Helsinki Testbed up and running

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Vaisala News 167 reported the launch of the Helsinki four-season mesoscale Testbed. Find out what has been happening since then.

The Helsinki Testbed, launched in early 2005, is a joint effort between the Finnish Meteorological Institute (FMI) and Vaisala. It consists of a particularly dense and versatile weather observation network, located in the Greater Helsinki area.

The Helsinki Testbed produces data for research on small scale weather phenomena, and contributes to the development of new mesoscale weather services, providing information on local weather events.

The first measurement campaign was carried out in conjunction with the World Championships in Athletics, held in Helsinki in August 2005. The focus was on gathering data for short-term weather forecasts. The November 2005 measurement campaign focused on different precipitation types. Rain, drizzle, snow and sleet were measured at 350 measurement points with different methods and equipment. The third campaign kicks off in January 2006 and focuses on the stable boundary layer. Two more confirmed campaigns remain after this - one on sea breeze in May 2006, and the other on convection in August 2006.

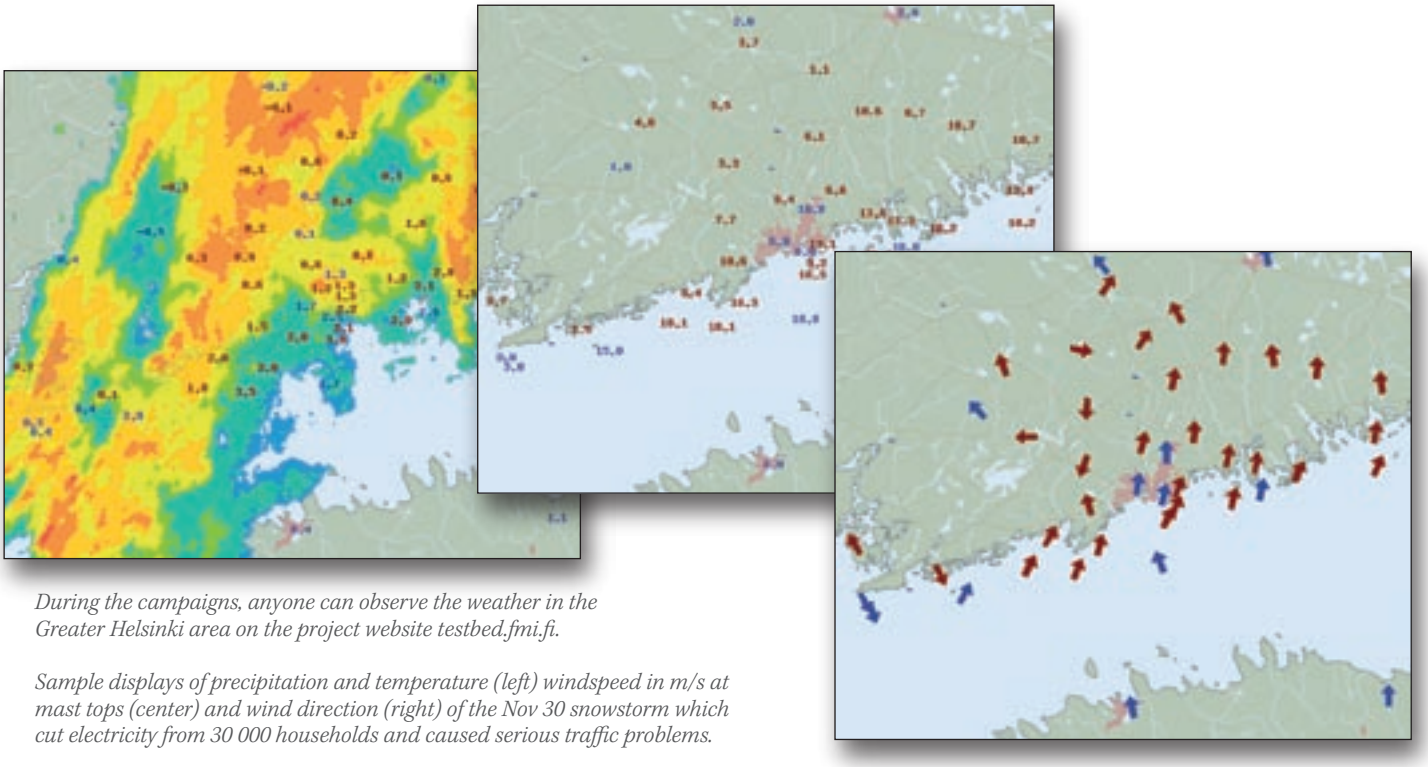
Urban Modeling Workshop

Enhanced three-dimensional mesoscale observing networks are critical to advancing numerical and empirical modeling for a broad spectrum of mesoscale applications, including severe weather warnings and forecasts, hydrology, air quality forecasting, chemical emergency response, transportation safety, and energy management. Today's mostly two-dimensional mesoscale measurement networks do not provide observations of the type, frequency, and density required to optimize mesoscale prediction and nowcasts. Mesoscale testbeds are widely recommended as the critical bridge needed to transition from research to operations.

To address these issues, Vaisala and the FMI convened an Urban Modeling Workshop in June 2005. The workshop brought together an international working group of scientists, interested in the observation and simulation of urban boundary layers to explore the ways in which urban modelers could make maximum use of the unique urban meteorological data sets compiled from the Helsinki Testbed.

Helsinki Testbed produces data for research on small scale weather phenomena

There was consensus among the participants that the Helsinki Testbed is an invaluable resource that offers modelers and observationalists a unique opportu-



During the campaigns, anyone can observe the weather in the Greater Helsinki area on the project website testbed.fmi.fi.

Sample displays of precipitation and temperature (left) windspeed in m/s at mast tops (center) and wind direction (right) of the Nov 30 snowstorm which cut electricity from 30 000 households and caused serious traffic problems.

nity to tackle the challenges of modeling a wide variety of atmospheric processes. It was also felt to address the needs of a broad range of practical and societally important applications, such as forecasting high-impact weather events, predicting air quality, managing emergency-response incidents, optimizing weather-sensitive transport operations, and increasing the efficiency of energy production and consumption patterns.

Wet World Championships in Athletics

The first measurement campaign of the Helsinki Testbed project was timed to coincide with the 10th World Championships in Athletics, held in Helsinki in August. Several additional weather observation sites had been installed, for example along the marathon route and at the Olympic Stadium, in cooperation with the Finnish Athletics federation and the City of Helsinki.

Unluckily for the athletes and spectators, the skies opened up and gave us one shower after another with an intensity we will never forget. According to the Testbed measurement data, it rained a total of 38 mm, or 1.5 million liters, inside the Olympic Stadium during the day and evening events.

Two-thirds of the total rainfall occurred on the evening of Tuesday August 9th, when 26.2 mm of water accumulated on the Olympic Stadium between 3 p.m. and 9 p.m. Due to the storm, the games had to be discontinued for some time. Most of the precipitation occurred during two intensive 20-minute downpours. The intensity of one of them was 89 mm per hour. 500 lightning bolts were detected in Helsinki and the surrounding areas during thunderstorms on the same day. Two other rainy days were the opening on Saturday August 6th (rainfall 3.2 mm), and Wednesday August 10th (rainfall 7.2 mm). Similar brief heavy rains occur in Finland only once every ten years on average.

Studying different precipitation types

Ironically, after the torrential rain showers during the first measurement campaign, the second campaign started in November with a focus on different precipitation types.

The type of precipitation is often self-evident: in freezing temperatures it is snow, during the summer it is water. However, when the temperature is close to 0 °C, precipitation can take different forms even within short distances: for instance, it can be snowing in one part of Helsinki while it is raining in another. Precipitation type depends on the temperature in the upper atmosphere, as well as on the temperature and humidity close to the ground. This is why it can snow in dry weather even in +4 °C. Supercooled liquid precipitation can occur in freezing temperatures if the upper atmospheric layers produce such conditions.

In November, the temperature in the Greater Helsinki area is often close to 0 °C, and precipitation falls as rain or snow, or a mixture of both. The relatively great differences in temperature at sea and in inland areas cause significant differences in the type of precipitation that occurs in different areas within Greater Helsinki.

Rain in freezing temperatures is particularly troublesome for road traffic and aviation, as the water quickly freezes when it hits a cold surface, such as a highway. The icing of aircraft wings alters the plane's flight capacity, so it is important that deicing is carried out before takeoff. In addition to aviation authorities, precipitation information is important to authorities in charge of road and property maintenance, as they make decisions on snow plowing and road salting.

The November campaign of the Helsinki Testbed, which managed to catch the November 30th snowstorm pictured above, uses different methods for measuring precipitation types. Temperature and humidity are measured with a dense observation network. In locations where there is no measurement equipment, the temperature is estimated based on the environment and the measurements taken at stations nearby. A radar-acoustic sounding system located at Helsinki's Malmi airport, coupled with more-frequent-than-average soundings, produces information on temperatures in the upper layers of the atmosphere. The properties of snow flakes and raindrops are measured by a weather radar particularly developed for this purpose.

Interested in joining the project?

The Helsinki Testbed is an open program where collaborators are encouraged to participate. To find out more about the Helsinki Testbed project and campaigns, please visit the project homepage at **testbed.fmi.fi**