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The WegenerNet observing weather and climate at 1 km-scale resolution: a new look at convective precipitation and other local-scale processes

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The region Feldbach in Eastern Styria, Austria, characteristic for experiencing a rich variety of weather and climate patterns, has been selected by the WegCenter as a focus area for a pioneering weather and climate observation experiment at very high resolution: The WegenerNet climate station network region Feldbach (in brief WegenerNet) is comprised of 151 meteorological stations, which measure temperature, humidity, precipitation, and other parameters, with high accuracy in a tightly spaced grid (one station per $\sim$2 km^2; each with 5-min time sampling; $\sim$1.4 km x 1.4 km grid in an $\sim$20 km x 15 km area centered near the City of Feldbach at 46.93°N, 15.90°E).
Since Jan 2007 the WegenerNet is providing, as part of the pilot and demonstration phase, regular measurements from the entire grid and since fall 2008 a complete quality-controlled data stream is available in near real time (data latency less than 1–2 hours) for visualization and download via the WegenerNet data portal (www.wegenernet.org).
Currently (early 2009) the network demonstration is moving into its final phase, with consolidating maintenance procedures, advancing weather and climate data product development and completing the data portal bilingually (German, English). Full operations is foreseen to be reached mid 2009, from which on the net is scheduled as a long-term field experiment serving as a high-resolution monitoring and validation site for weather and climate research and applications.
Adding further value, the WegenerNet data are complemented by lightening measurements in cooperation with the Inst. of Physics/Univ. of Munich (European LiNet network, including dedicated stations in Feldbach and Graz). In addition, a 3D-steerable Doppler weather radar (of the Styrian Hail Protection Society at Reicherhöhe near Graz) is available with un-obscured view of clouds and rain over the WegenerNet area, focusing its measurements on hail and heavy rainfall. Complementary hailpad measurements are planned as well (as of 2009).
Many research projects investigating climate and environmental change and impacts, as well as local weather (extremes), will benefit from WegenerNet data covering the local scales from 1–10 km. This is a key domain for future high-resolution climate modeling and analysis, currently mainly covering the 10–50 km scale, for meeting the needs of climate impact models and studies in heterogeneous orography such as the Alpine region. Applications include validation of non-hydrostatic climate models operated at 1–10 km resolution for dynamical downscaling, validation of statistical climate downscaling techniques, in particular for precipitation, “ground-truth” provision for and validation of high-resolution atmospheric and hydrologic Earth observation data from satellites, validation of weather radar rain rate estimates, study of orography-local climate relationships, basin-scale and local water balance assessments, and many others.
The presentation will introduce the WegenerNet and its characteristics and capabilities along the lines above and will show example applications of its (1 km x 1 km) weather and climate products, with focus on the highly-variable convective summer precipitation. On-line access will also be demonstrated (www.wegcenter.at/wegenernet, www.wegenernet.org).