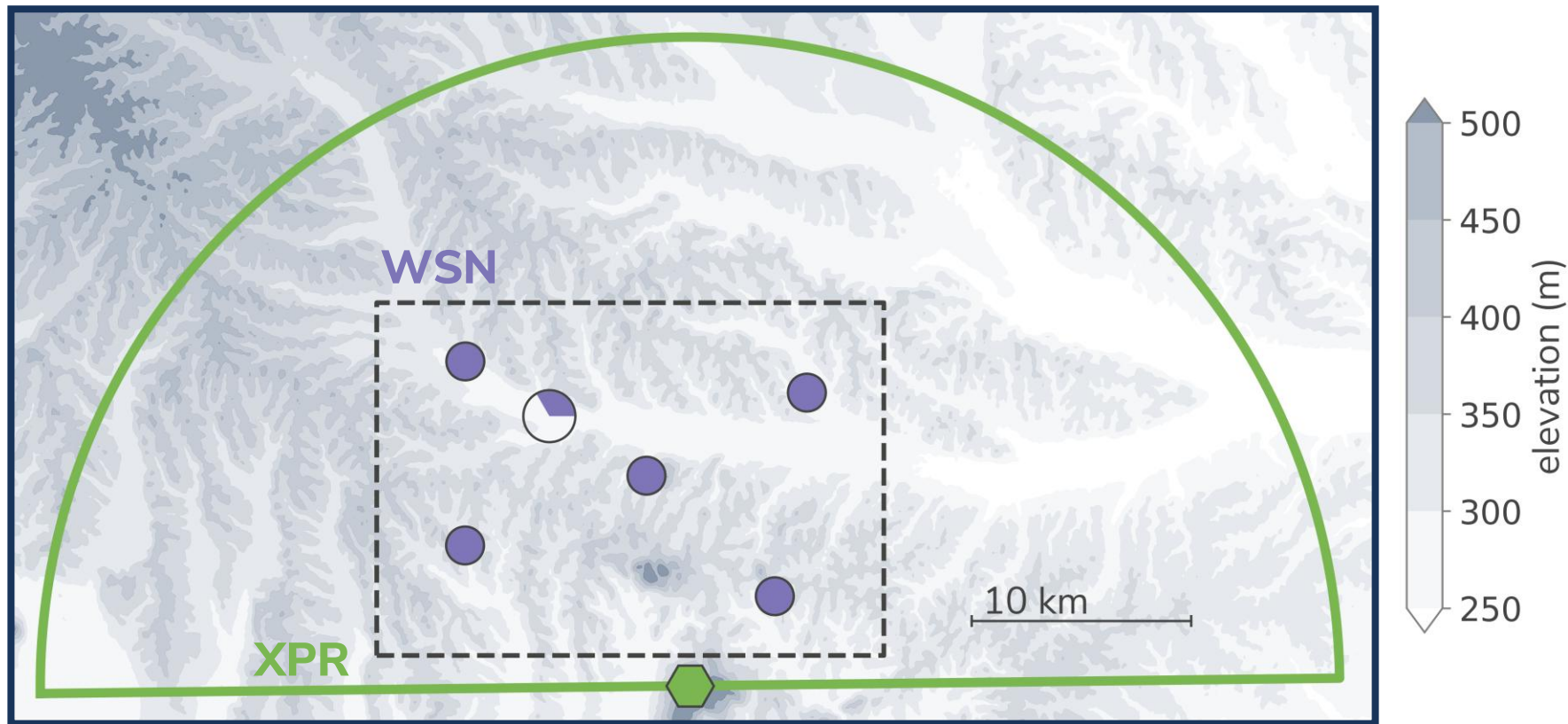
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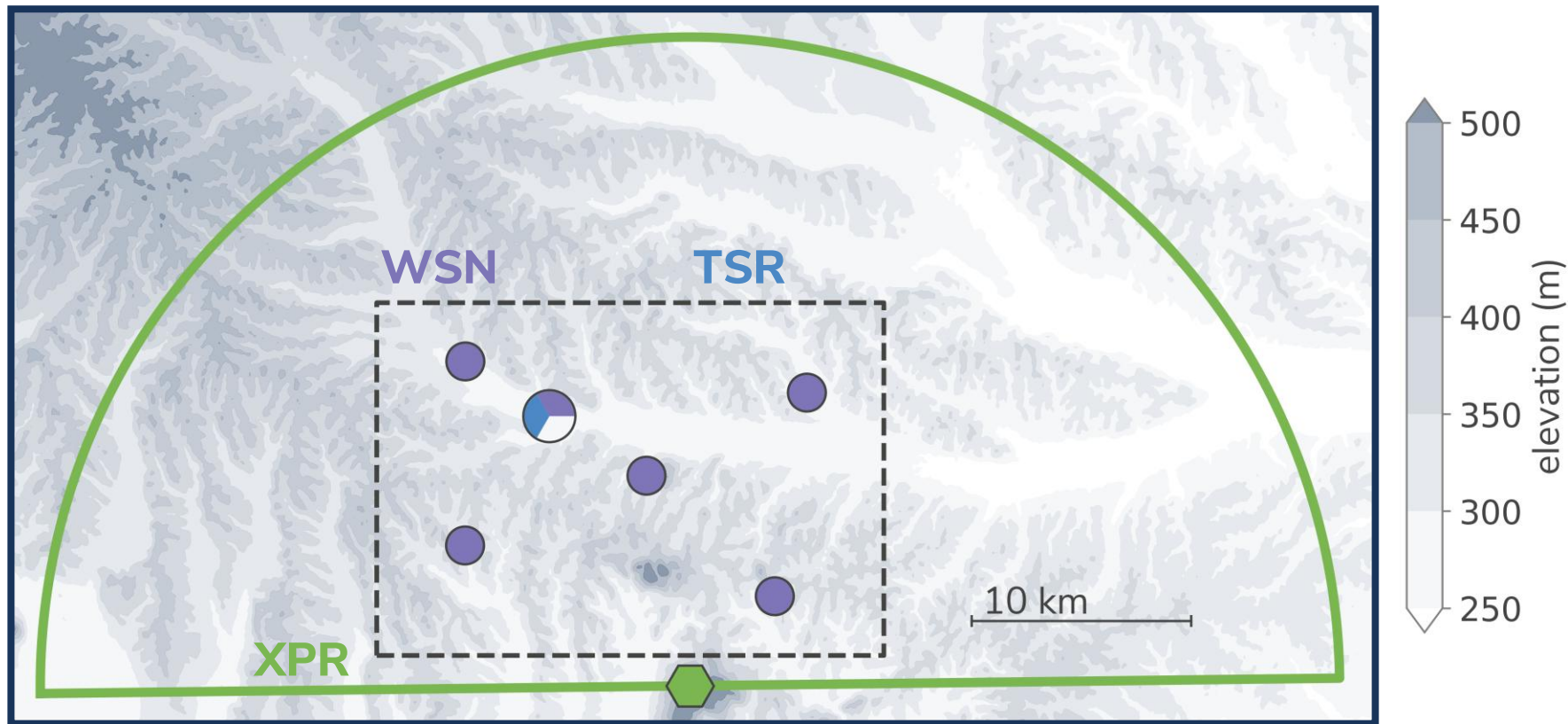
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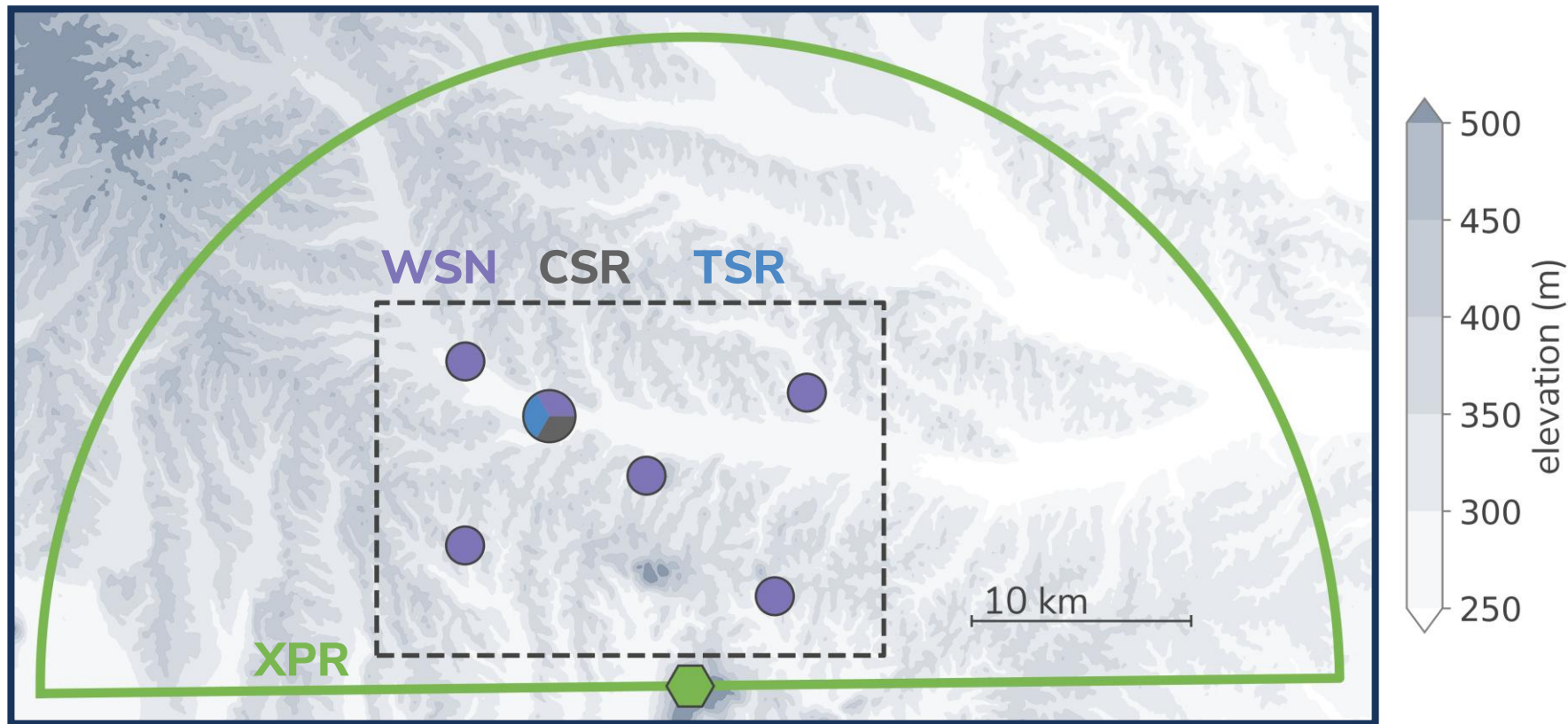
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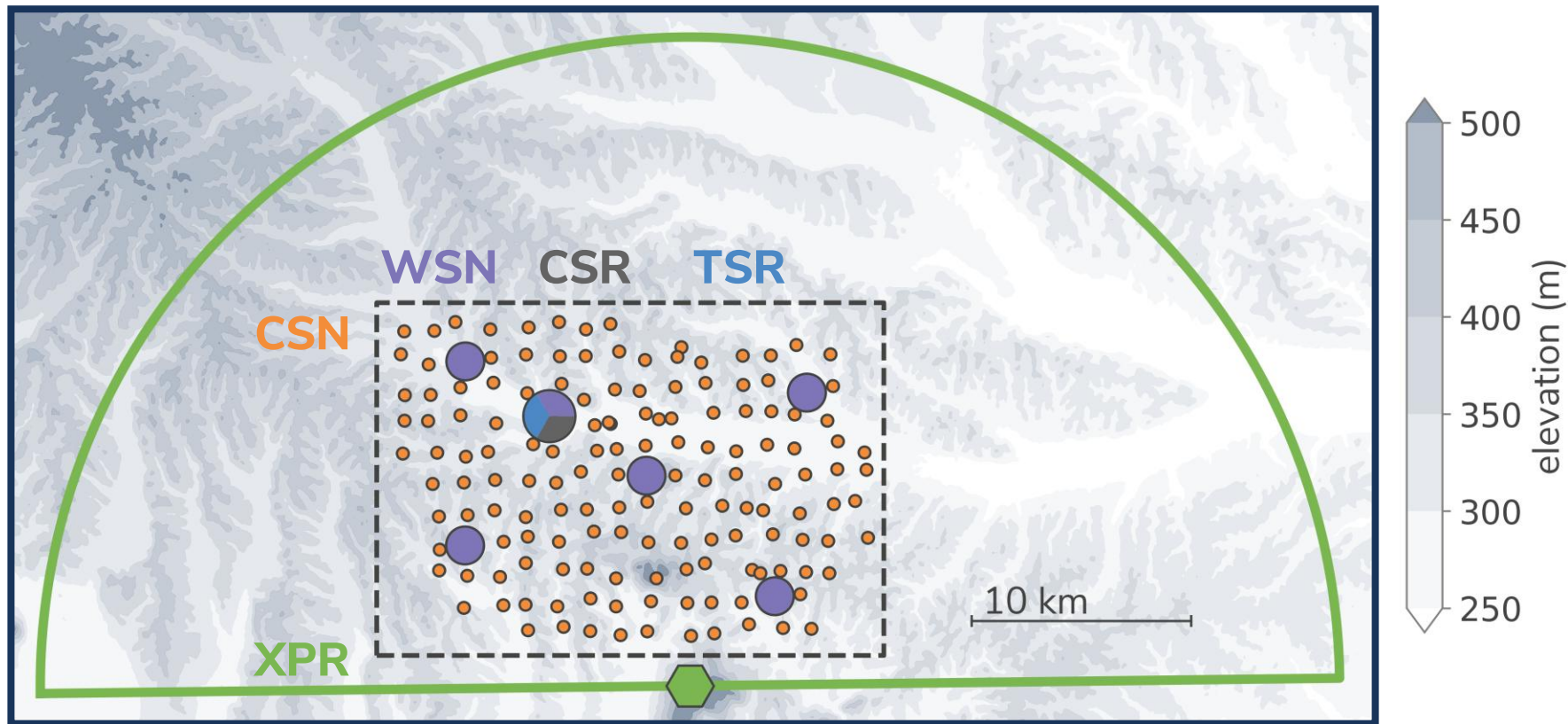
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Observed Variables



Clouds



Upper-air Water Vapor



Upper-air Temperature



Surface wind speed
and direction



Surface Temperature



Surface Pressure



Precipitation



Surface Water Vapor



Soil Moisture



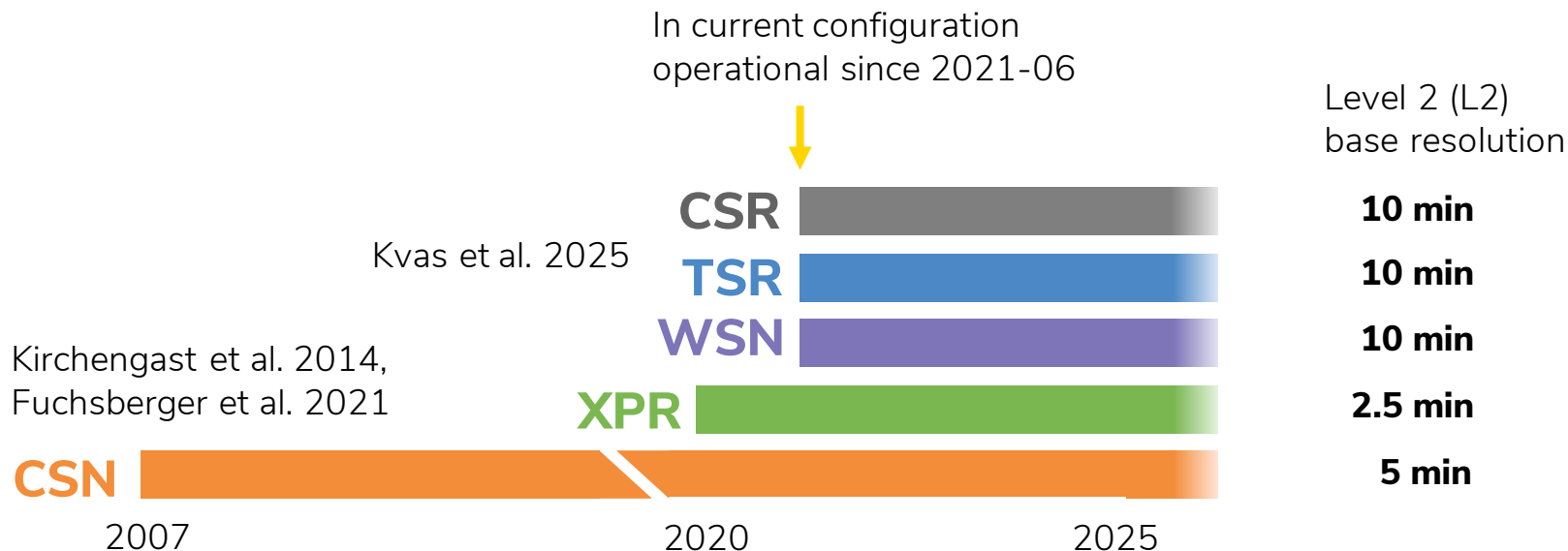
Snow



Land Surface
Temperature

Icons: WMO (CC BY-NC-ND 4.0)

Data Coverage and Resolution



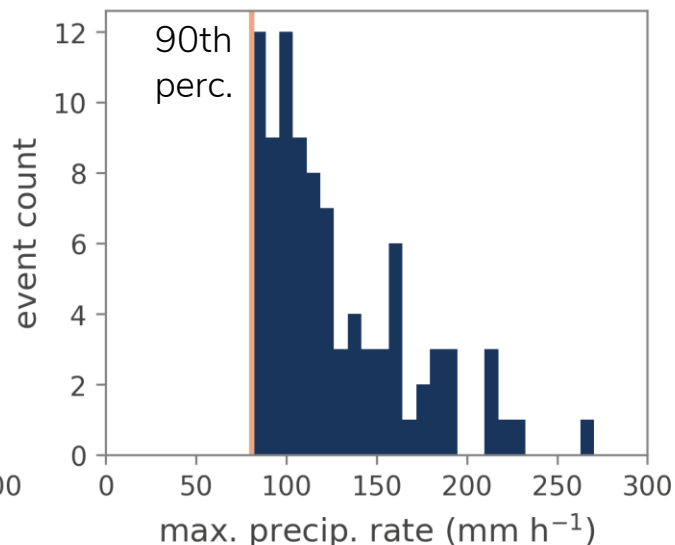
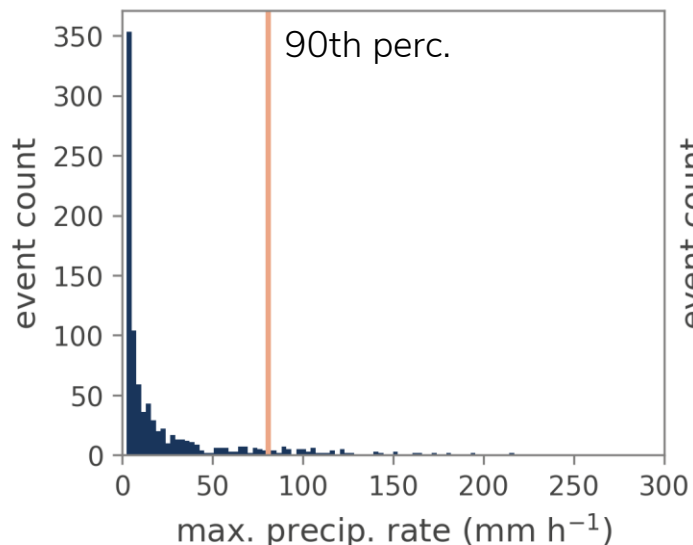
02

Extreme Precipitation Event Case Studies

Extreme Precipitation Event Case Studies

906 recorded precipitation events in the warm season (April to October) since 2021-06

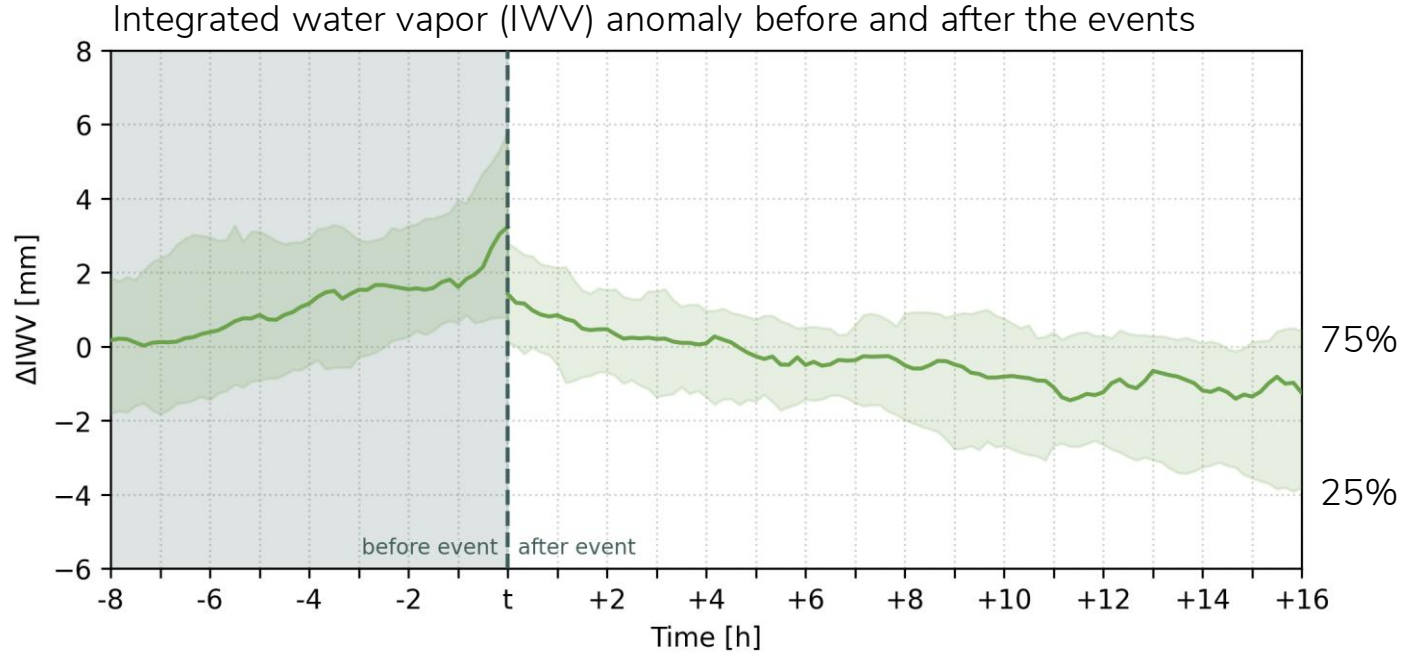
91 events with maximum intensity > 80 mm / h



Preprint:
Haas et al. 2025



Event Formation and Dissipation

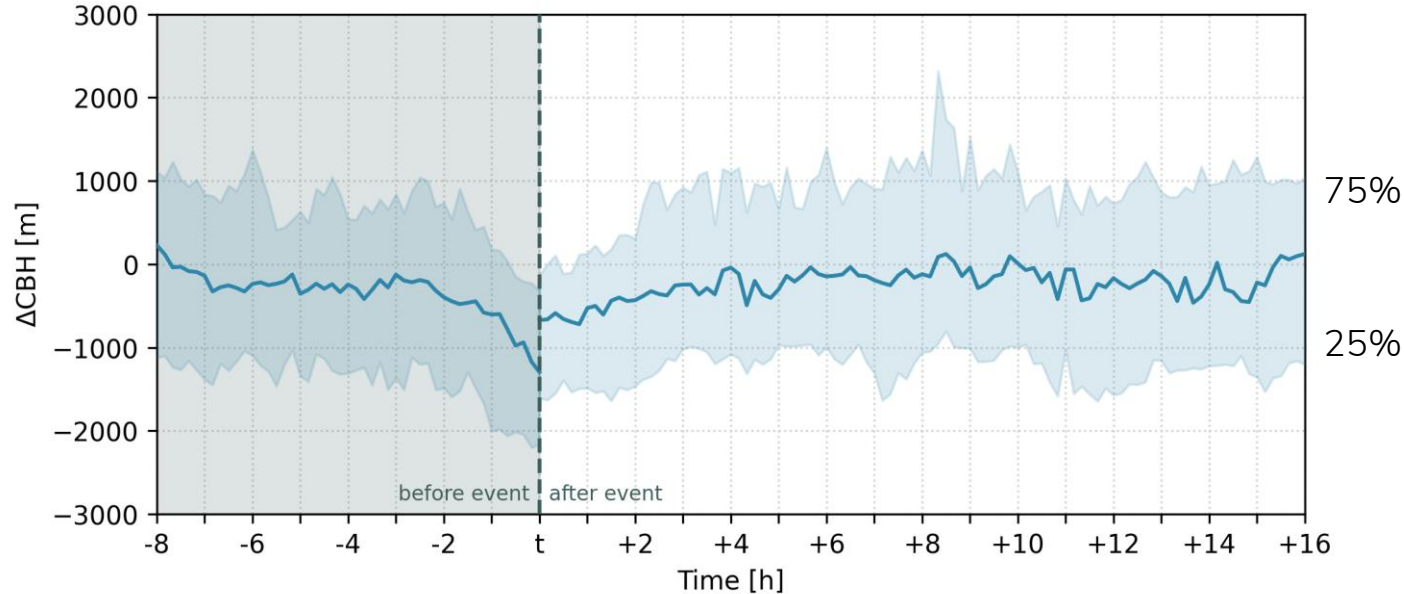


Preprint:
Haas et al. 2025



Event Formation and Dissipation

Cloud base height (CBH) anomaly before and after the events

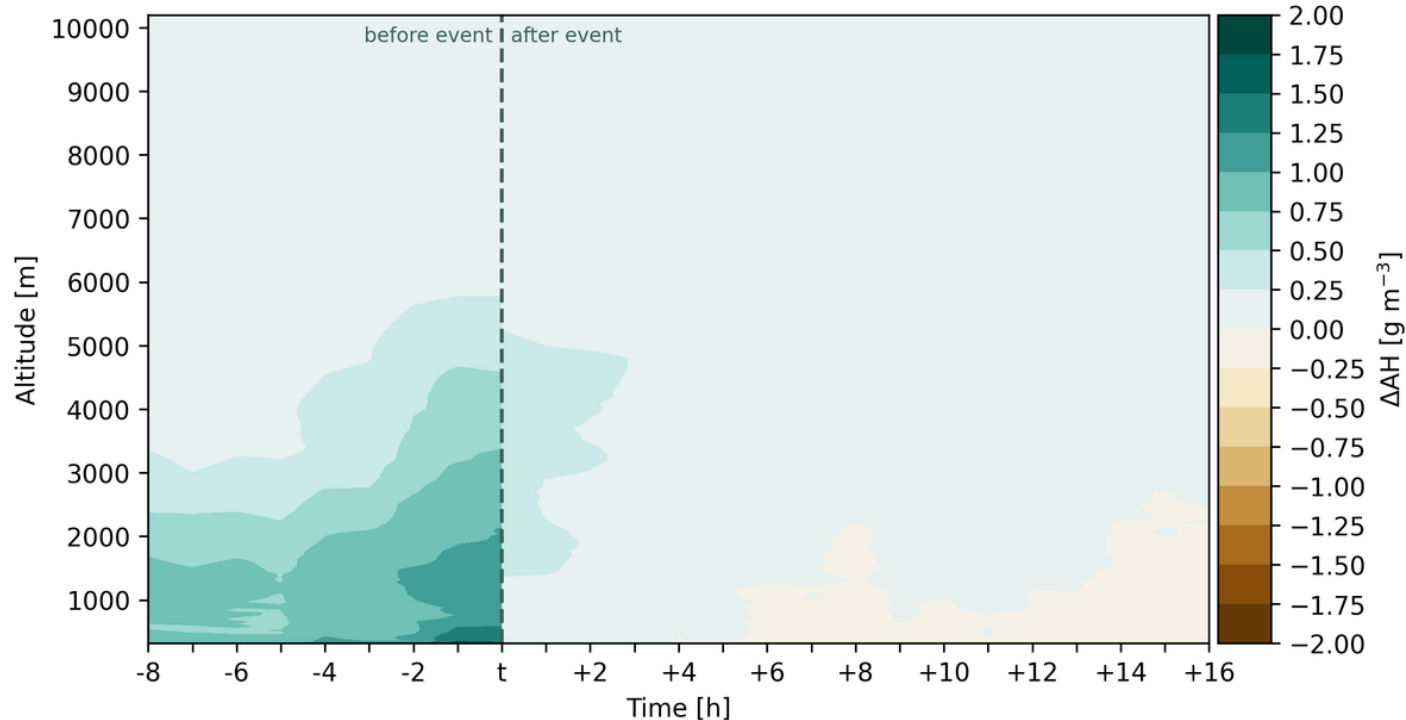


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Event Formation and Dissipation

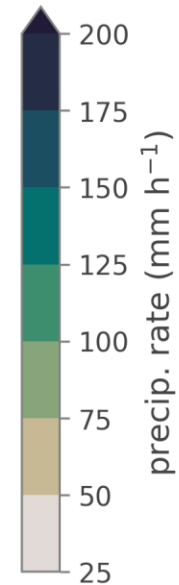
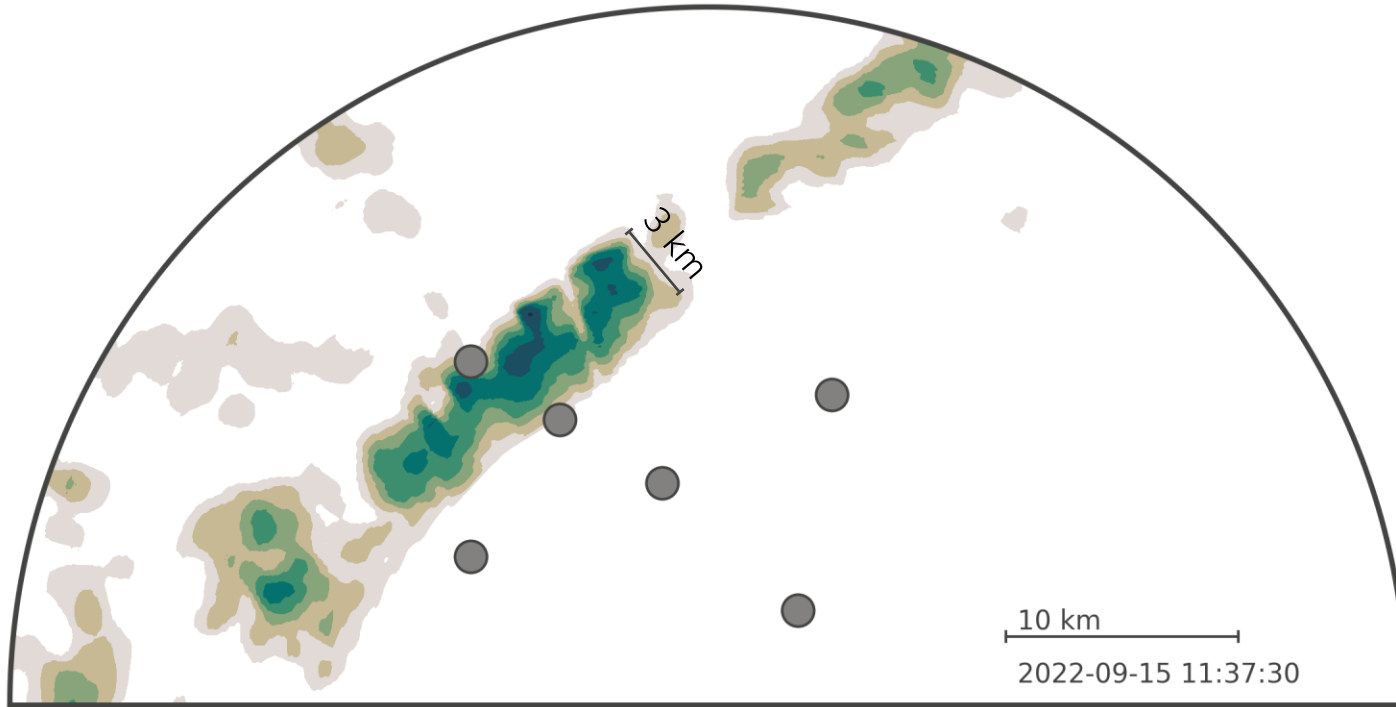
Absolute humidity (AH) anomaly before and after the events (average)



Preprint:
Haas et al. 2025

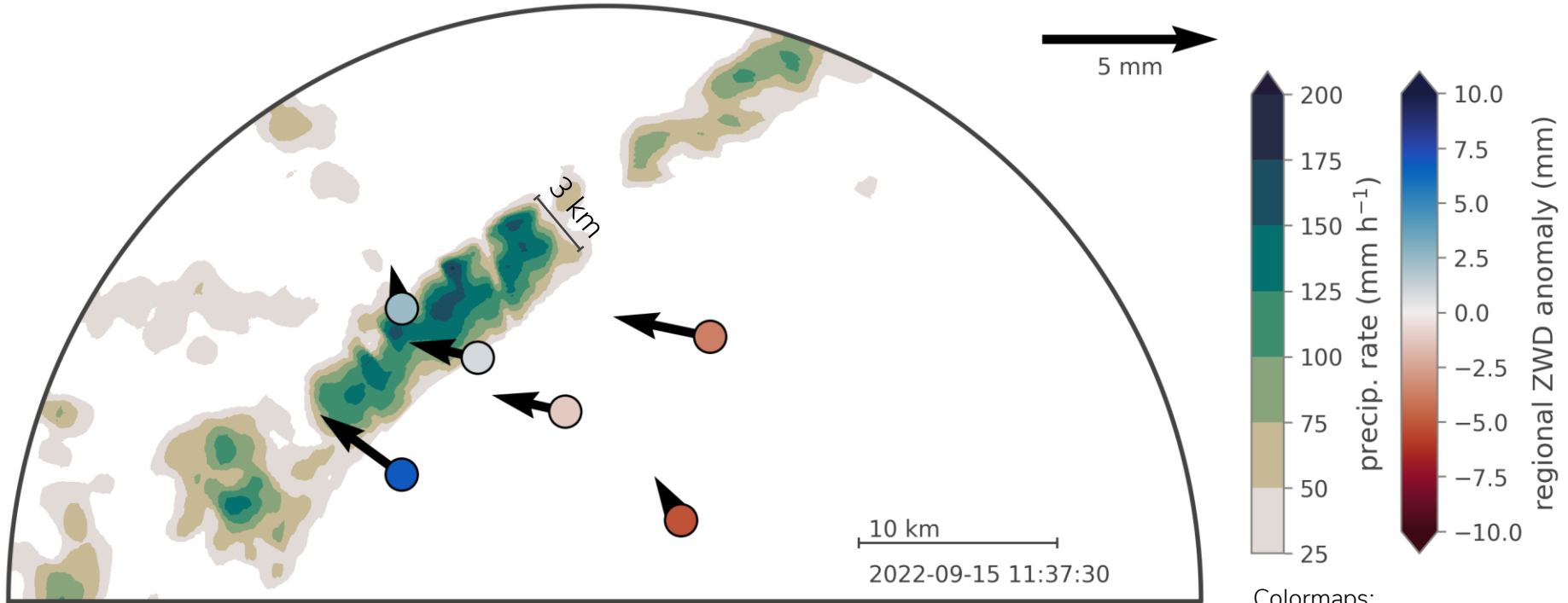


Tropospheric gradients and wet delay during heavy precipitation events



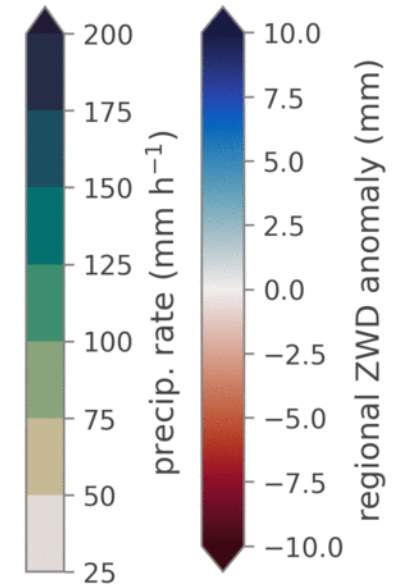
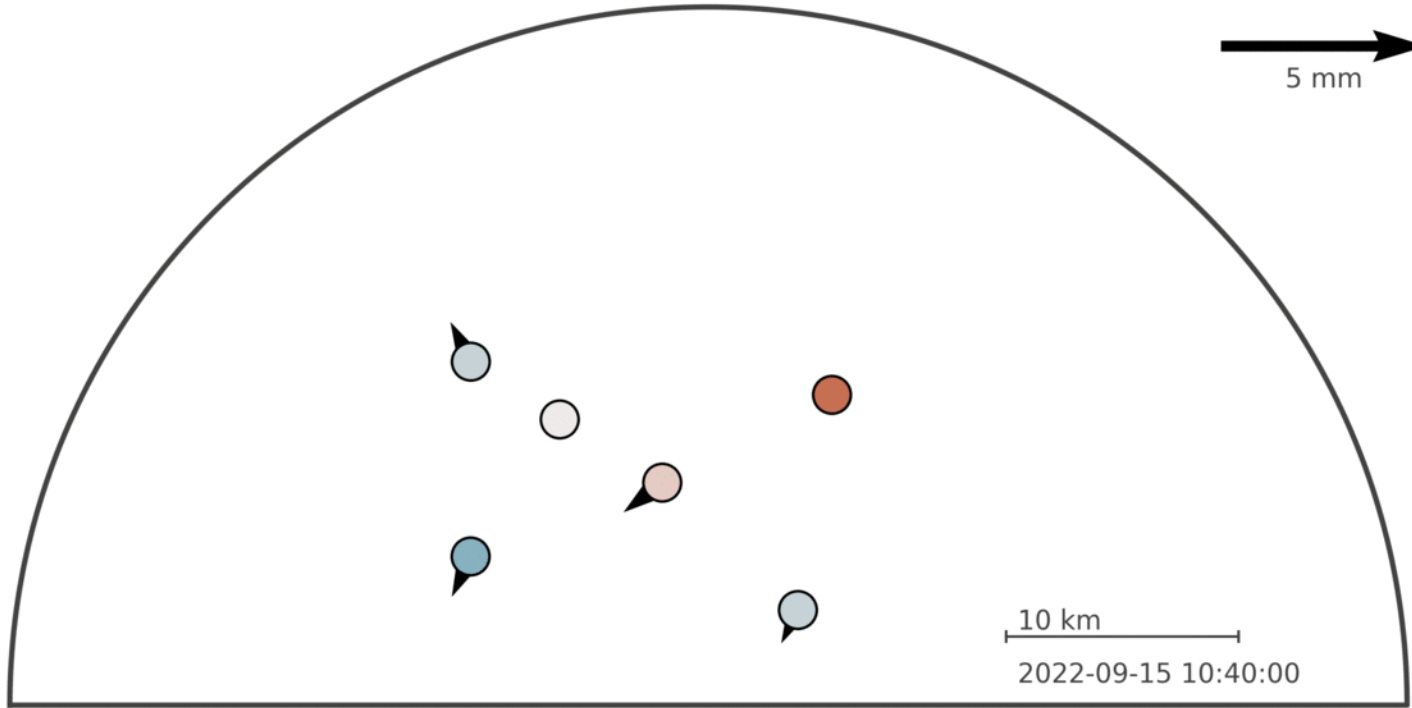
Colormaps:
Thyng et al. 2016

Tropospheric gradients and wet delay during heavy precipitation events



Colormaps:
Thyng et al. 2016

Tropospheric gradients and wet delay during heavy precipitation events





Colormaps:
Thyng et al. 2016

03

WegenerNet Data Portal

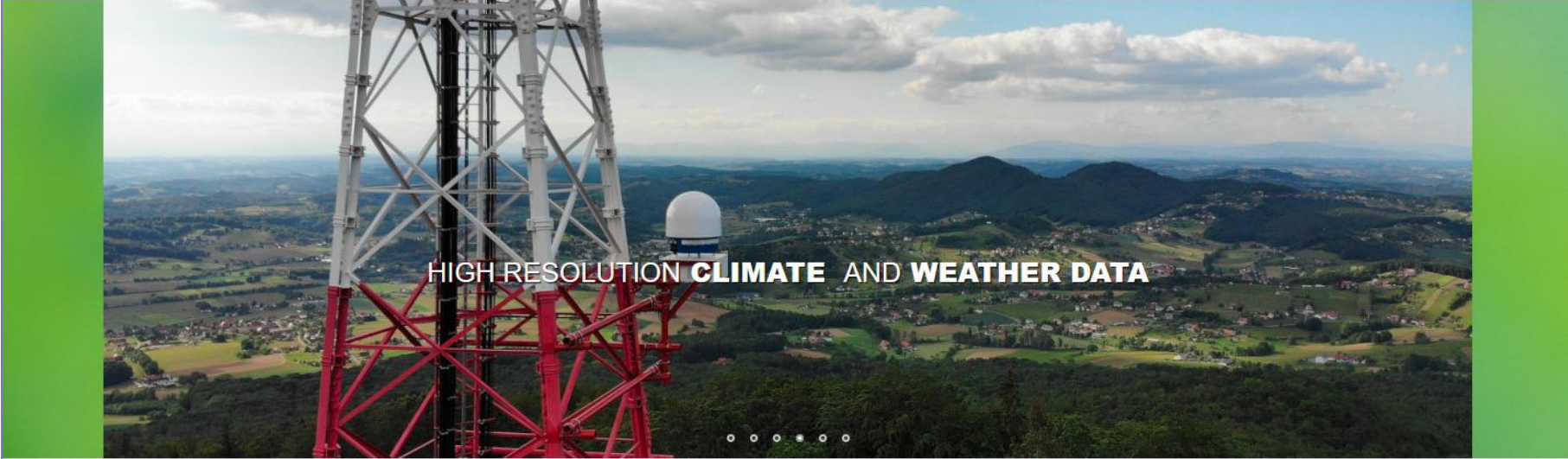
WegenerNet Data Portal

wegcenter.uni-graz.at/wegenernet



WegenerNet
Data portal

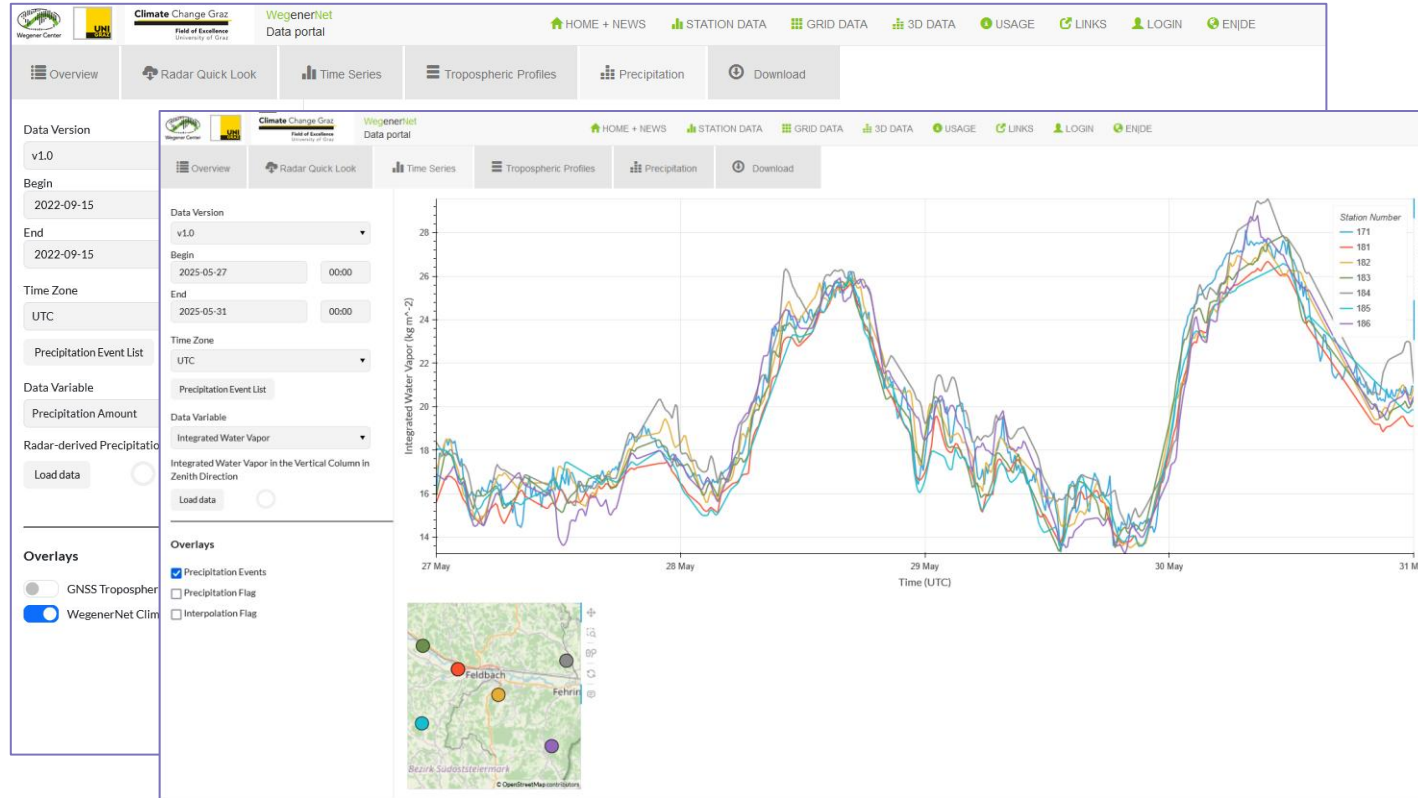
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HIGH RESOLUTION **CLIMATE** AND **WEATHER DATA**

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Visualization



Metadata



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WN3D_L2_BD_v1_Precipitation

Abstract

The WN3D_L2_BD_v1_Precipitation data set comprises data from the polarimetric X-Band Doppler precipitation radar for studying precipitation given as gridded data cube (time, northing, easting, altitude), resampled to even time stamps in UTC in the product target resolution of 2.5 minutes.

[WegenerNet](#) [Feldbach Region](#) [FBR](#) [WegenerNet 3D Open-Air Laboratory](#) [Precipitation](#) [X-Band Radar](#) [Precipitation Amount](#)
[Attenuation-corrected Horizontal Reflectivity](#) [Hydrometeor Type](#) [Precipitation Type](#)

Metadata

Dataset Name	WN3D_L2_BD_v1_Precipitation
License	CC BY 4.0 (https://creativecommons.org/licenses/by/4.0)
Dataset Version	v1.0
Processing Level	L2
Temporal Coverage	2020-06-01T00:00:00/2025-06-03T00:00:00
Temporal Resolution	PT150S

[XML ISO-19115 metadata](#) [DOI: 10.25364/WEGC/WPS3D-L2-10](#)



Visualization



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☒ **Data selection**

Data product:

L2

Data collection:

TroposphericProfiles

Version:

v1.0

Time range

Begin
2025-05-26

End
2025-06-02

Variables

BD

☒ **T_profile_cmp('time', 'h_msl')** Compound Temperature Profile merged from Boundary Layer- and Full Troposphere Temperature Profiles

☒ **RH_profile('time', 'h_msl')** Relative Humidity Profile

☐ **AH_profile('time', 'h_msl')** Absolute Humidity Profile (Water Vapor Mass Density Profile)

☐ **P_profile('time', 'h_msl')** Air Pressure Profile Derived from Temperature and Relative Humidity Profiles

☐ **P_profile_interp_flag('time', 'h_msl')** Interpolation Flag for Variable P_profile

☐ **AH_profile_interp_flag('time', 'h_msl')** Interpolation Flag for Variable AH_profile

☐ **RH_profile_interp_flag('time', 'h_msl')** Interpolation Flag for Variable RH_profile

☐ **T_profile_cmp_interp_flag('time', 'h_msl')** Interpolation Flag for Variable T_profile_cmp



Visualization



Metadata



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API endpoints

WegenerNet Data Portal



WegenerNet File API

v1.0.0OAS 3.1

[/data-api/file/v1/openapi.json](#)

Wegener Center for Climate and Global Change - University of Graz - Website
Send email to Wegener Center for Climate and Global Change - University of Graz

Servers

/data-api/file/v1

▼

Data Sets

^

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List Available Datasets

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Query Metadata For A Dataset

▼

Download Files

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Download A Single File From A Dataset

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List Available Data Collections

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List Available Data Collections

▼



Visualization



Metadata



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API endpoints

04

Summary and Outlook

Summary and Outlook



The WegenerNet 3D Open-Air Lab provides high-quality, high-resolution datasets for meteorological and climate sciences.



Its data output provides a detailed view of the atmosphere from the surface to the upper troposphere.



This enables many science applications, for example, the study of extreme precipitation events.



The WegenerNet data portal offers tools for online data visualization and for automated and manual data download.

Data available at the
WegenerNet Data Portal:



Wegener Center



wegcenter.uni-graz.at/wegenernet

Thank you!

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Kvas, A., Fuchsberger, J., and Kirchengast, G. : High-resolution atmospheric data cubes from the WegenerNet 3D Open-Air Laboratory for Climate Change Research, *Earth Syst. Sci. Data*, submitted, 2025.