

Helsinki urban modeling workshop
HTB project, cont. / Jani Poutiainen, FMI, 15.6.2005

<i>Mesoscale terminology</i>	<i>Space scale</i>	<i>Time scale</i>
Meso- α	200-2000 km	6 h – 2 d
Meso- β	20-200 km	30 min – 6 h
Meso- γ	2-20 km	3-30 min

Orlanski (1975)

HTB Research: Air quality modeling

Meteorological pre-processing model development

Basis: MPP model produces e.g. mixing height and stability parameters for air quality model.
HTB measurements are to be utilized in pre-processing.

Operative air quality forecast model development

Basis: HTB profile measurements are to be utilized in the model.

Air quality model validation

Basis: Estimation of importance of improved resolution observations in air quality forecast model.



HTB Research: Remote sensing

Precipitation type

Basis: Temperature and humidity analyses with profiles as well as polarization of radar backscattered radiation. Manually observed precipitation type.

→ Connection to road condition analyses, and radar measured accumulated precipitation.

Mesoscale fog 2D-diagnostics and verification

Basis: Satellite measurements, lidars and present weather sensors as well as weather cameras.

→ Connection to safety in air, maritime and road traffic operations.

Temperature inversion strength and height

Basis: Examination of satellite measurements in inversion detection. Verification sources: radio soundings and masts.

→ Connection to dispersion modeling, by studying spatially wide coverage inversion measurement methods.

Sea breeze occurrence, coverage and strength

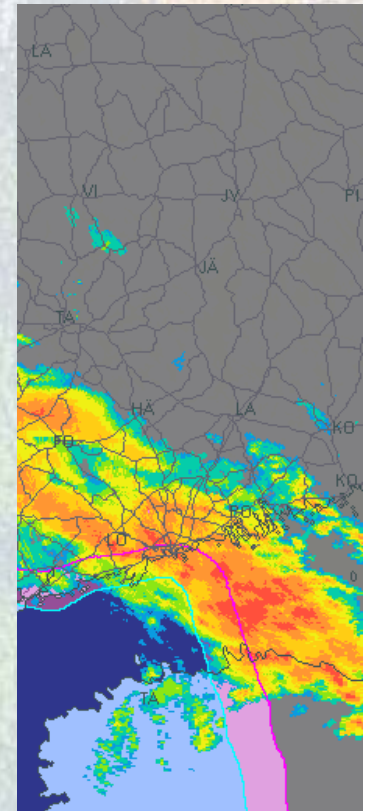
Basis: Sea breeze may be detected indirectly from satellite images. Verification sources: in-situ temperature and wind measurements.

→ Connection to coastal temperature forecasting, air and maritime traffic weather service, dispersion modeling, and insect migration studies.

Convection and nowcasting

Basis: Study of autocorrelation and optical flow methods in nowcasting. Data sources: Weather radar, satellite and lightning location network.

→ Connection to convection forecasting (e.g. shallow convection over sea).



HTB Research: NWP models

Modeling of measurement campaigns

Basis: Use of fine grid (3-5,5 km) HIRLAM, and creation of experimentation environment.
→ Connection to atmospheric processes study, and HIRLAM model verification.

Study of atmospheric processes

Basis: Dense network creates significantly improved frame work for this task. Focus is in modeling of convective precipitation, stable boundary layer, and sea breeze.

Mesoscale data-assimilation

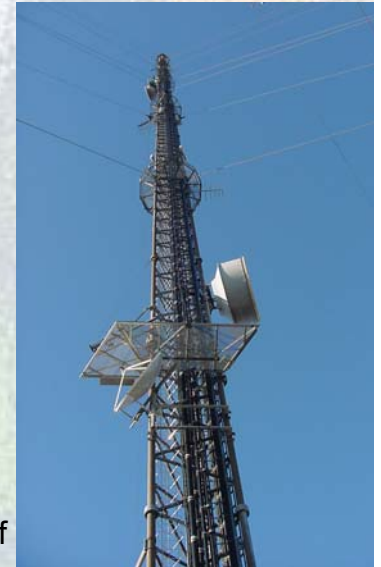
Basis: Study of dense observation network in precise description of the state of atmosphere, and in forecasting. Use of HIRLAM-MBE (9 km) in assimilation experiments.

Model verification

Basis: NWP models often describe atmospheric phenomena in different time and space scales compared to available observations. Dense network now enables range of methods (e.g. upscaling and downscaling) in model verification and sensitivity studies. Different HIRLAM versions will be tested with varying horizontal resolutions, such as 3, 5.5, 9 and 22 km.

→ Connections to:

- Knowledge of the quality of the models and their development needs.
- Future design of optimal observation networks with respect to meteorological modeling.



HTB Research: Road weather modeling

Development of surface temperature forecasting

Basis: Importance of radiation measurements and road weather station metadata in surface temperature modeling.

→ Connected to success of road weather type interpretation.

Improvement of road weather type interpretation

Basis: Remotely sensed precipitation type and amount in road weather modeling.

→ Connection to HTB remote sensing studies.



Data availability

- Surface-based in situ and remotely sensed measurements within the HTB inner domain.
- Upper-air soundings within the HTB outer domain.
- Outer-domain (and HEL) commercial aircraft soundings and enroute observations, as available.
- Operational HIRLAM MBE and HIRLAM RCR analyses and forecasts produced by Finnish Meteorological Institute (FMI) for the HTB outer domain.
- Special observations made in HTB project using standard or non-standard measurement systems and sensors.
- Polar-orbiting and geostationary satellite data, as routinely acquired by FMI.

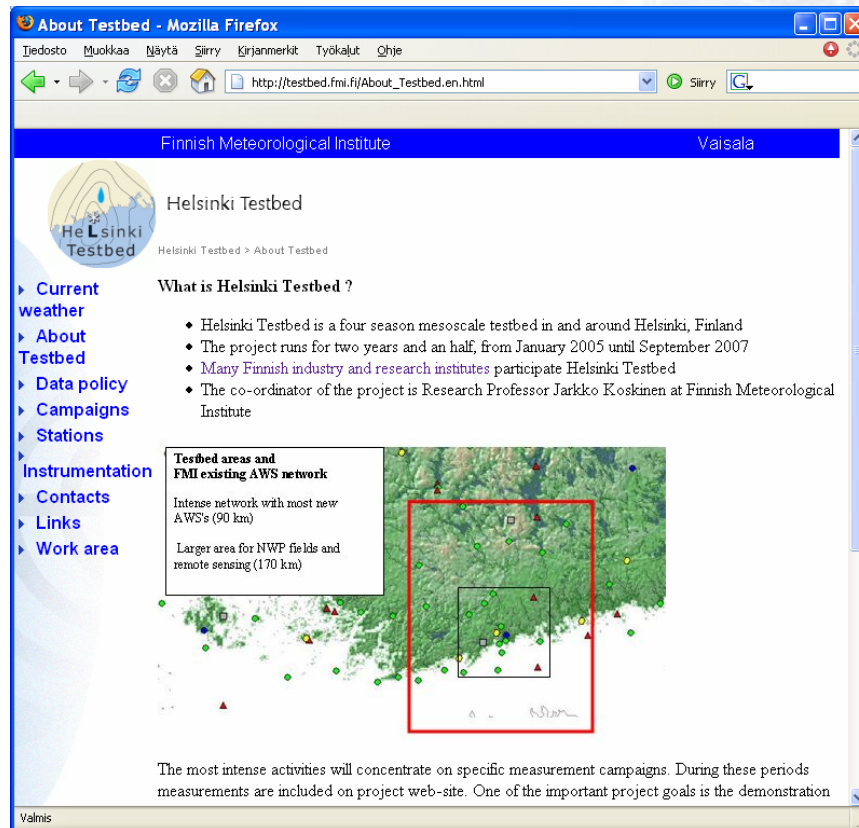
No.	Sites in Helsinki Testbed domain
46	FMI weather stations
34	FMI precipitation stations
13	Off-line temperature loggers in greater Helsinki area
8	Weather transmitters in greater Helsinki area
191	Road weather stations
292	Surface weather stations, total
42	Pairs of weather transmitters in masts
5	Optical backscatter profilers (new ceilometers)
6	FMI ceilometers
4	C-band Doppler radars
1	Dual polarization Doppler radar
4	RAOB sounding stations
1	UHF wind profiler
-	Total lightning network

HTB data *users and participants*

- Open international project, parallel and joint projects welcome!
- Data available for everyone in non-commercial use
- Recognized participants get HTB support, and are requested to submit data to HTB data archive
- HTB provides:
 - Central data warehouse (measurements, NWP fields, access over internet)
 - Infrastructure
 - Measurement site
 - Assistance on practical arrangements

Detailed policies: http://testbed.fmi.fi/Data_policy.en.html

WEB: <http://testbed.fmi.fi/>



The screenshot shows a Mozilla Firefox browser window displaying the 'About Testbed' page of the Helsinki Testbed project. The browser's address bar shows the URL http://testbed.fmi.fi/About_Testbed.en.html. The website header identifies the Finnish Meteorological Institute (FMI) and the Vaisala logo. The main content area is titled 'Helsinki Testbed' and includes a navigation menu on the left with items like 'Current weather', 'About Testbed', 'Data policy', 'Campaigns', 'Stations', 'Instrumentation', 'Contacts', 'Links', and 'Work area'. The main text under 'What is Helsinki Testbed?' provides a brief overview of the project, including its duration (January 2005 to September 2007) and the involvement of Finnish industry and research institutes. A map of the Helsinki region is shown, with a red box highlighting the 'Testbed areas and FMI existing AWS network'. The map includes a legend with two entries: 'Intense network with most new AWS's (90 km)' and 'Larger area for NWP fields and remote sensing (170 km)'. The bottom of the page mentions that intense activities will concentrate on specific measurement campaigns and that one of the project goals is the demonstration of the testbed.

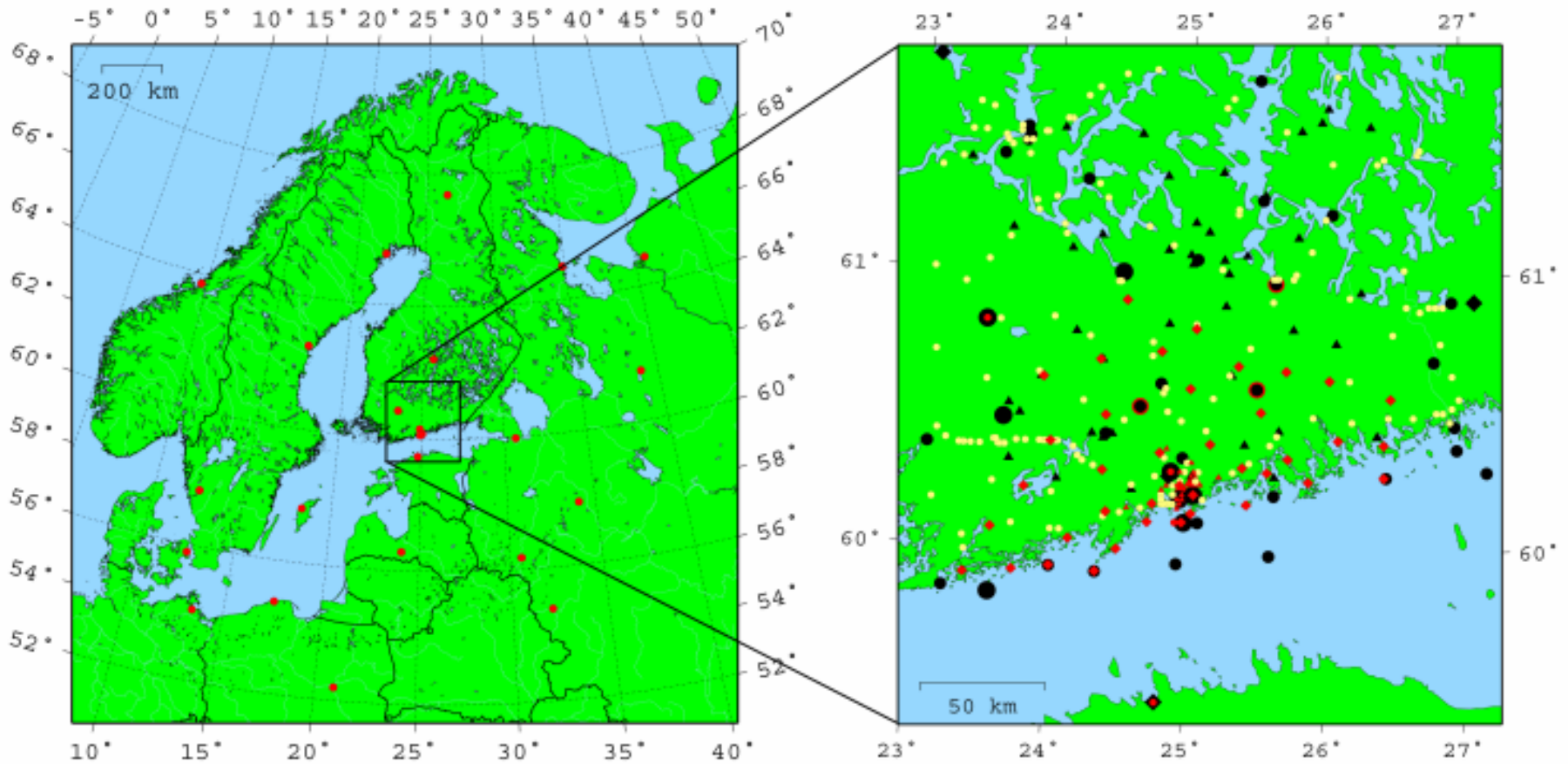
project summary:

http://testbed.fmi.fi/Misc/HTB_manuscript_Savannah.pdf

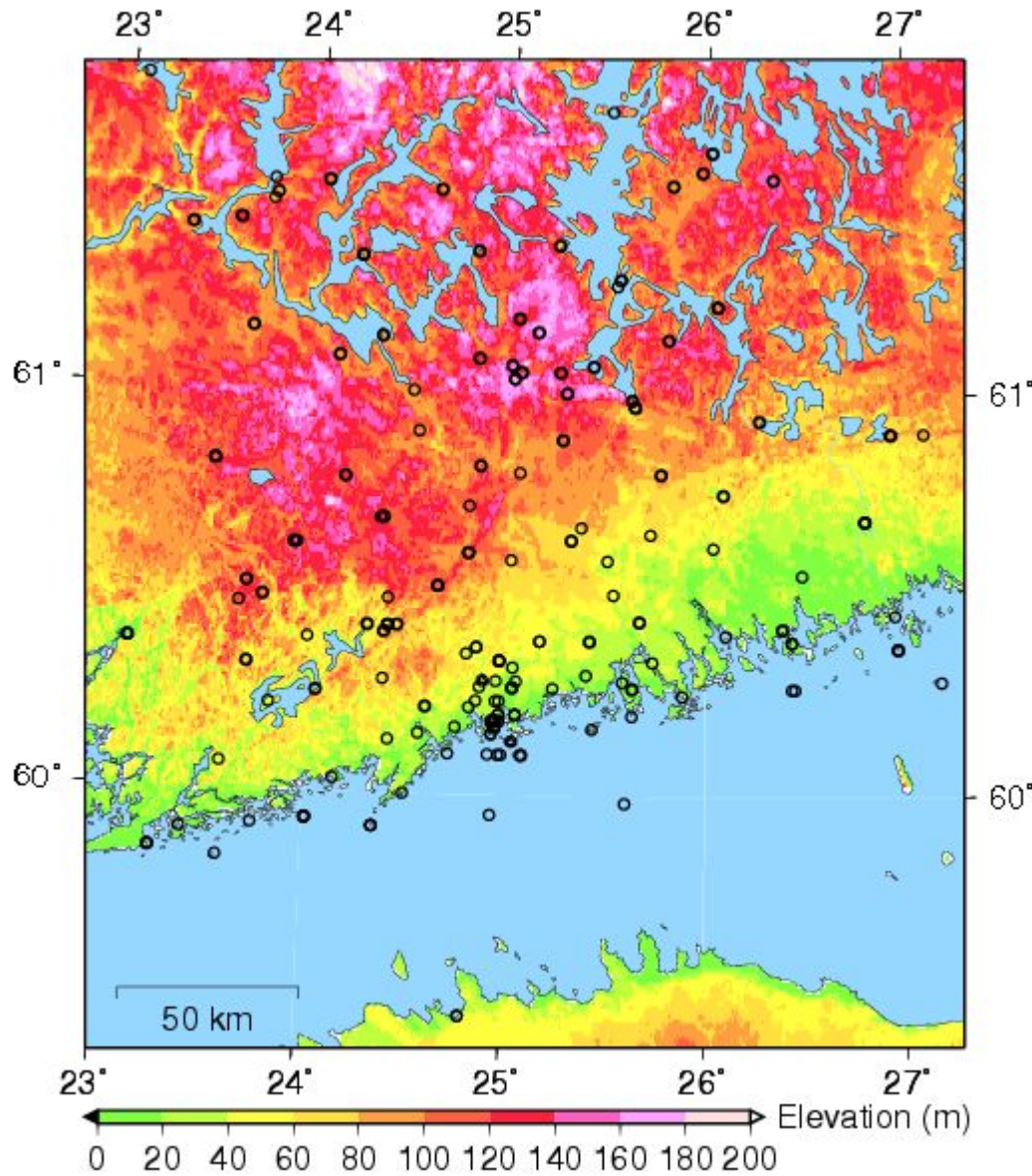
HTB maps:

outer domain

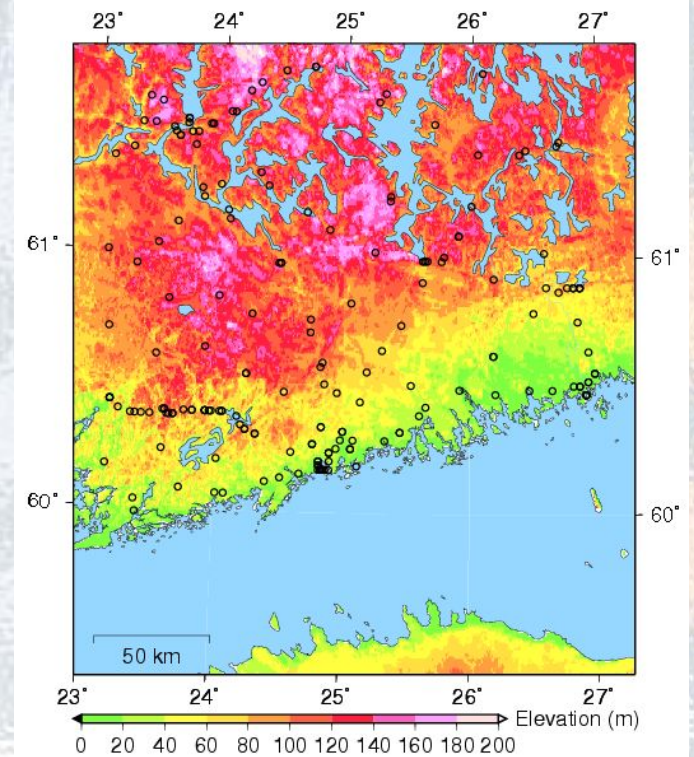
inner domain



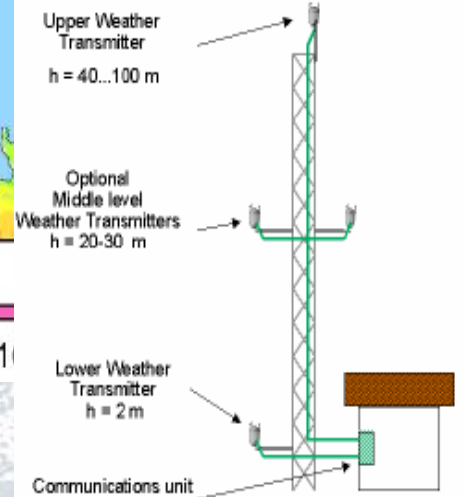
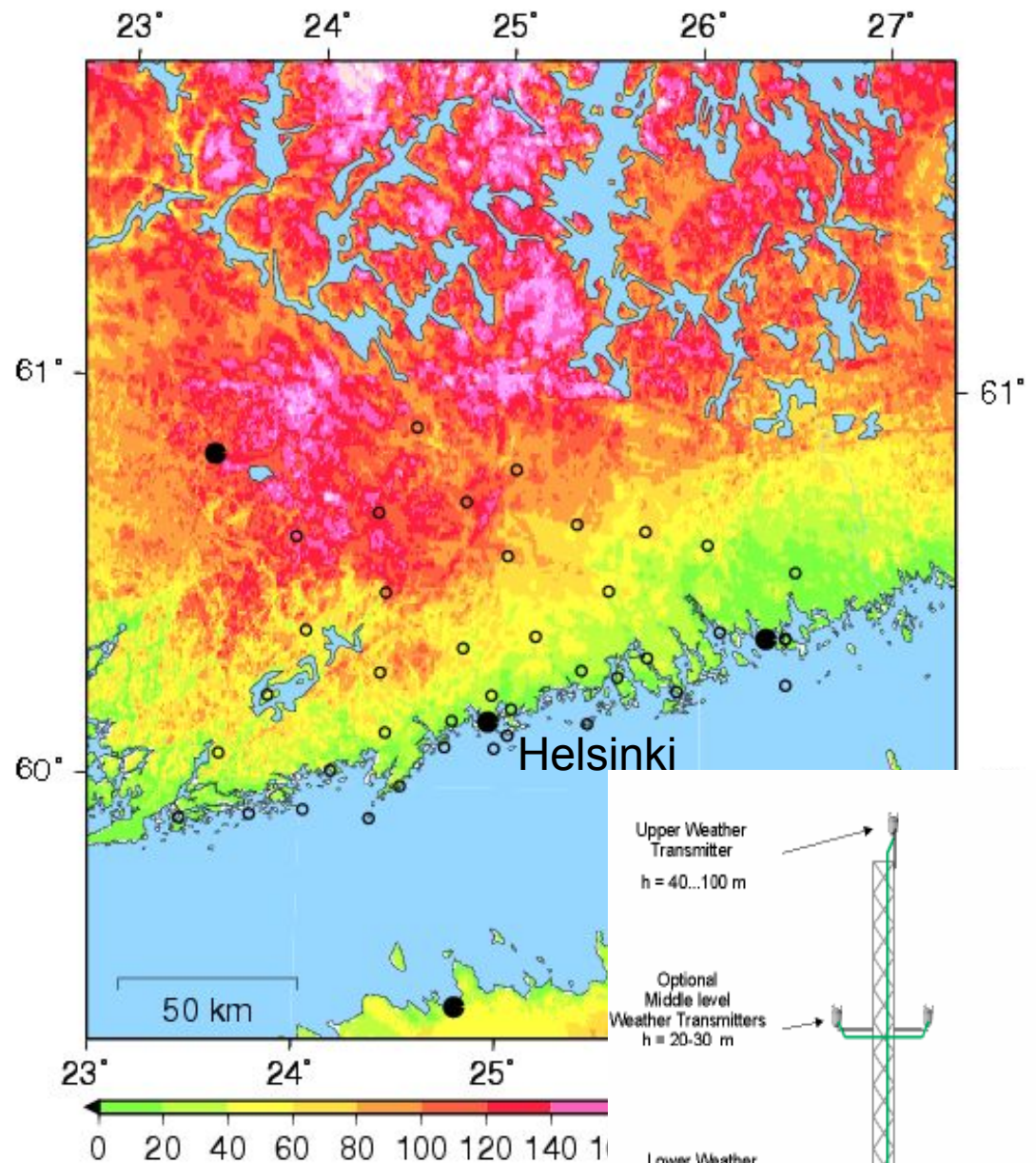
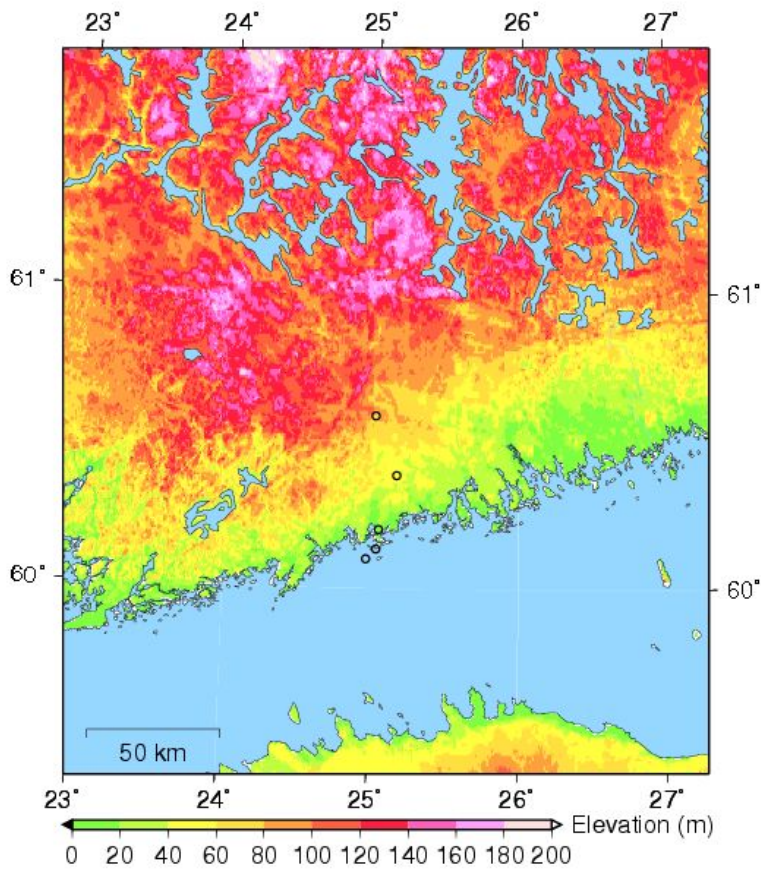
All stations except road weather stations (plan on 21.1.2005):



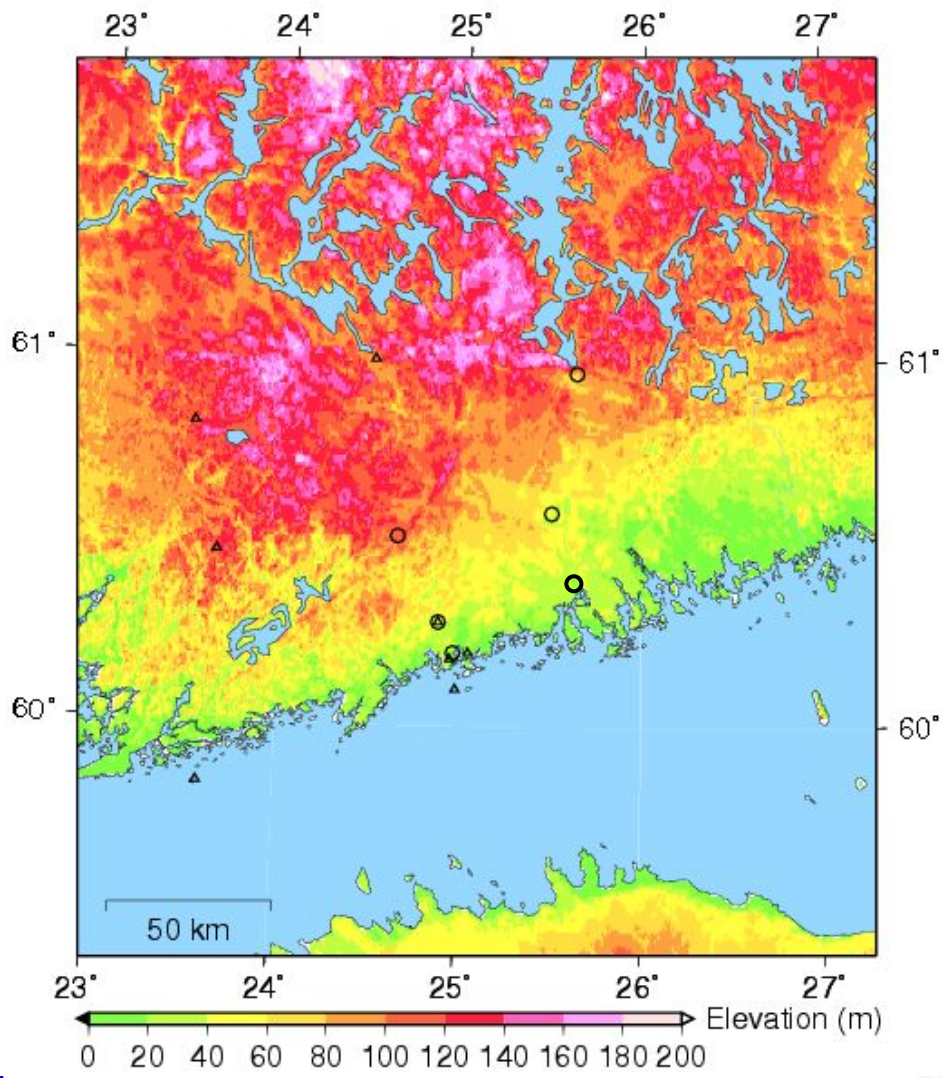
Road weather stations



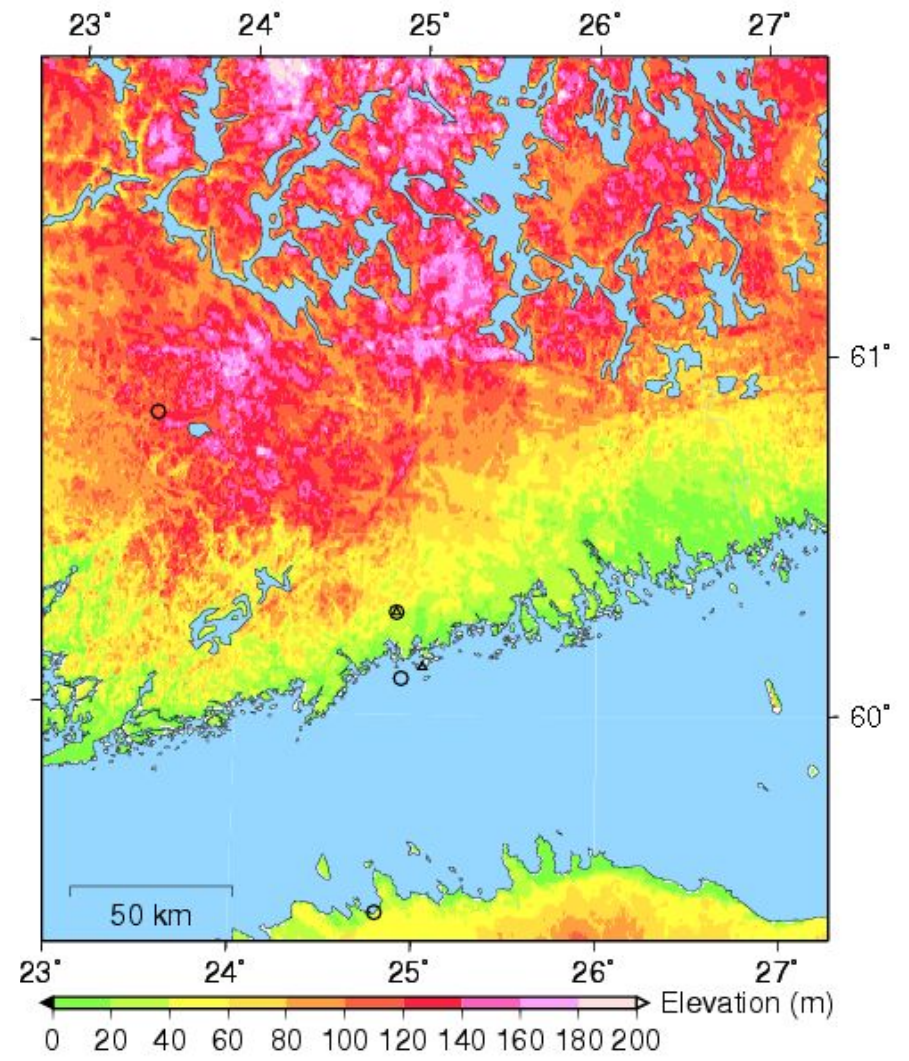
Communication
masts; 39 pcs.
(plan on 19.1.2005):



Masts with 3 heights,
middle height doubled



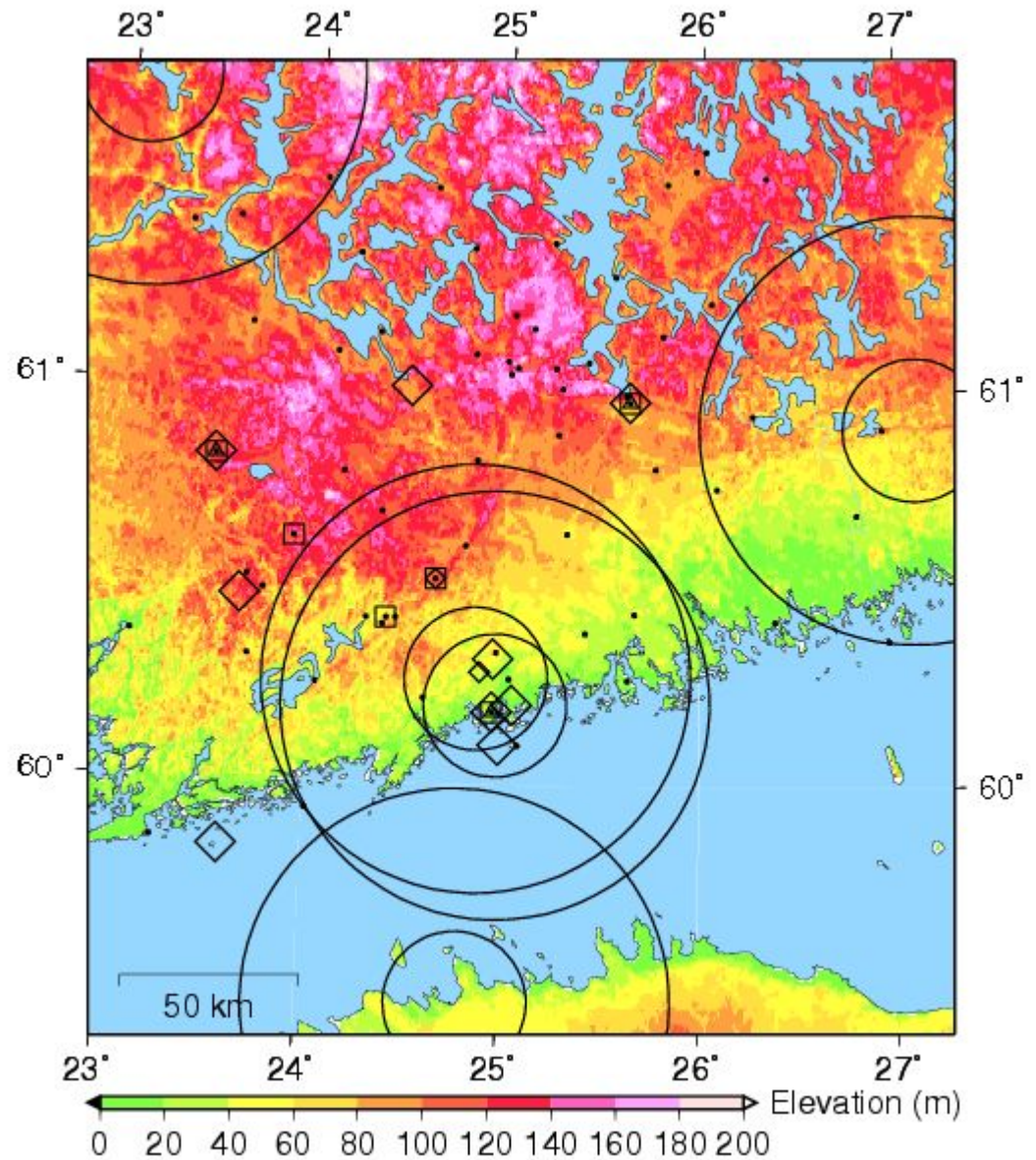
Ceilometers (triangles and circles)



Radio soundings (circles)

Rain measurements

- belt: weather radar 20-60km
- dot: manual obs
- big diamond: FD12P
- triangle: autom snow depth



Urban surface stations

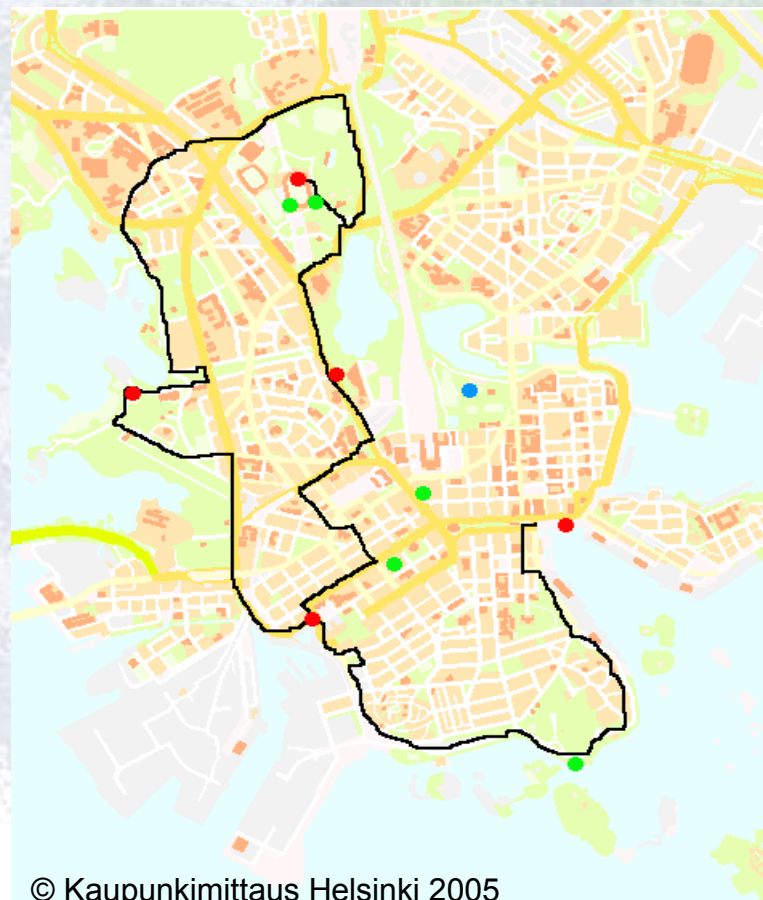
Helsinki Kaivopuisto	testbed
Helsinki Bulevardi	testbed
Helsinki Roihupelto	testbed
Helsinki city center (YTV)	testbed
Helsinki Vallila (YTV)	testbed
Vantaa Tikkurila (YTV)	testbed
Espoo Leppävaara (YTV)	testbed
Helsinki Olympic stadium (x3)	testbed/WCA2005
Espoo Otaniemi	testbed/WCA2005
Helsinki Hietalahti	testbed/WCA2005
Helsinki Hietaniemi	testbed/WCA2005
Helsinki Finlandia house	testbed/WCA2005
Helsinki Market square	testbed/WCA2005
Helsinki Kaisaniemi	FMI AWS
Helsinki Itä-Pakila	heat island
Vantaa Pakkala	heat island
Vantaa Asola	heat island
Helsinki Tapulikaupunki	heat island
Sipoo, Östersundom	heat island
Kirkkonummi Sundsberg	heat island
Vantaa Riipilä hill	heat island
Vantaa Riipilä valley	heat island
Helsinki Harju	heat island
Helsinki Pitäjänmäki	heat island
Helsinki Itä-Pakila	heat island

Total

27 pcs.



Central city real-time stations/WCA2005



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