Urban Meteorological Observations in Helsinki, Finland

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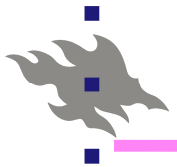
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

VAISALA



UNIVERSITY OF HELSINKI

A Public–Private–Academic Partnership

ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

- Forecasting (public)
- Research (meteorology, air-quality)
- Commercial services (road weather, meteorology, climate)

VAISALA

- Instrumentation (e.g., WXT, radar)
- Solutions (networks, applications)

UNIVERSITY OF HELSINKI

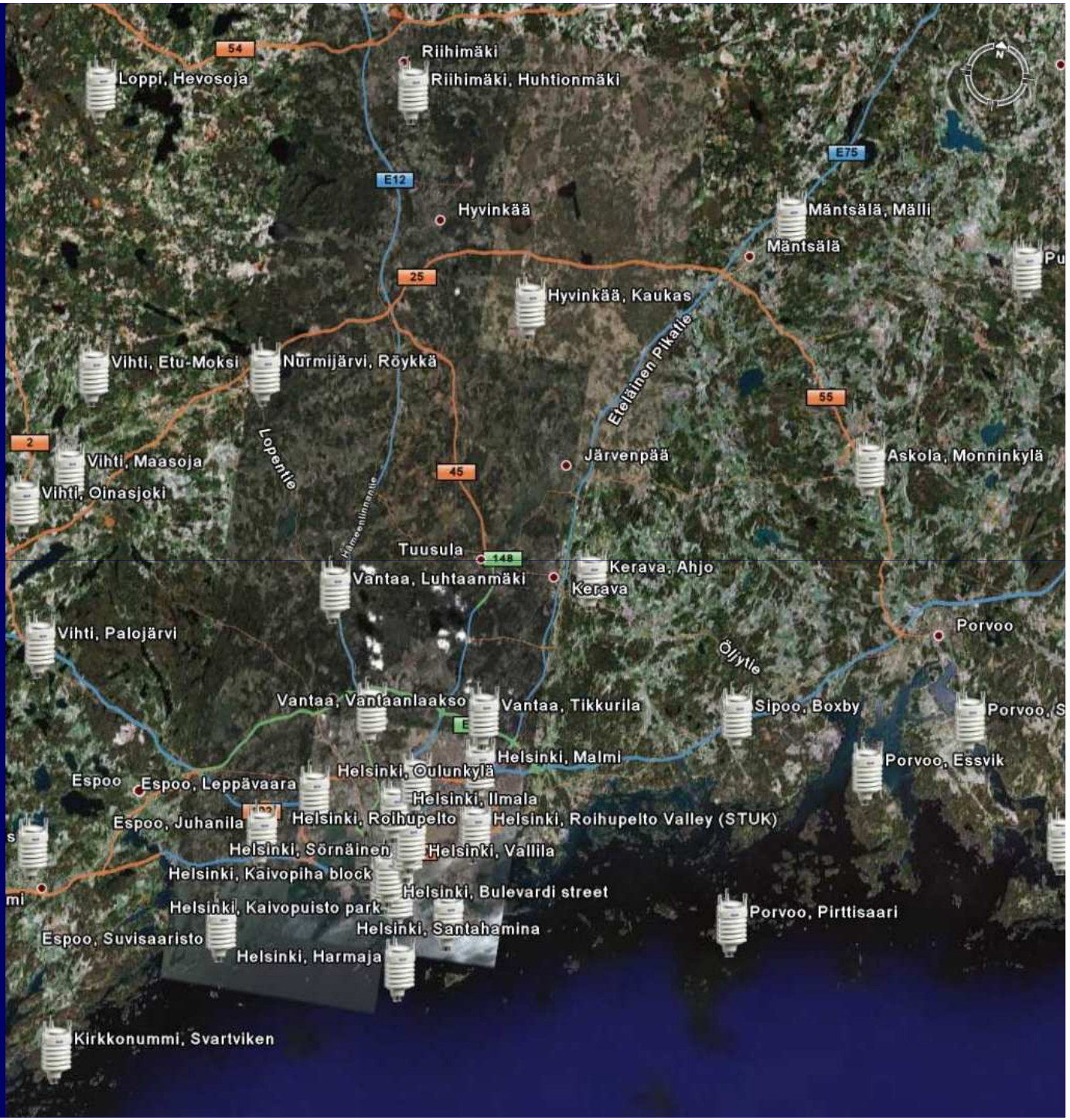
- Research (aerosols, boundary layers)

Helsinki

Image © 2005 DigitalGlobe
Google
Pointer 60°10'57.53" N 24°57'25.04" E
Streaming 100%
Eye alt 47061 ft

Surface Weather Transmitter: Vaisala WXT510 (61)

<$2000



Mast Installations (44)

Upper Weather Transmitter

40–120 m

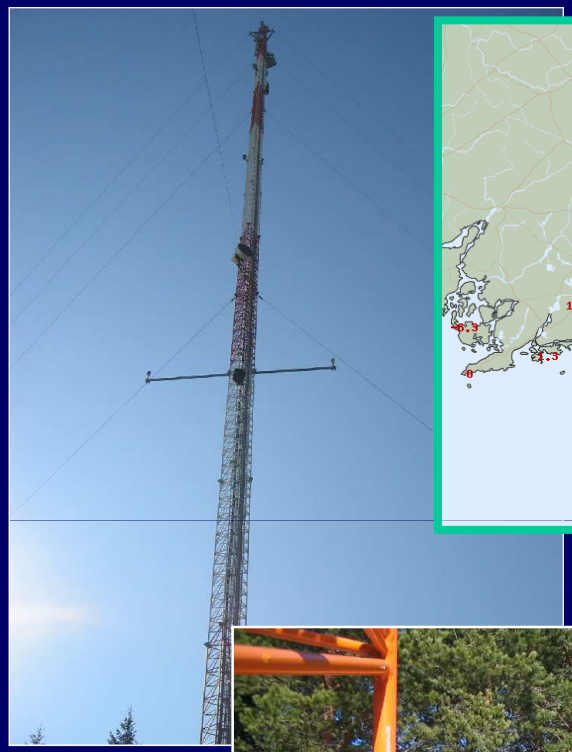
Middle Weather Transmitters

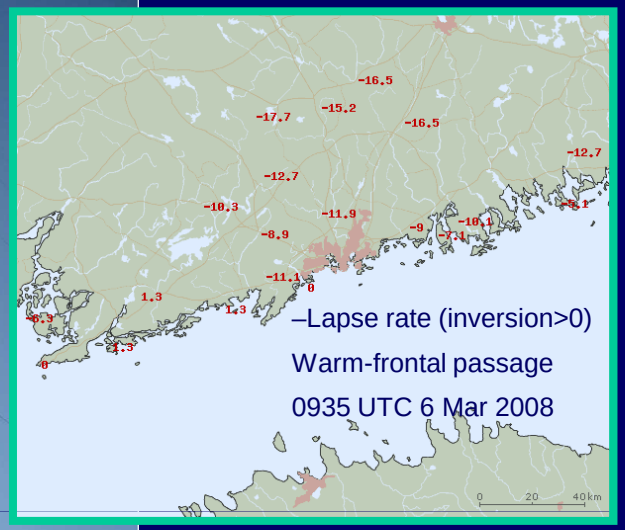
20–30 m

(on 5 sites)

Lower Weather Transmitter

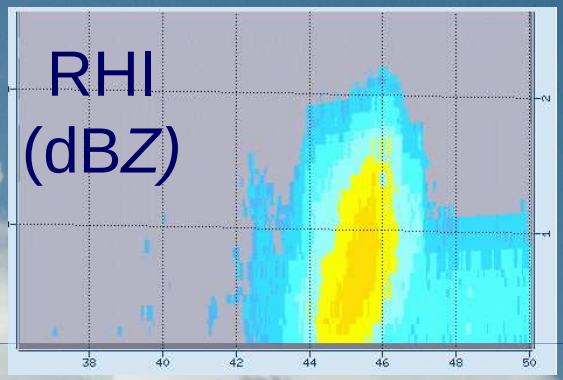
2 m



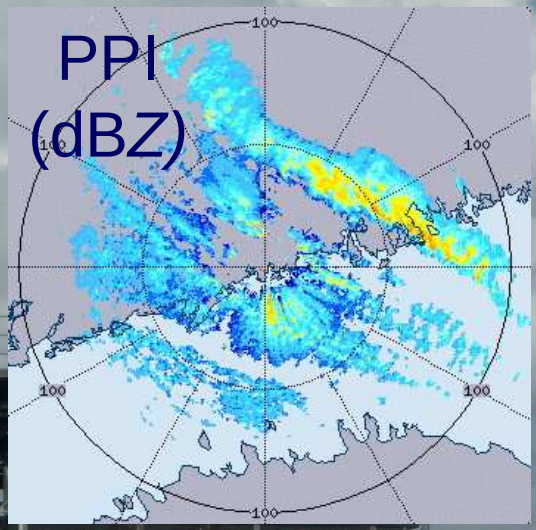


Communications Unit

Univ of Helsinki Dual-Polarimetric Radar



VAISALA



(Matti Leskinen, David Schultz)

The SMEAR III Station, Kumpula Campus

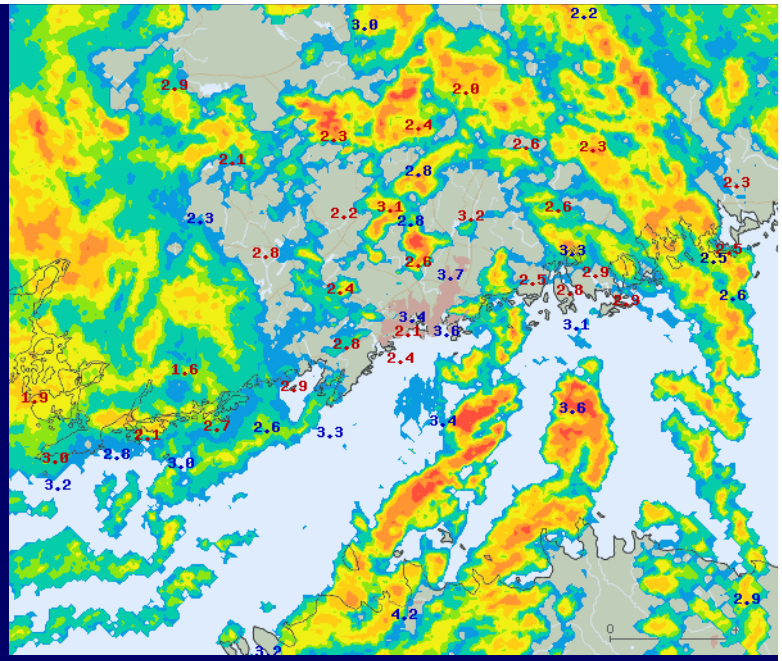
- Started autumn 2004
- Surface–atmosphere interactions in an urban area
- 31-m high tower
- Winds, temp, radiation, etc.
- Heat, moisture, aerosol particle, CO_2, and momentum fluxes

(Leena Järvi)

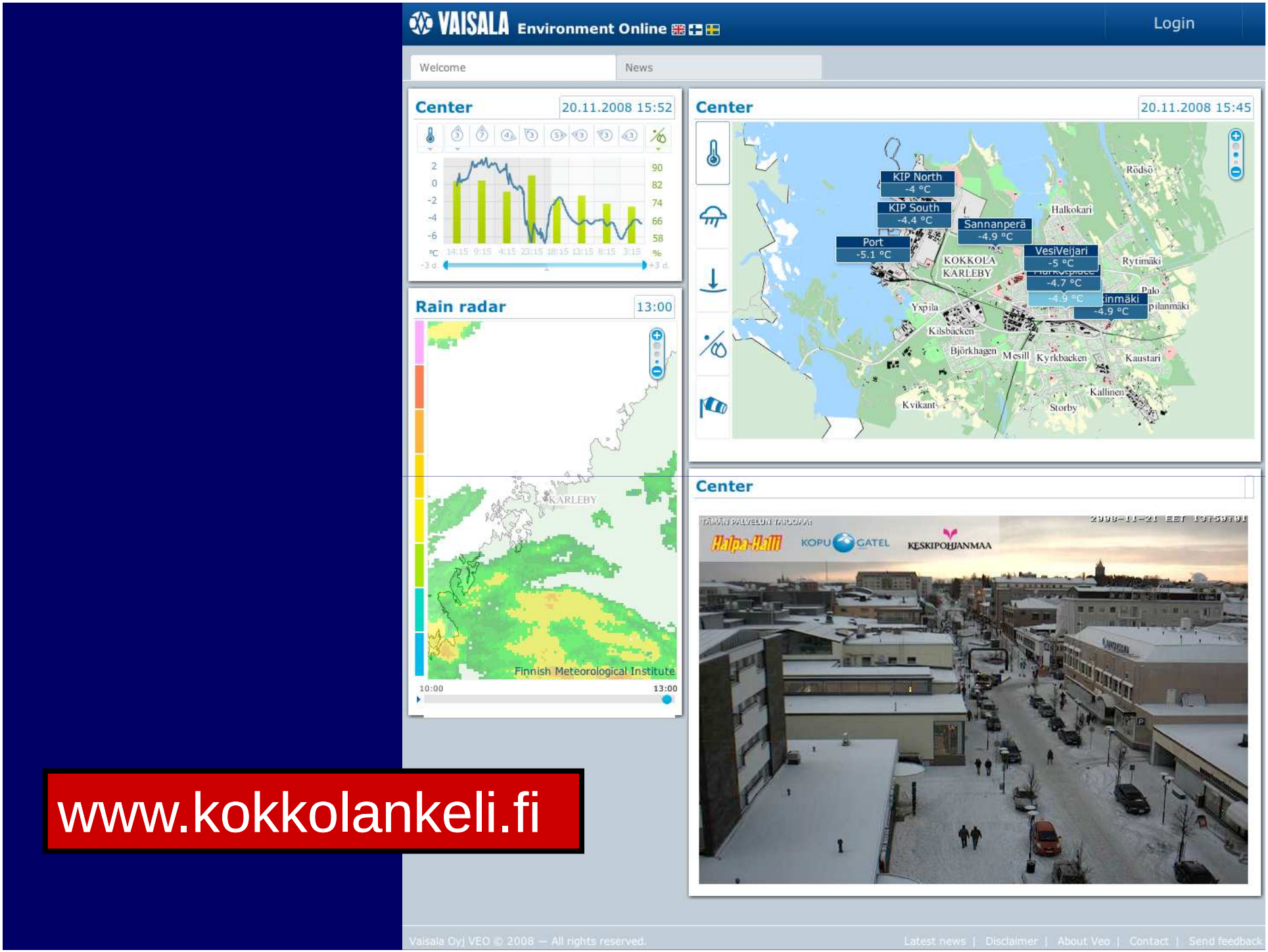
Other Instrumentation

- Radiosonde (1–2)
- Road weather sensors (191)
- Weighing precipitation sensors (10)
- Ceilometers (12)
- UHF wind profiler with RASS
- Joss–Waldvogel RD-69 Disdrometer
- Precipitation occurrence sensor
- Hydrometeor Size Detector
- Ecological stations (6)

Data Availability



- Google Earth
- Public Web page (testbed.fmi.fi)
  - Free real-time radar data
- Researcher’s Interface on Web
- Real-time Web interface for customer applications (Kokkola)

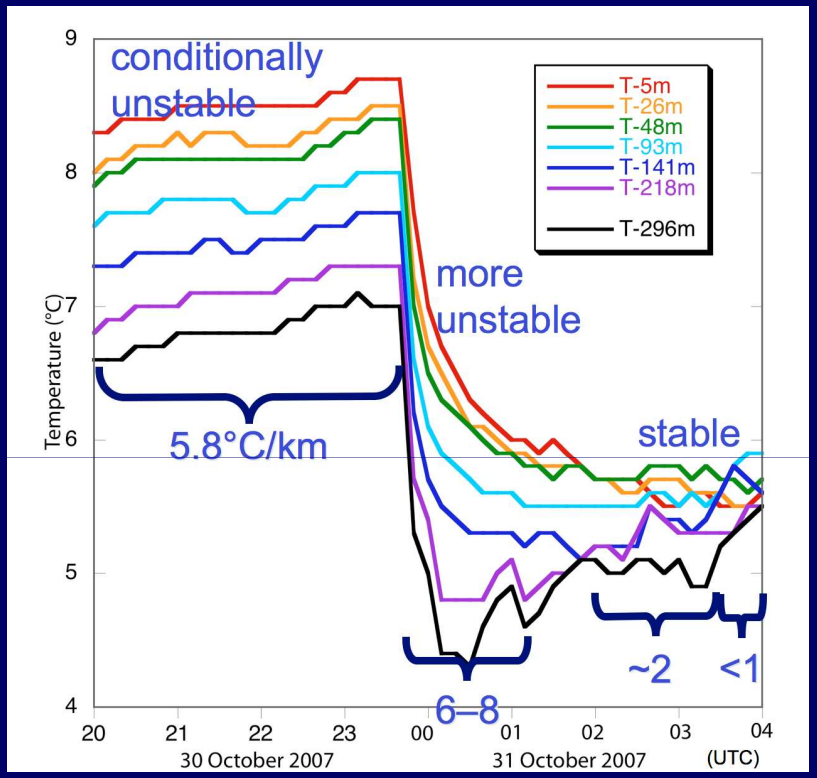


www.kokkolankeli.fi

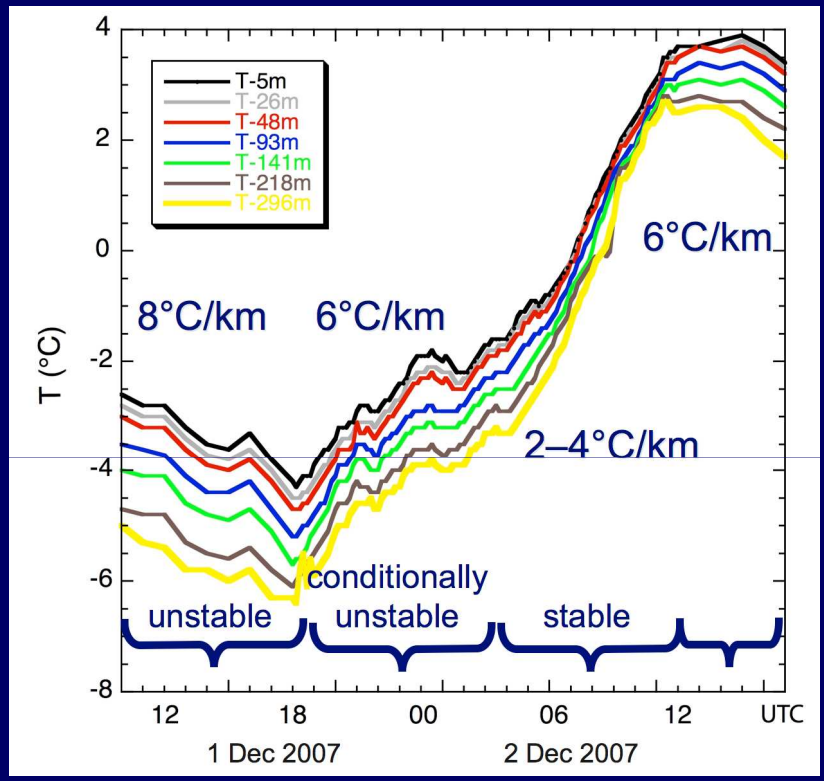
The Testbed serves a number of users.

- Researchers
- NWP group at FMI
- Instrument developers
- Radar meteorologists
- Public
- Forecasters

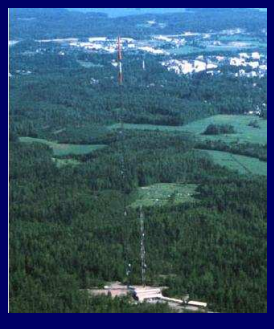
JP2.1: Observations of fronts from the Helsinki Testbed Mesoscale Observing Network – Schultz and Leskinen



Cold Front

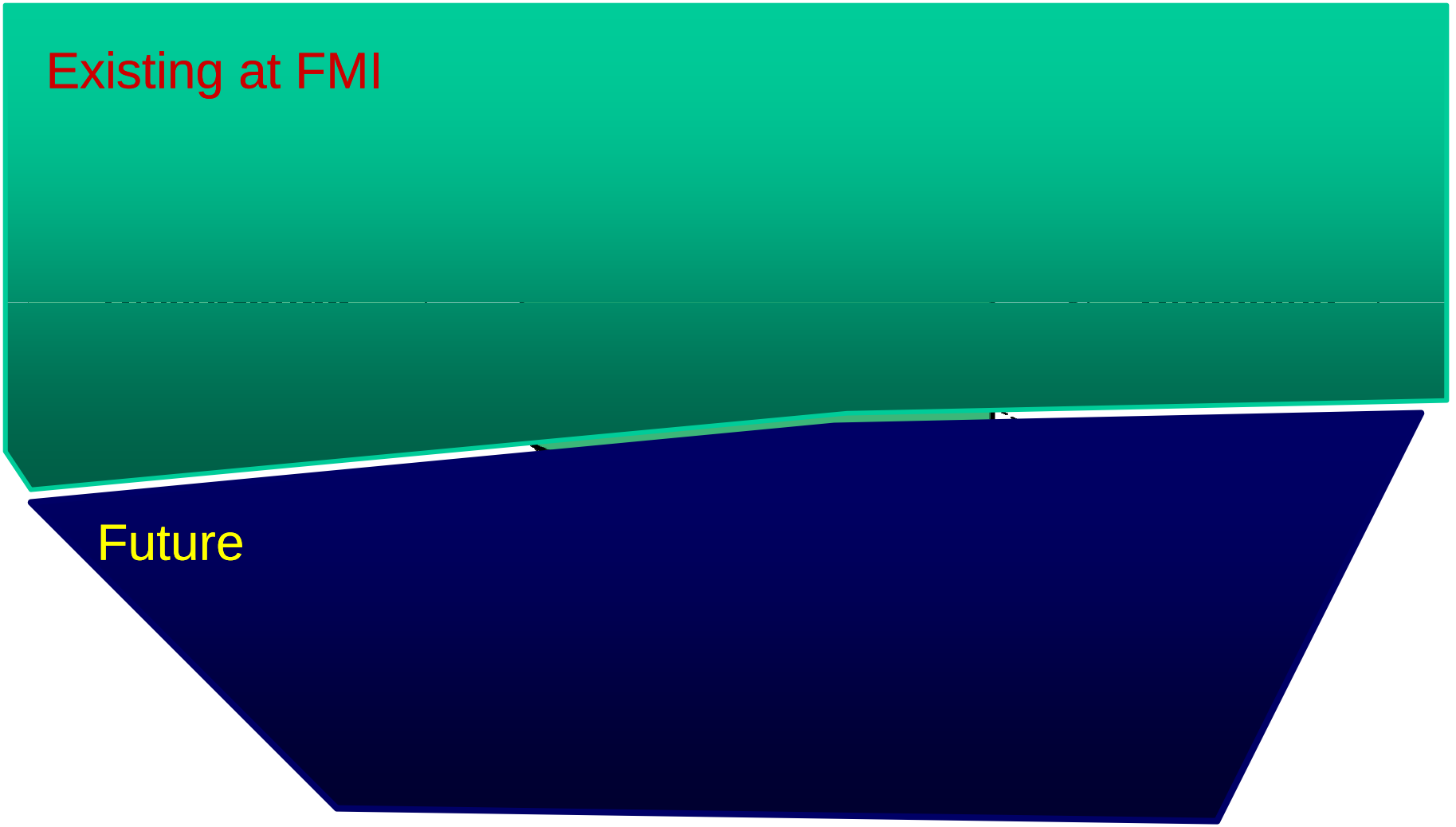


Warm Front



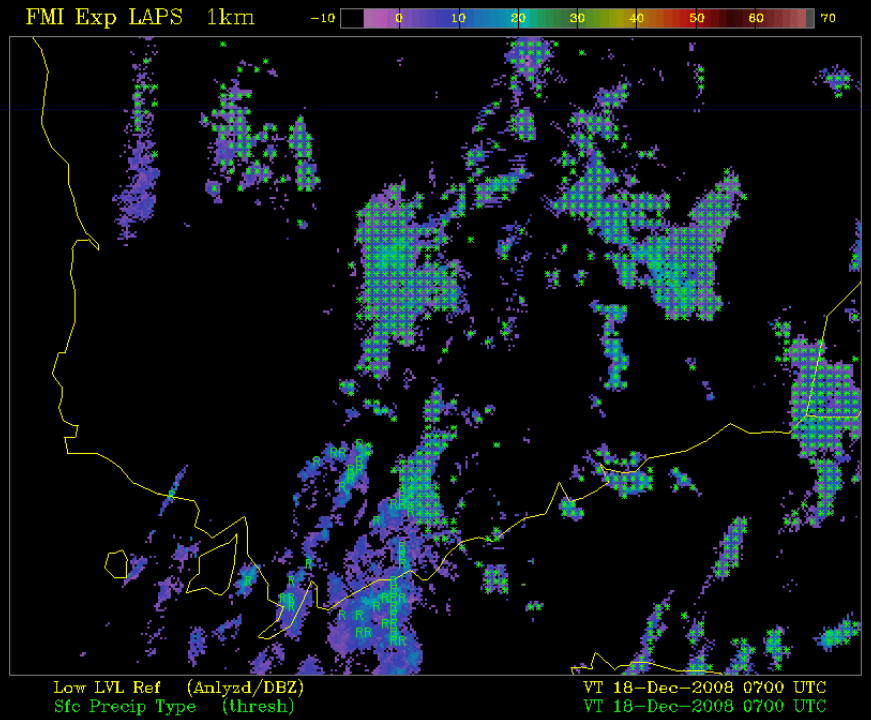
Data from 327-m tall Kivenlahti radio tower

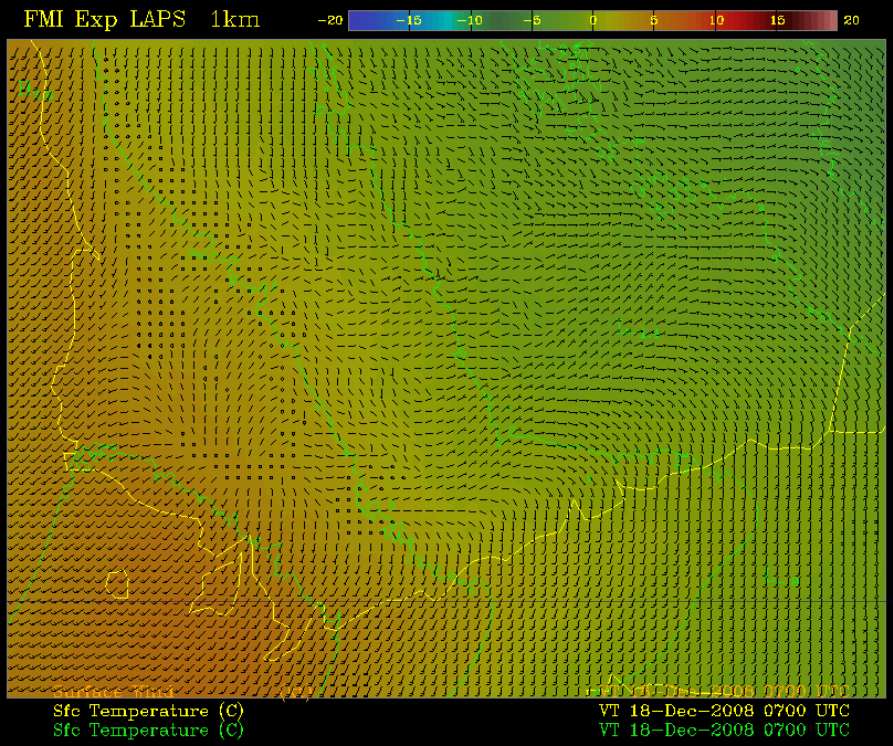
LAPS: Local Analysis and Prediction System



(Erik Gregow, FMI)

Testbed data is used in FMI's LAPS analyses.



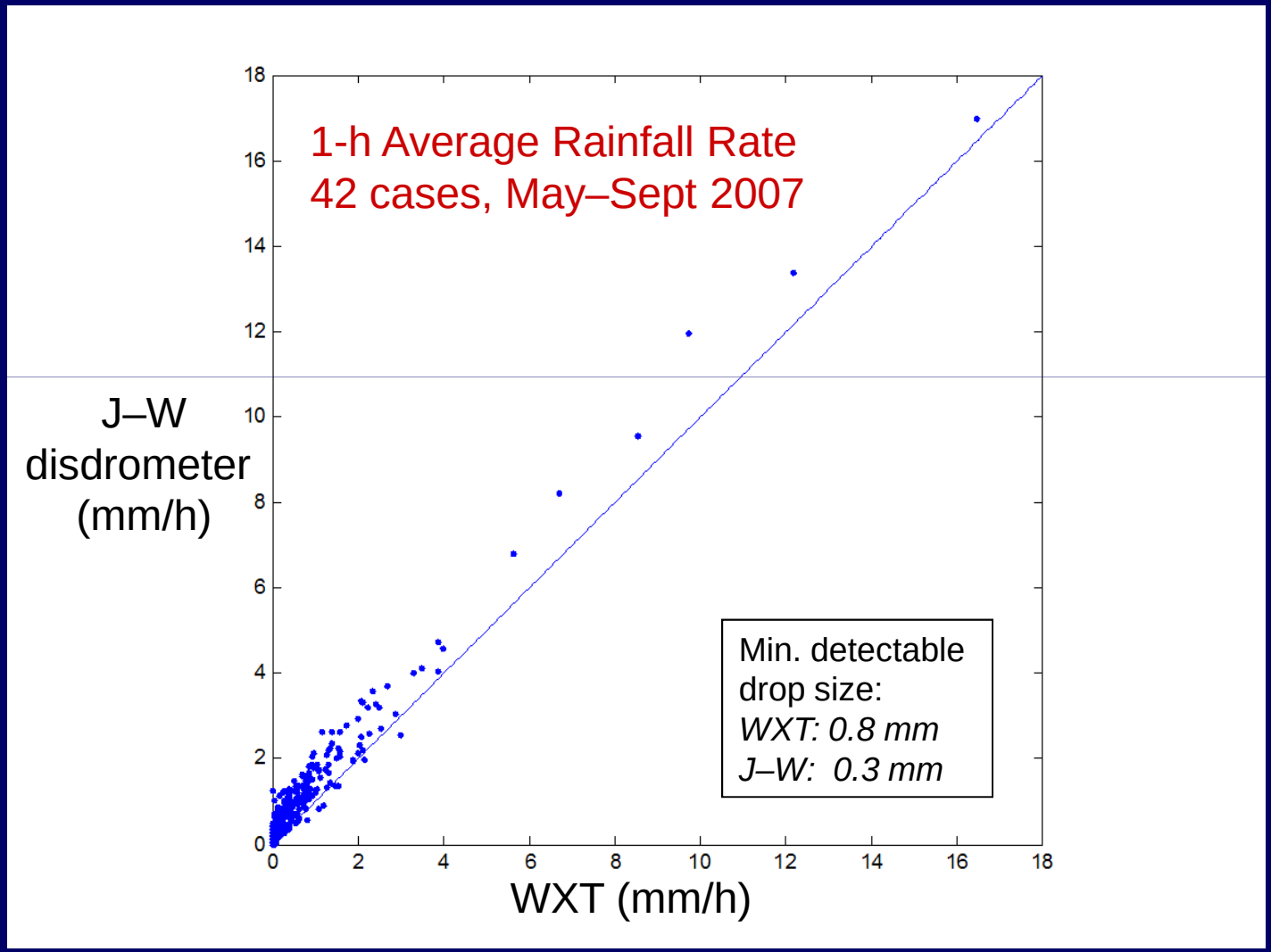


Surface Temperature

Reflectivity and Precip Type

(Erik Gregow, FMI)

Can a $2000 WXT compare to a $XXX,000 Joss–Waldvogel disdrometer? **Yes!**

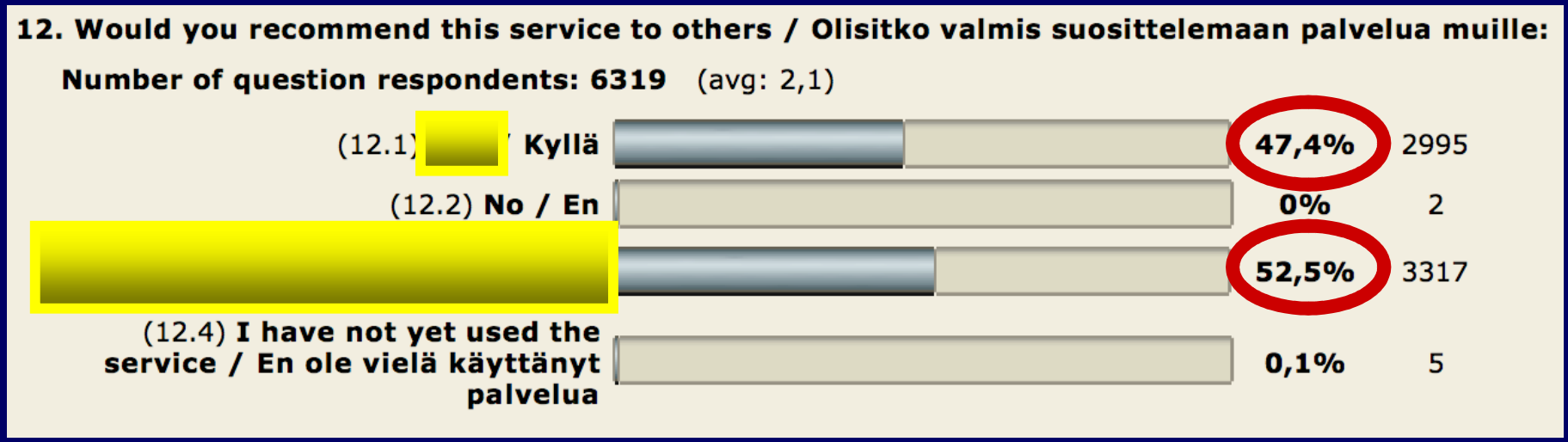


(Marjo Hoikkanen, Heikki Pohjola, Tapio Haarlaa, David Schultz)

People ♥ Helsinki Testbed

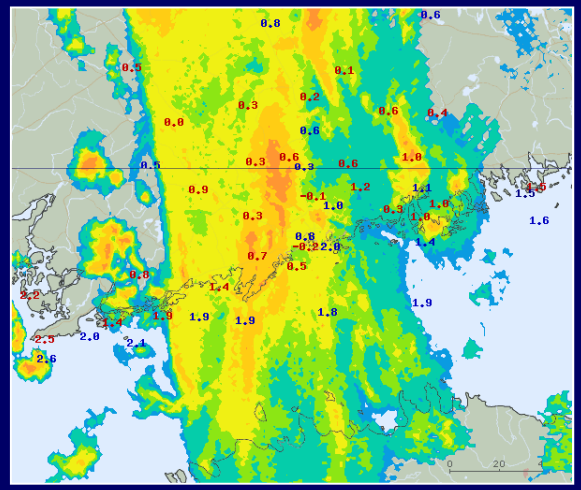
- Over 3 million Web hits, 41,000 users (Nov. 2008)
- 6300 responses to a 1-month user survey

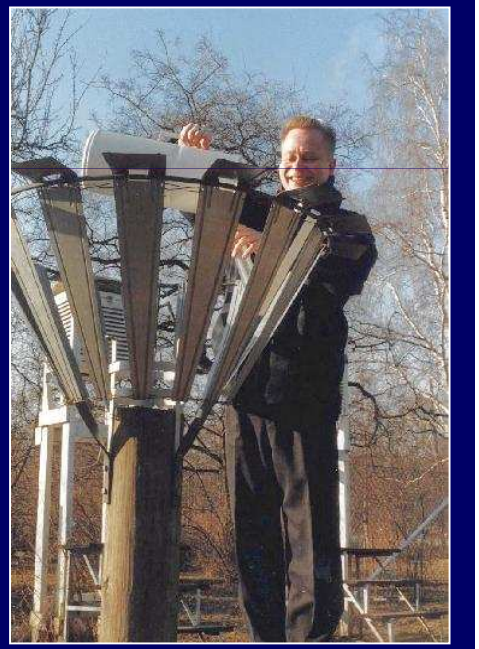
- 74% private use or general interest in weather
- 15% professional use
- 2% scientific research



Helsinki Testbed provides…

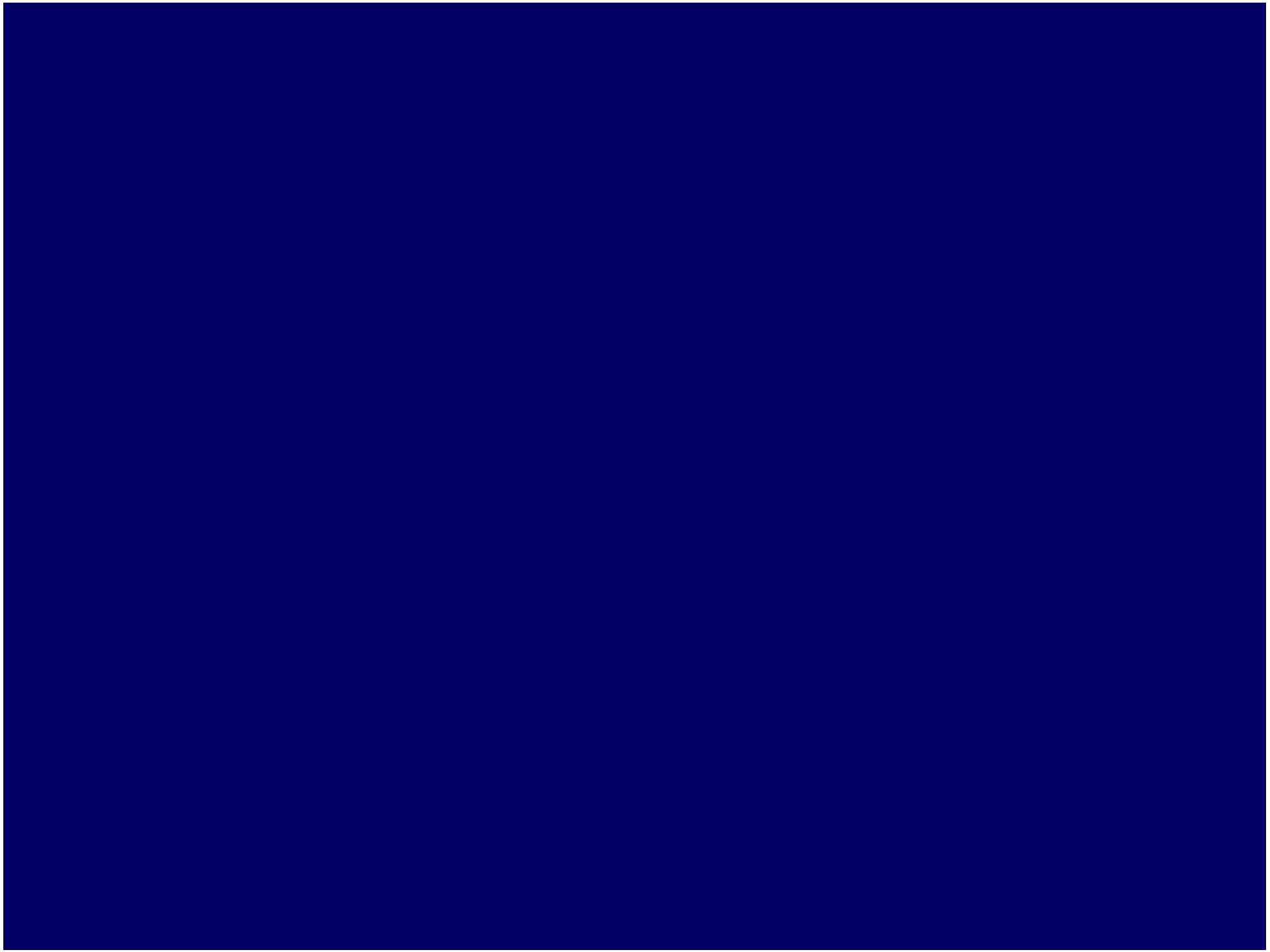
- Database
  - Measurements
  - NWP fields
  - Access over internet
- Infrastructure
  - NASA CloudSat and GPM
- Measurement sites





“Open invitation to the research and operational communities…”

http://testbed.fmi.fi



Finland
170km
St. Petersb
Helsinki
80km
Image © 2006 MDA EarthSat
Tallinn
Tallinn
Estonia
Google
Pointer 61°30'54.88" N 26°10'27.39" E elev 367 ft
Streaming 100%
Eye alt 395.25 mi

Foci

- Forecast and dispersion modeling (development and verification)
- Information systems and technology integration
- End-user product development and demonstration
- Data distribution: public, research
- Mesoscale weather and instrument research

Challenges Ahead for Testbed

- What is an “optimal” meso-gamma-scale network?
- Anyone can produce an analysis from LAPS. The challenge is producing a **GOOD** analysis.
  - Model domain, grid spacing, vertical resolution, lateral boundary conditions, ensemble analysis techniques … all of these can screw up an otherwise good analysis/forecast!
  - All of these factors and more need to be explored in a systematic way with LAPS.
- Can the economic value of the Helsinki Testbed be quantified?