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

Data availability and case studies of extreme precipitation events

Andreas Kvas[1], Jürgen Fuchsberger[1], Gottfried Kirchengast[1,2], Stephanie J. Haas[1], Robert Galovic[1,3], Daniel Scheidl[1], Christoph Bichler[1,2]

1) Wegener Center for Climate and Global Change, University of Graz
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

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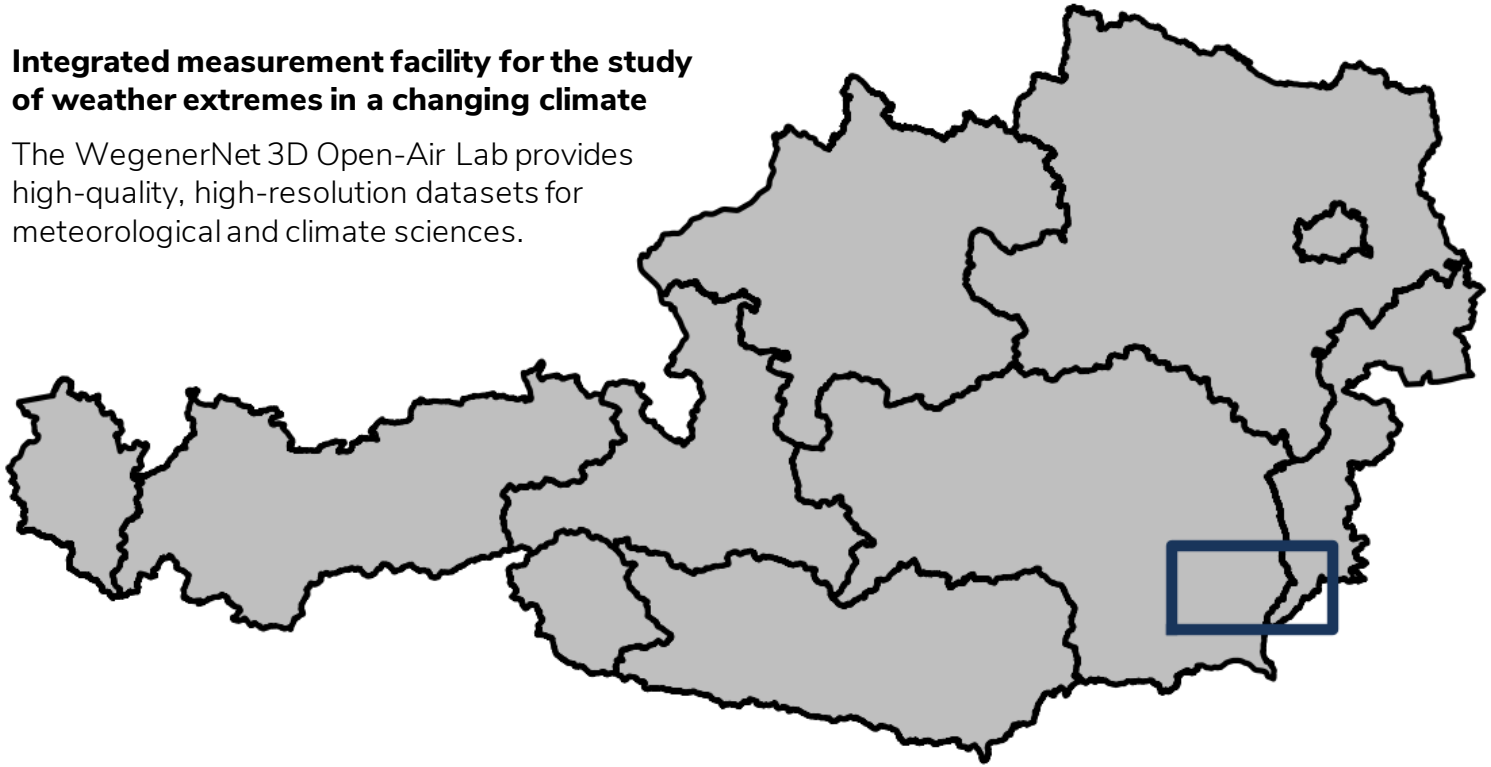
Integrated measurement facility for the study of weather extremes in a changing climate

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



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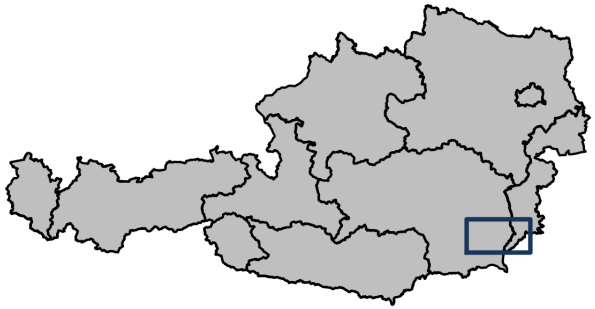

X-Band Precipitation Radar (XPR)

WEGN GNSS StarNet (WSN)

GFZ Helmholtz Centre for Geosciences

Climate Station Network (CSN)

Tropospheric Sounding Radiometer (TSR)

Cloud Structure Radiometer (CSR)

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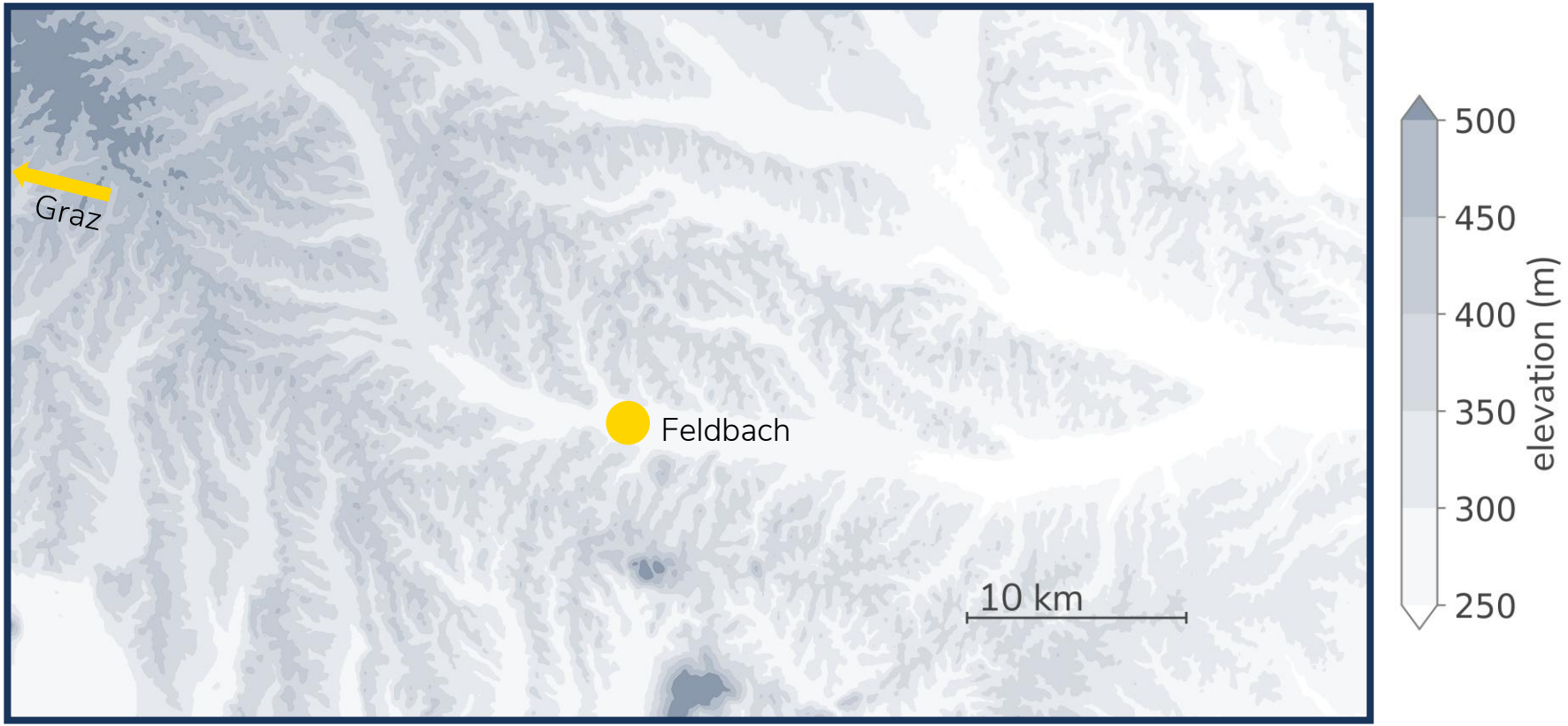

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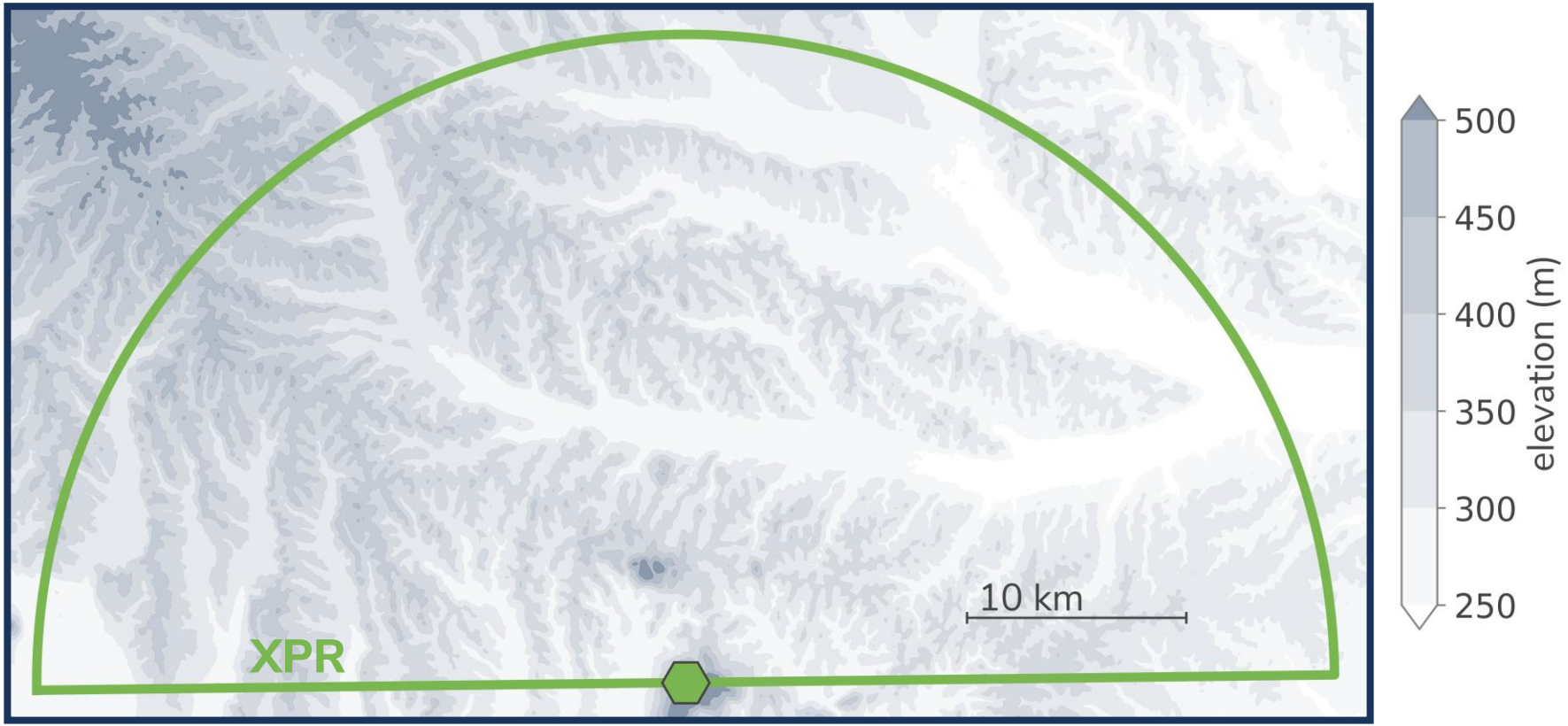

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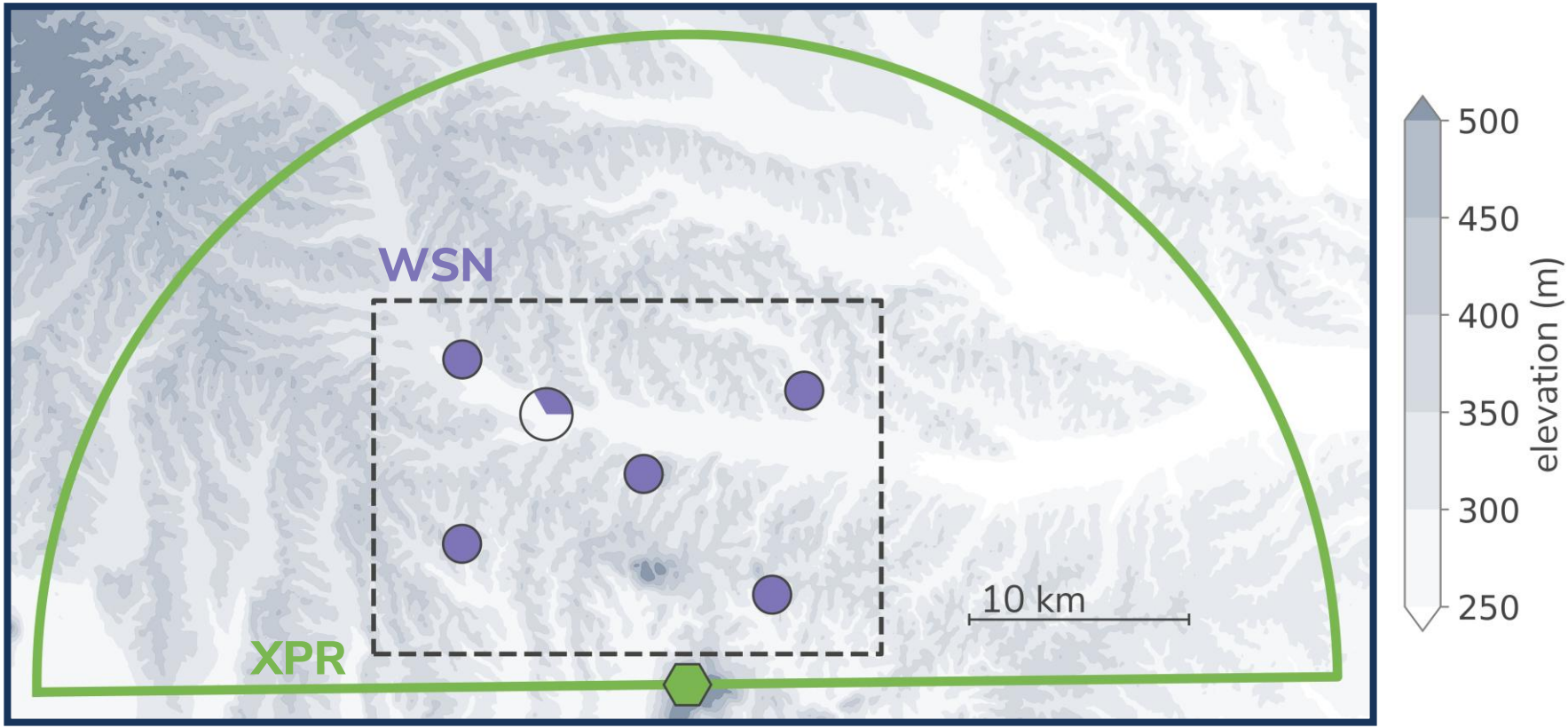

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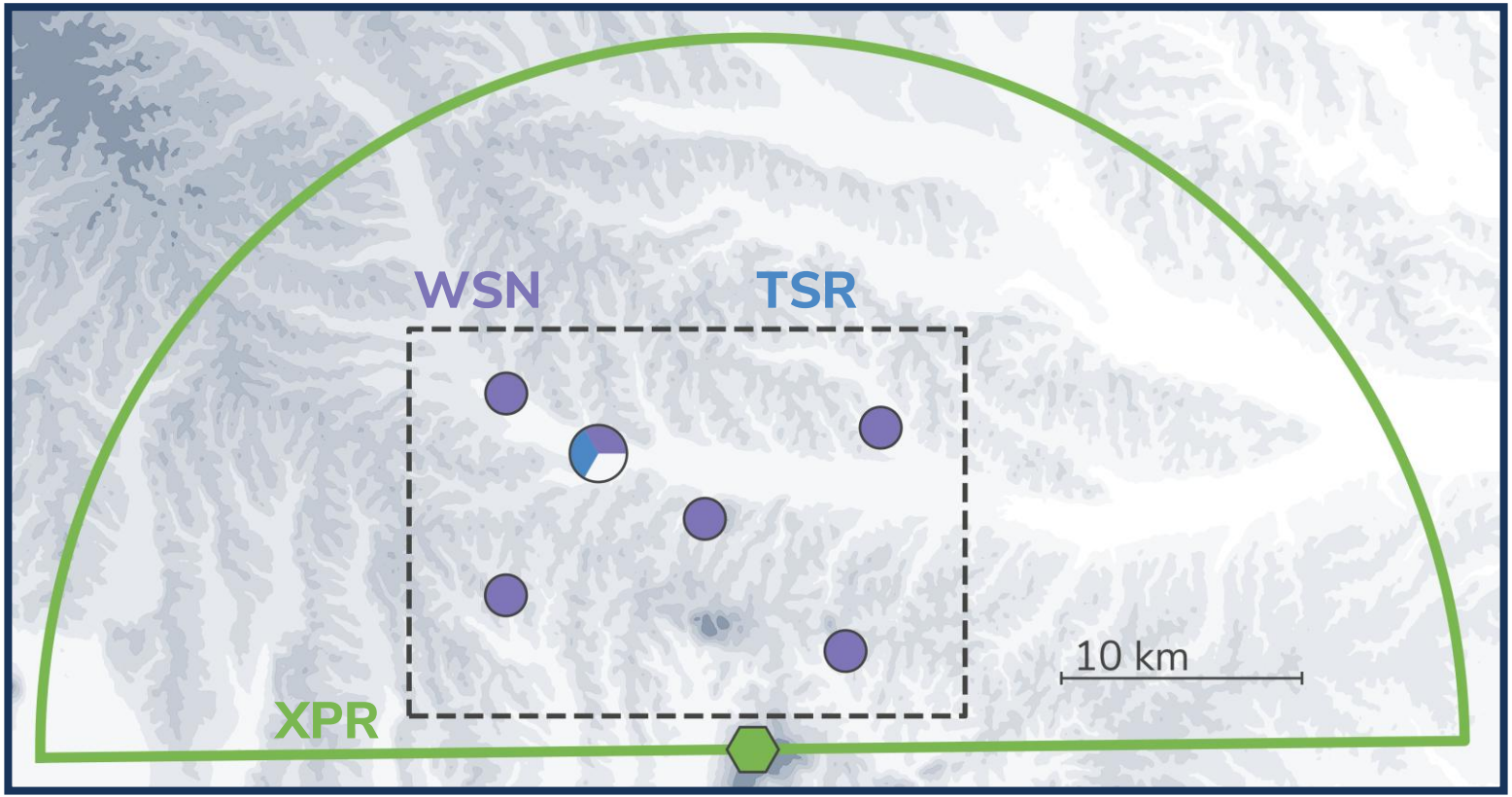

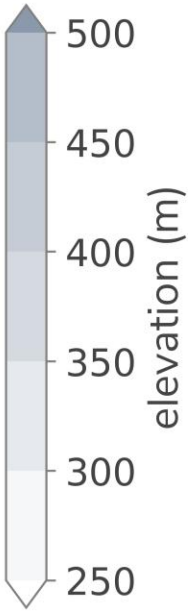

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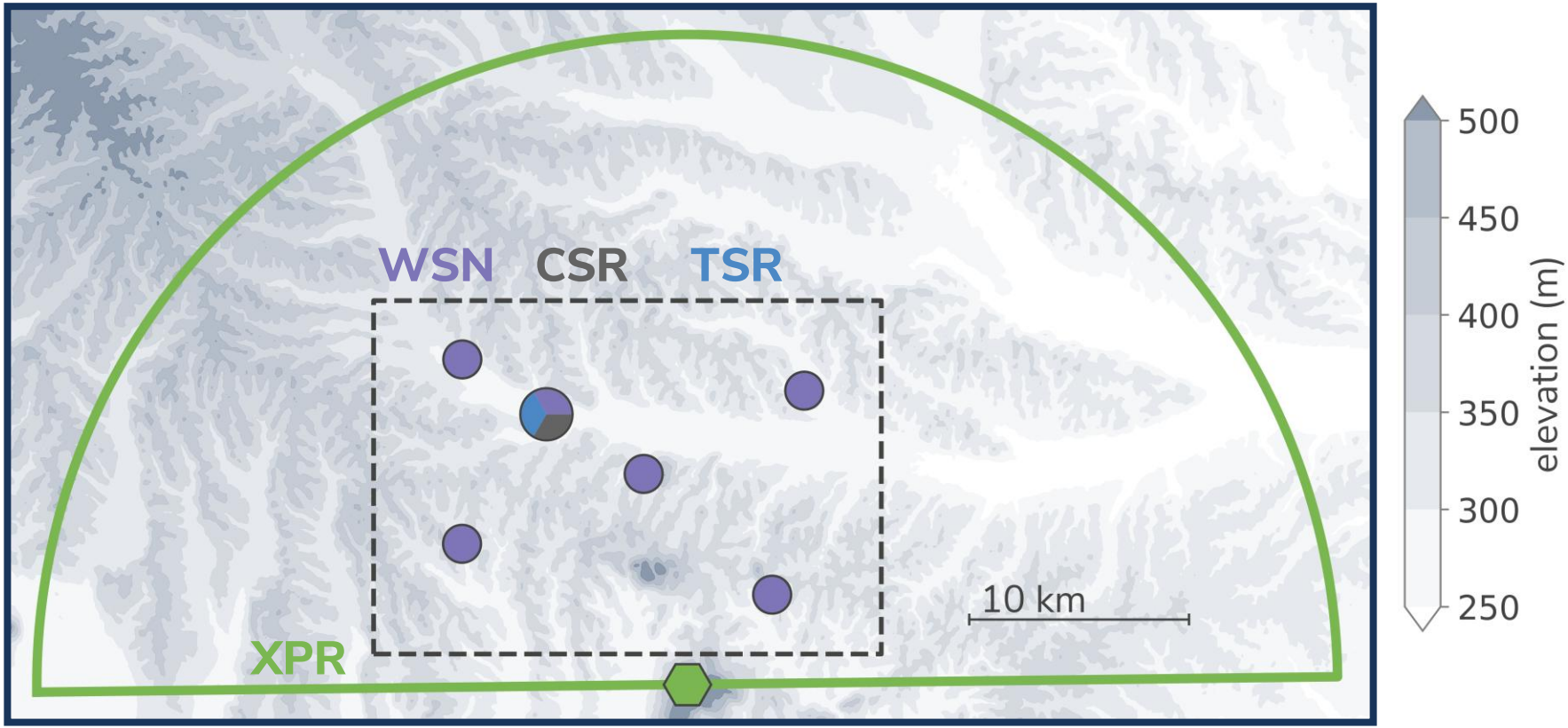

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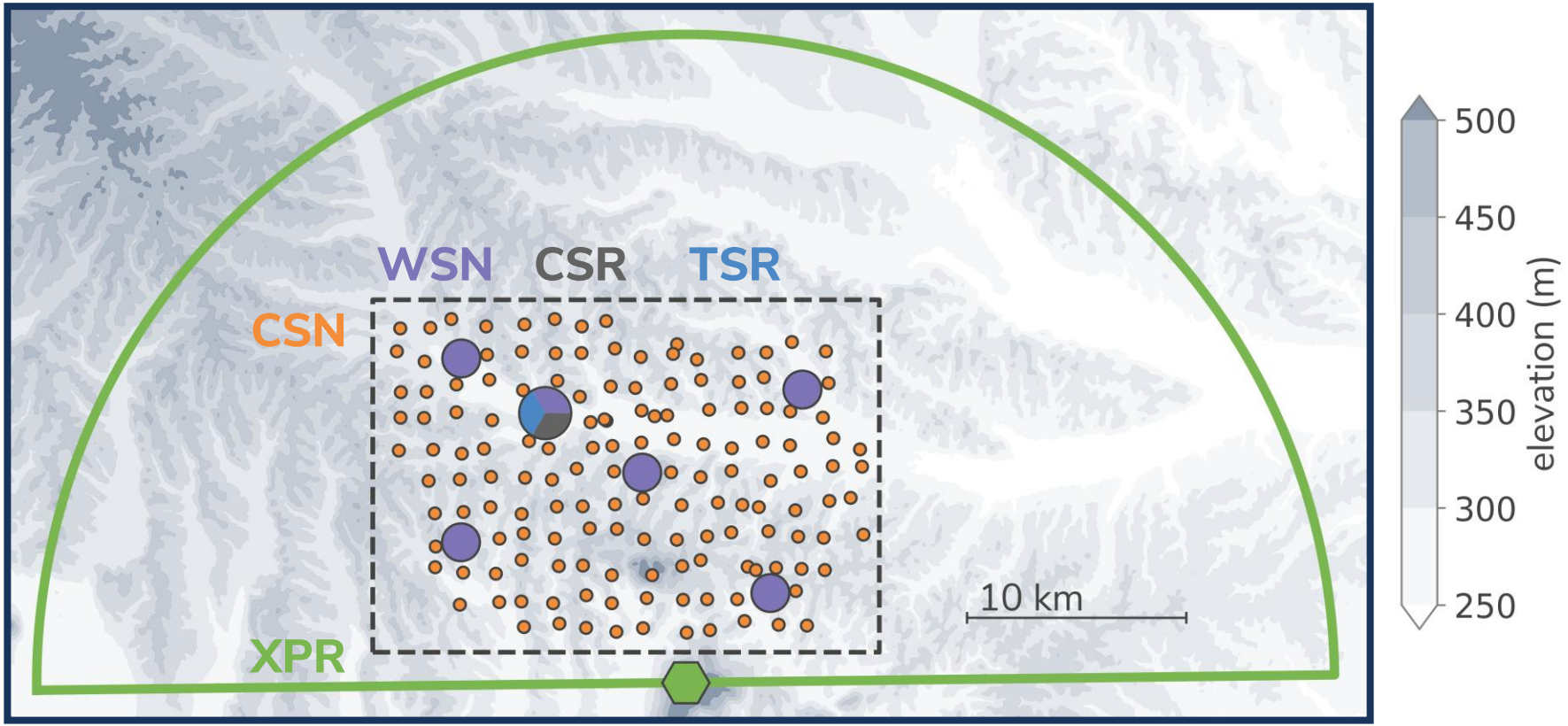


Observed Variables


Clouds


Upper-air Water Vapor


Upper-air Temperature


Surface wind speed and direction


Surface Temperature


Surface Pressure


Precipitation

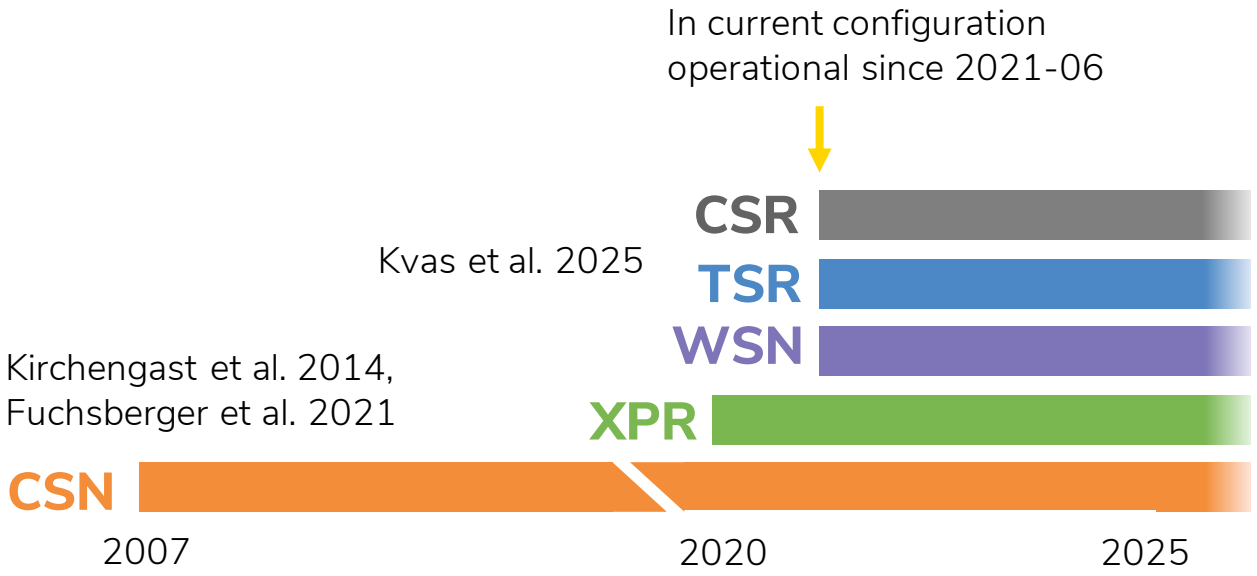

Surface Water Vapor


Soil Moisture


Snow


Land Surface Temperature

Data Coverage and Resolution



Level 2 (L2)
base resolution

10 min

10 min

10 min

2.5 min

5 min

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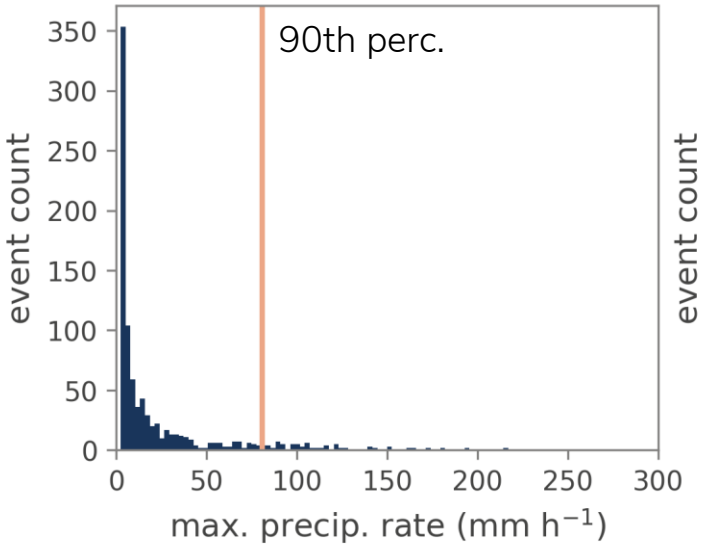
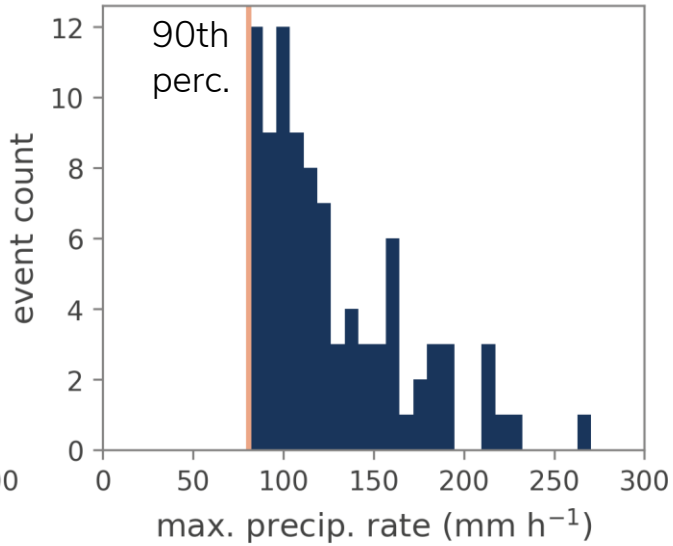
Extreme Precipitation Event Case Studies

Extreme Precipitation Event Case Studies

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

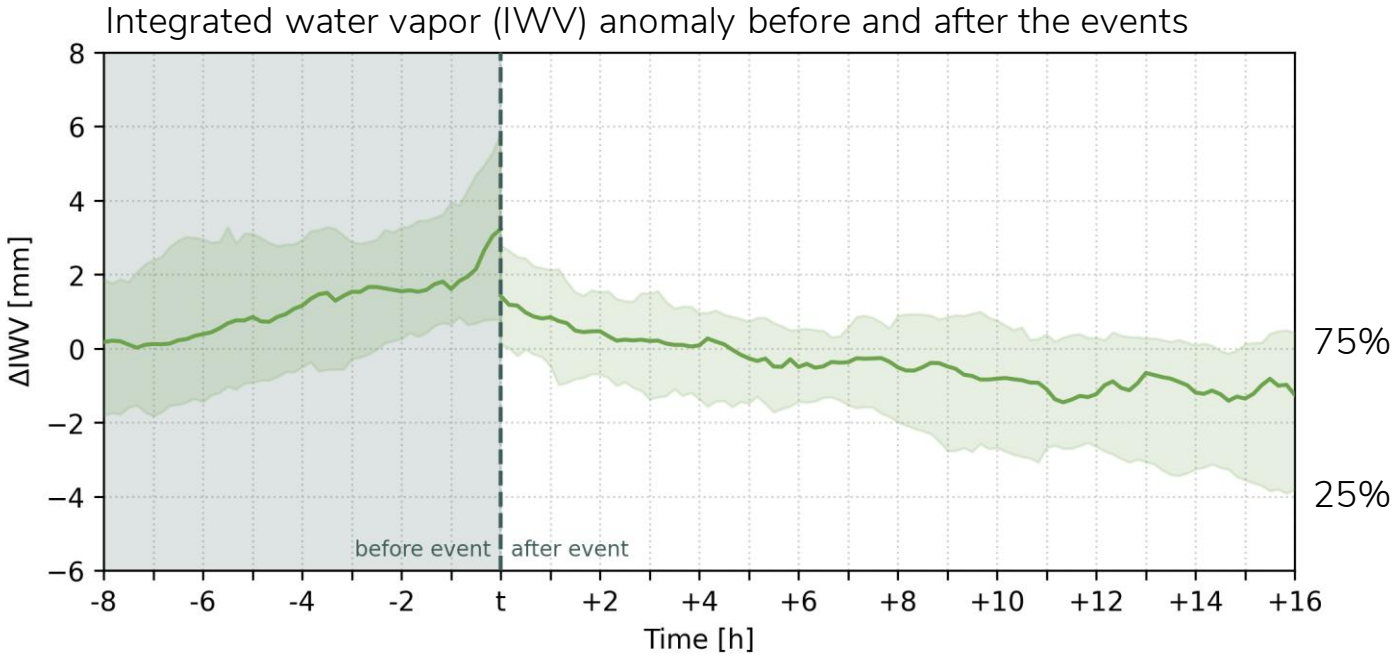
91 events with maximum intensity > 80 mm / h





Preprint:
Haas et al. 2025

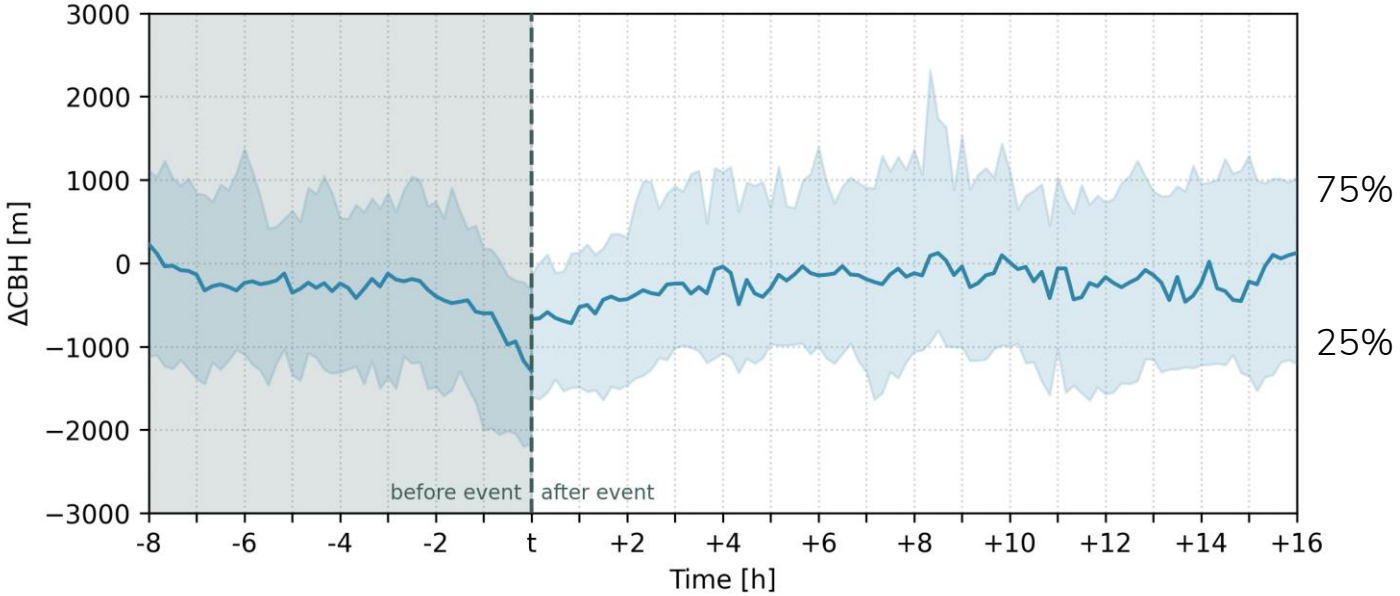
Event Formation and Dissipation



Preprint:
Haas et al. 2025

Event Formation and Dissipation

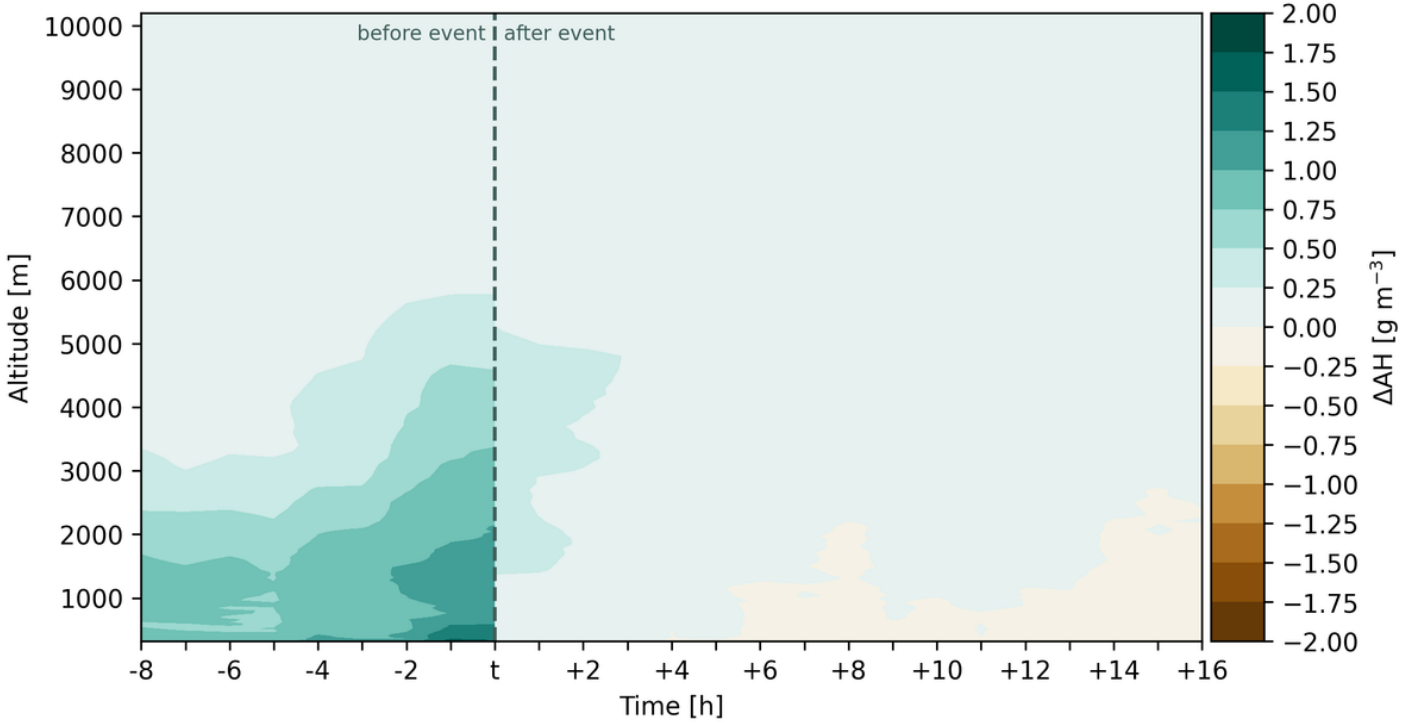
Cloud base height (CBH) anomaly before and after the events



Preprint:
Haas et al. 2025

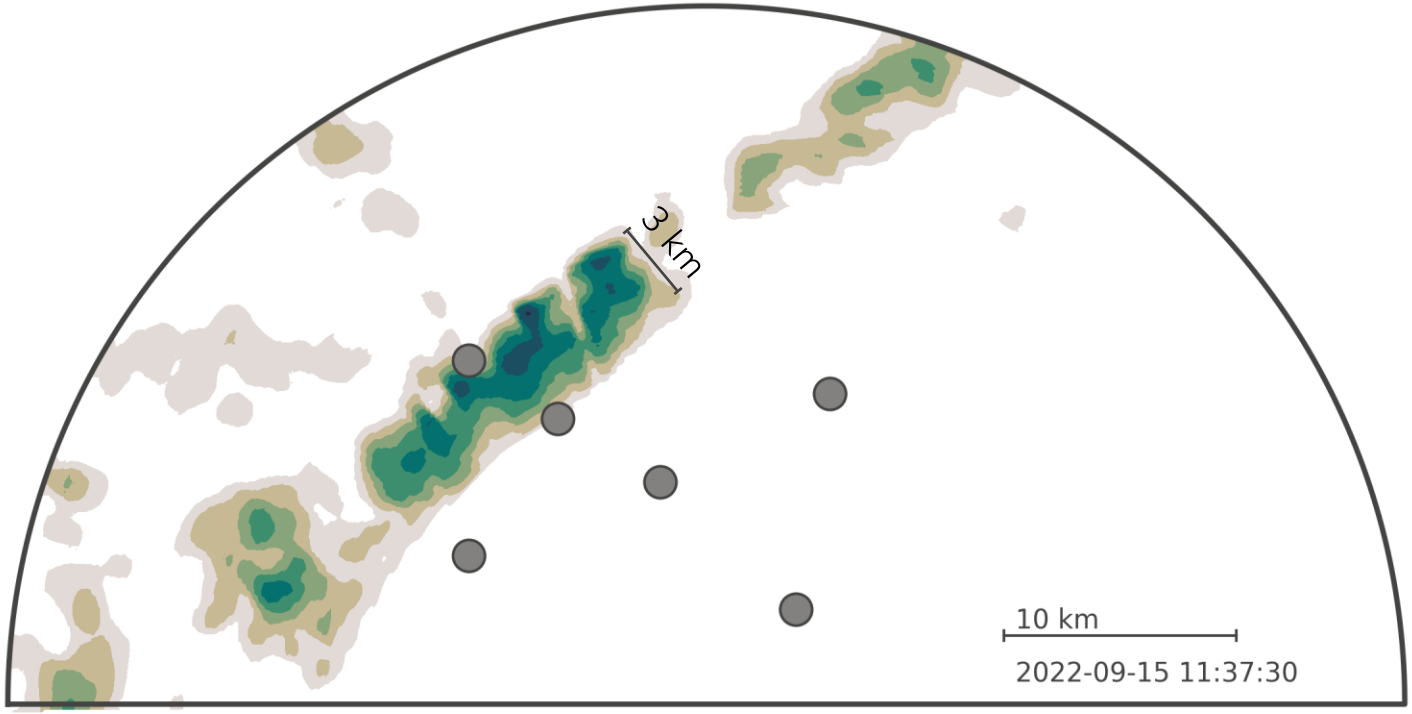
Event Formation and Dissipation

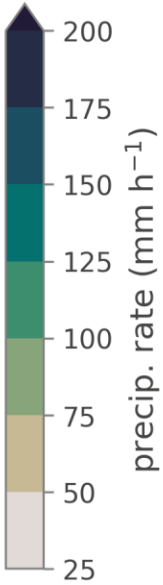
Absolute humidity (AH) anomaly before and after the events (average)



Preprint:
Haas et al. 2025

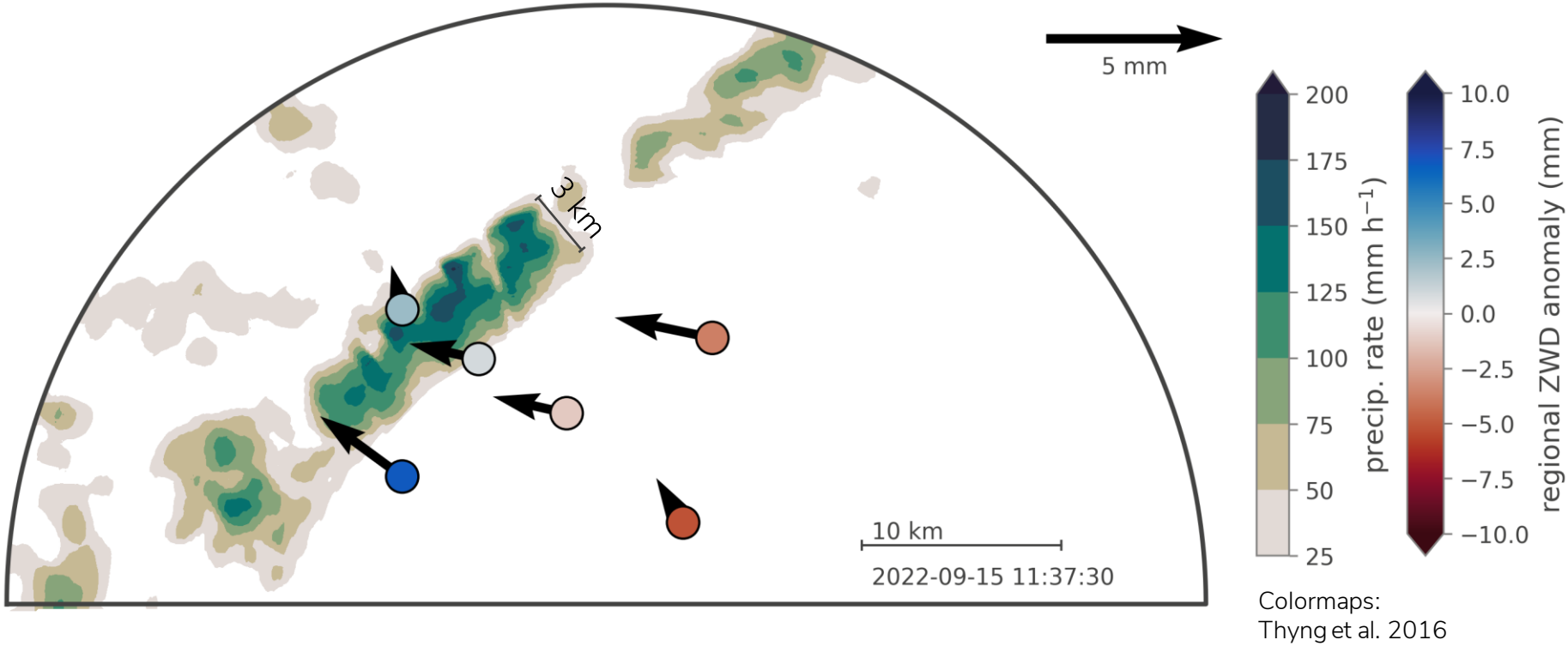
Tropospheric gradients and wet delay during heavy precipitation events





Colormaps:
Thyng et al. 2016

Tropospheric gradients and wet delay during heavy precipitation events



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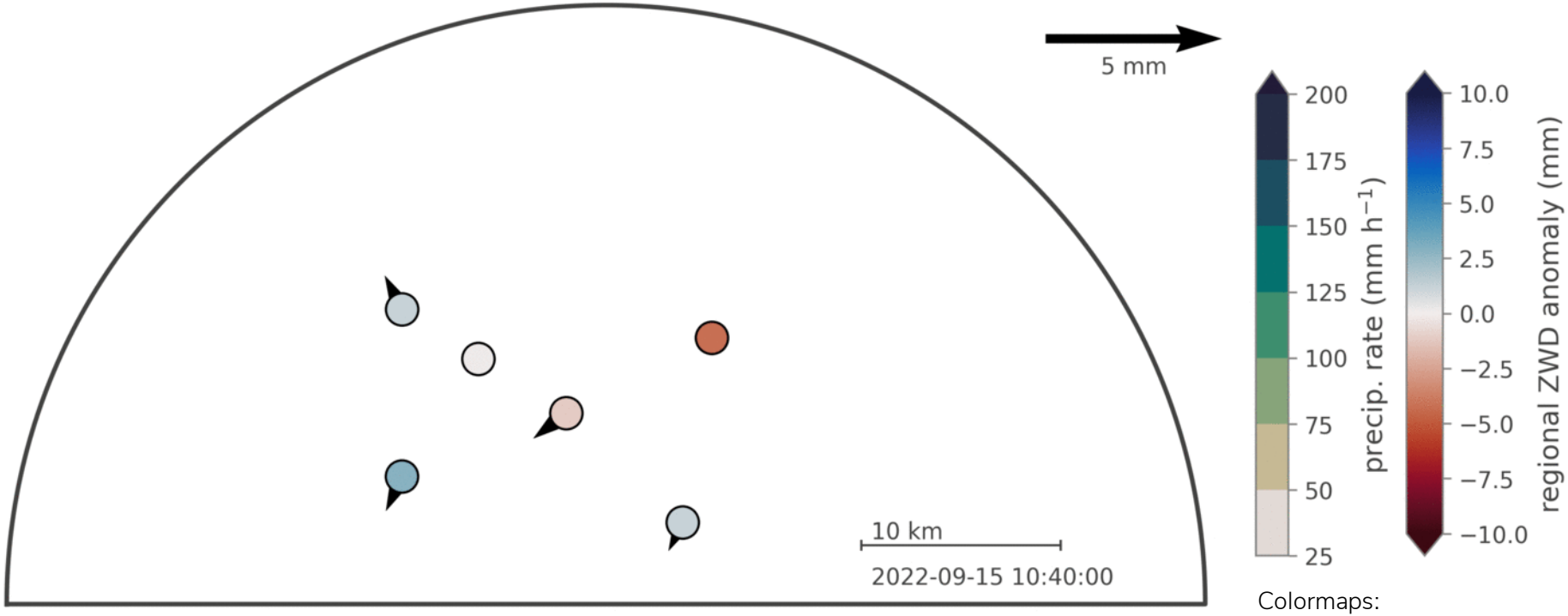

Colormaps:
Thyng et al. 2016

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WegenerNet Data Portal

WegenerNet Data Portal

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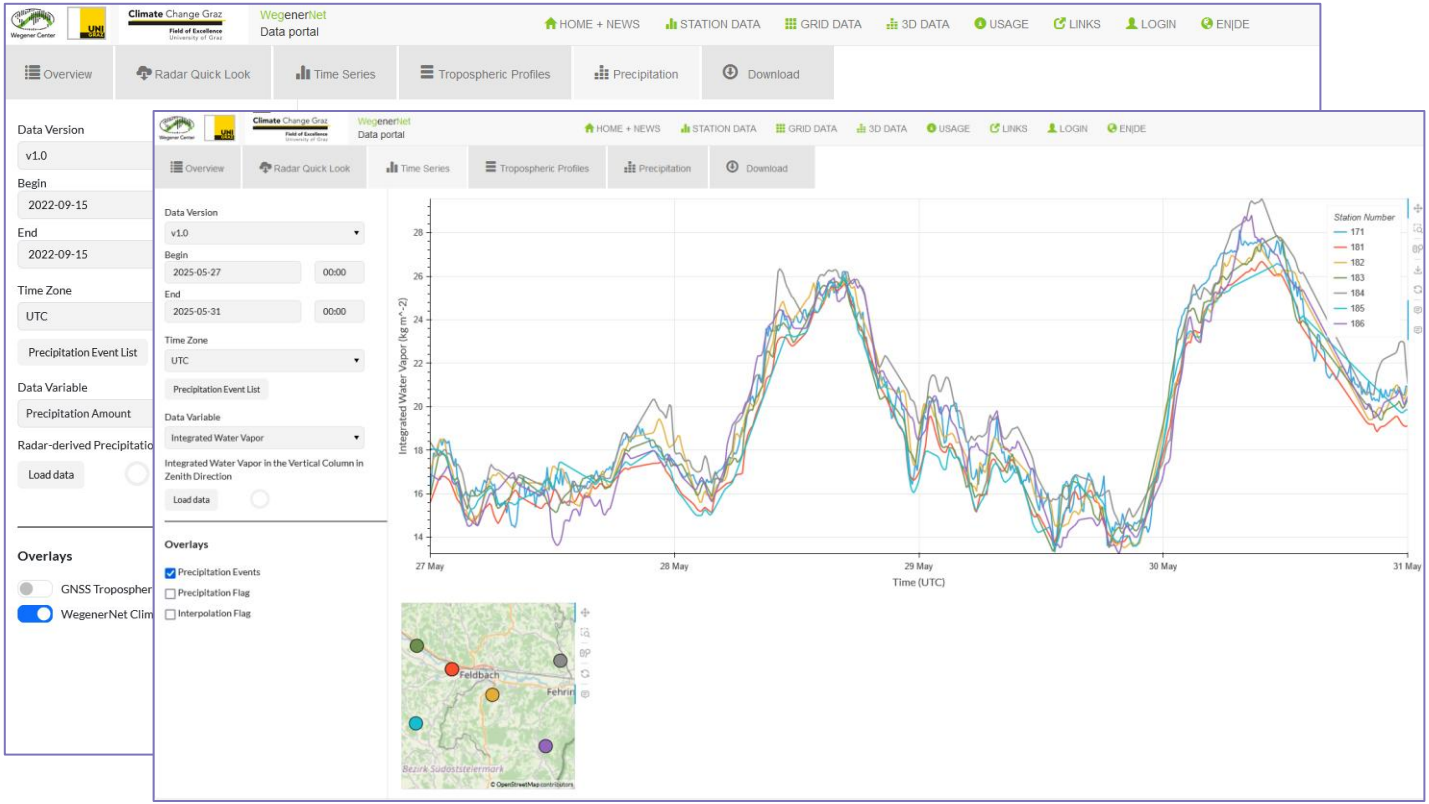
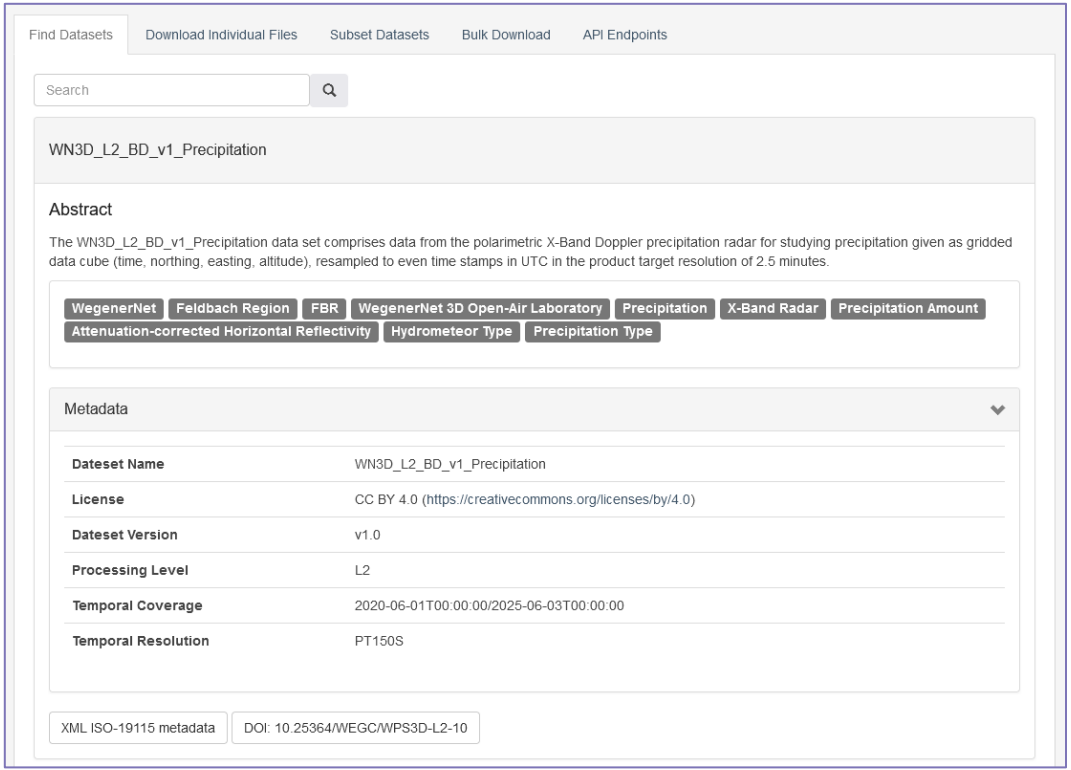
WegenerNet Data Portal



- Visualization
- Metadata
- Dowload
- API endpoints

WegenerNet Data Portal



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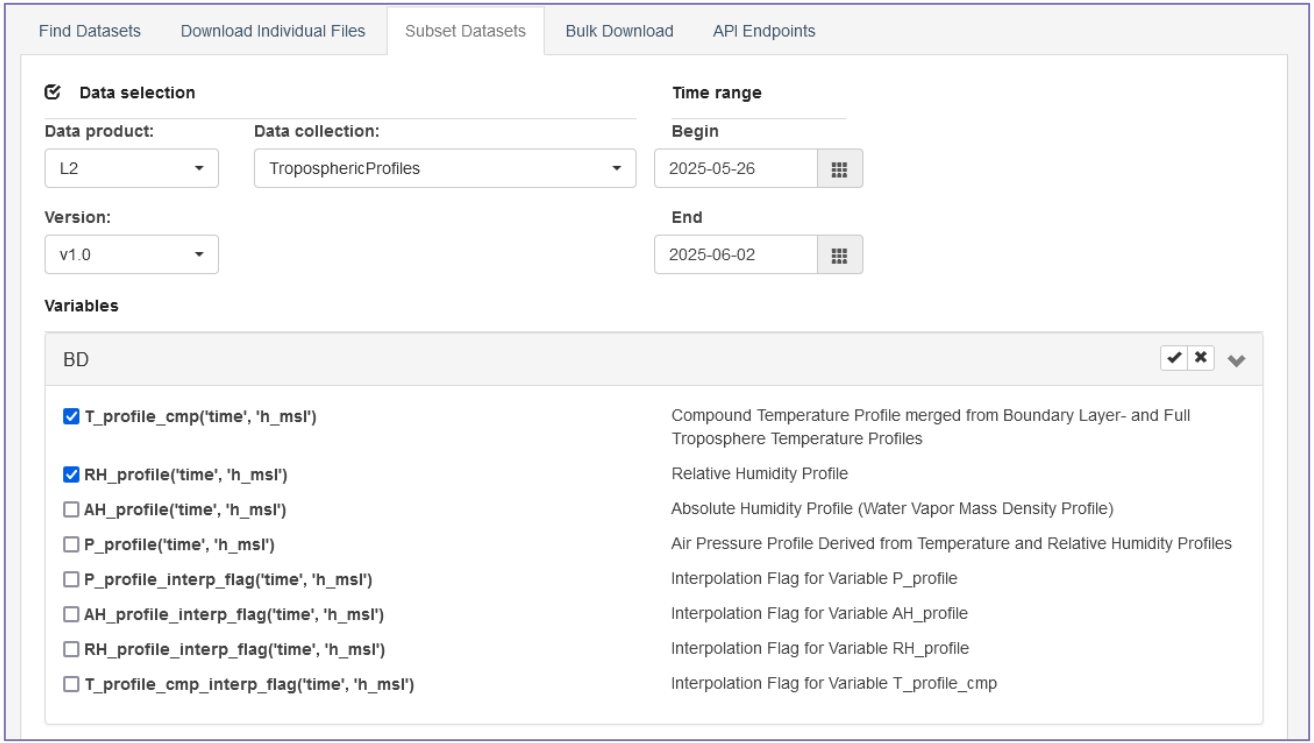

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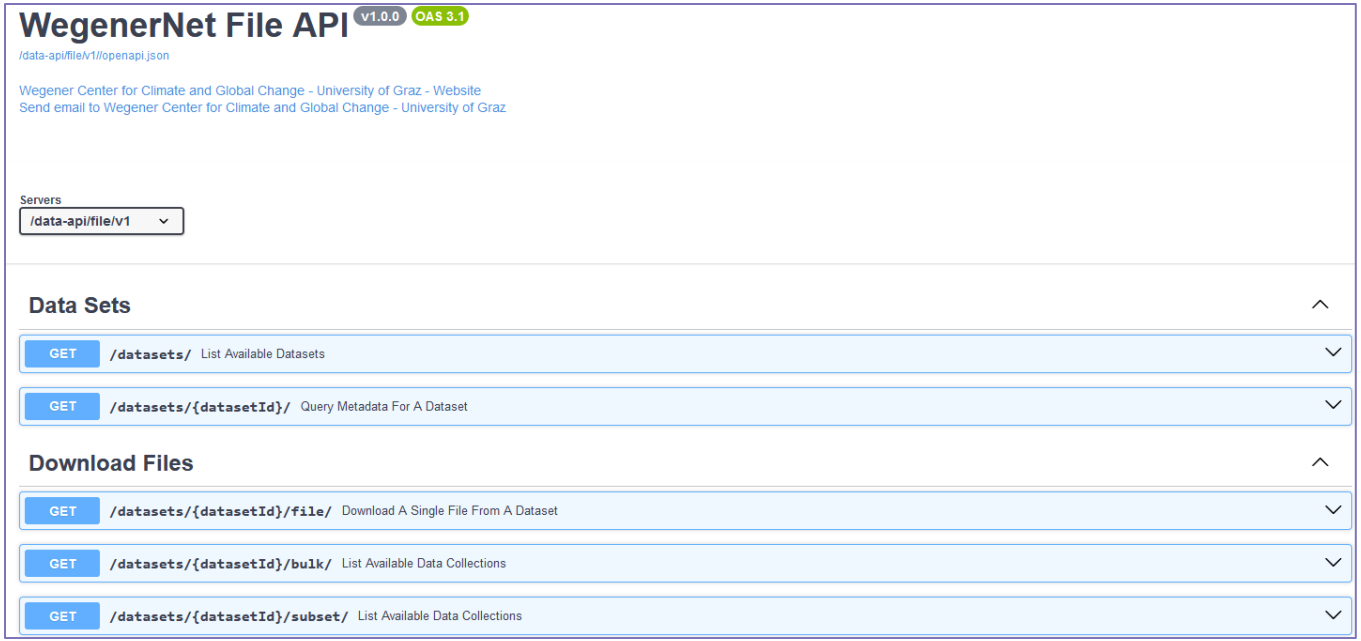

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04

Summary and Outlook

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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:

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wegcenter.uni-graz.at/wegenernet

Thank you!

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