

# **The WegenerNet 3D Open-Air Laboratory for Climate Change Research: Data availability and case studies of extreme precipitation events**

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The WegenerNet 3D Open-Air Laboratory for Climate Change Research (WEGN3D Open-Air Lab), located in southeastern Austria around the city of Feldbach (46.93°N, 15.90°E), provides a unique measurement setup for the study of extreme hydrometeorological events such as heavy precipitation, hailstorms, and droughts. The WEGN3D Open-Air Lab combines a polarimetric X-band Doppler weather radar, a microwave tropospheric sounding radiometer, an infrared cloud structure radiometer, and a GNSS station network for integrated water vapor sensing with the WegenerNet hydrometeorological ground station network, consisting of 156 climate stations. It covers an area of about 22 km x 16 km, with a radar coverage of 1400 km<sup>2</sup>.

This highly synergistic infrastructure allows near real-time monitoring of temperature, humidity, water vapor, cloud parameters, and precipitation from the surface to the upper troposphere with very high spatial and temporal resolution. The instrumentation has been operational in its current configuration since mid-2021, providing a consistent and growing data record of nearly four years to date. All data generated within the WEGN3D Open-Air Lab are published on the WegenerNet Data Portal as user-friendly data cubes. These data cubes can be viewed, subset, and retrieved via a web user interface with additional download capabilities available through application programming interfaces (APIs).

In this contribution we highlight science use cases of the WEGN3D Open-Air Lab with different case studies. These include observation-driven life cycle analysis of extreme precipitation events, the interaction between GNSS signal path delay and heavy precipitation, and the validation of spaceborne remote sensing data. We also present the WEGN3D-data-cubes-related additions to the WegenerNet Data Portal.