ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

# The Finnish Meteorological Institute

29/07/2008

# Organisation since 1 March 2006

# Personnel


- 571 person-years
  - Research 248
  - Technical Services 138
  - Weather Service 109
  - Customer Services 32
  - Administration and Director General's Office 43
- women 40% - men 60%
- 55% academic degree
  - 15% researcher training

# Economy

- Budget 48.7 million euros
  - 67% Budgetary funding (Ministry of Transport and Communications)
  - 33% Commercial operations or external research funding
- Ca. 41% of research funded from external sources
  - EU
  - ESA
  - EUMETSAT
  - Academy of Finland
  - Tekes, etc.

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**MINISTRY OF THE INTERIOR**
- NUCLEAR ACCIDENTS
- DISPERSION OF HAZARDOUS MATERIALS
- DEVASTATING WEATHER PHENOMENA
- FOREST FIRES
- MARINE RESCUE

**MINISTRY OF SOCIAL AFFAIRS AND HEALTH**
- NUCLEAR ACCIDENTS
- HEALTH EFFECTS OF AIR IMPURITIES

**DEFENCE FORCES**
- WEATHER SERVICES FOR NORMAL TIMES AND EXCEPTIONAL SITUATIONS

**MINISTRY OF EDUCATION**
- UNIVERSITIES OF HELSINKI AND KUOPIO, HELSINKI UNIVESITY OF TECHNOLOGY
- UNIVERSITY OF OULU / SODANKYLÄ

**MINISTRY OF TRADE AND INDUSTRY**
- SPACE AND EARTH OBSERVATION TECHNOLOGY
- TECHNOLOGICAL SERVICES FOR MOBILE MEDIA
- WEATHER OBSERVATION TECHNOLOGY

**MINISTRY OF TRANSPORT AND COMMUNICATIONS**
- TRAFFIC SAFETY
- ENVIRONMENTAL IMPACTS OF TRAFFIC
- SMOOTH FLOW OF TRAFFIC
- DAY-TO-DAY INFORMATION SOCIETY
- TRANSPORT 2030

FMI´s atmospheric expertise

**MINISTRY OF FOREIGN AFFAIRS**
- EXPORTS OF WEATHER AND SPACE TECHNOLOGY
- DEVELOPMENT COOPERATION PROJECTS

**CITIZENS**
- WARNING SERVICES
- MARINE WEATHER, PEDESTRIAN WEATHER, DRIVING WEATHER ETC.
- WWW, RADIO, TV

**COMMERCIAL CLIENTS**
- ENTERPRISES
- PRIVATE INDIVIDUALS

**MINISTRY OF THE ENVIRONMENT**
- AIR QUALITY
- CLIMATE CHANGE

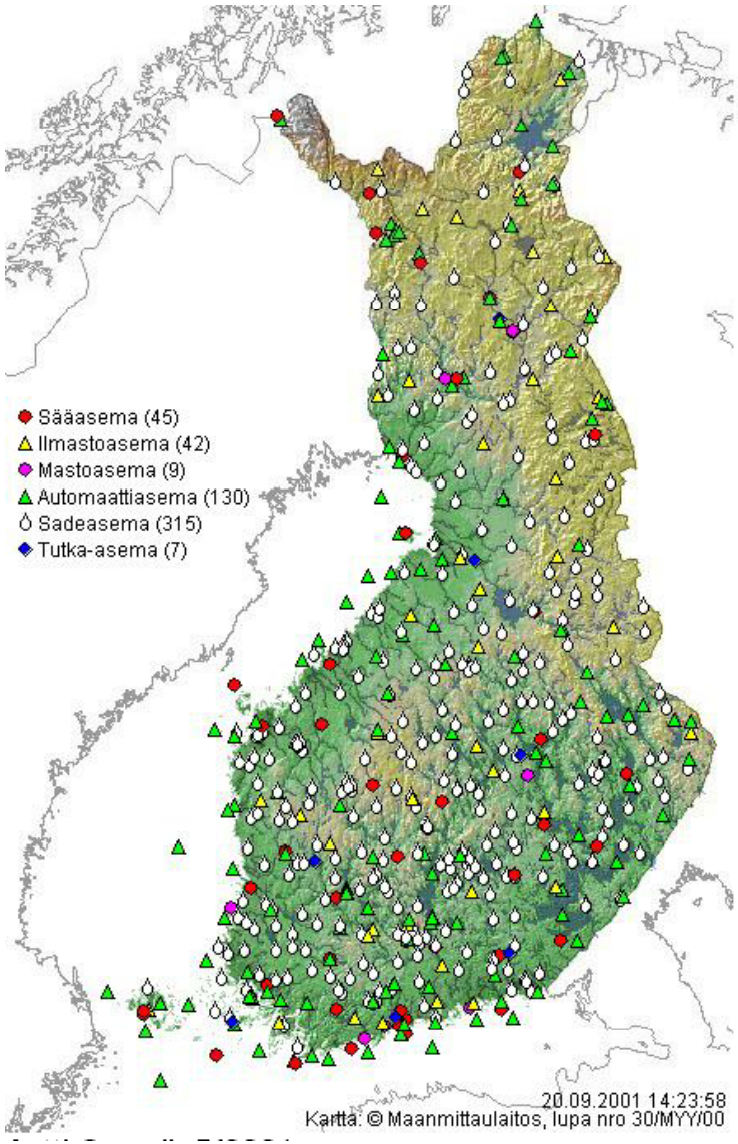
**MINISTRY OF AGRICULTURE AND FORESTRY**
- SERVICES FOR AGRICULTURE AND FORESTRY
- FLOODS CAUSED BY HEAVY RAINS
- ADAPATATION TO CLIMATE CHANGE

**INTERNATIONAL OBLIGATIONS**
- WMO
- EUMETSAT
- EUMETNET
- ECMWF
- IAEA
- EMEP
- AMAP

ETC.

# Technical Services

| | | |
|---|---|---|
| **Operative stations, in total** | **ca.** | **550** |
| **Sounding stations** | | **3** |
| **Weather radars** | | **8** |
| **Antennas for lightning location** | | **8** |
| **Air quality stations** | | **30** |
| **Surface observation stations** | | **180** |
| **Rainfall measurement sites** | | **400** |
| **Automation** | | **91%** |
| **Target for 2010** | **>** | **95%** |



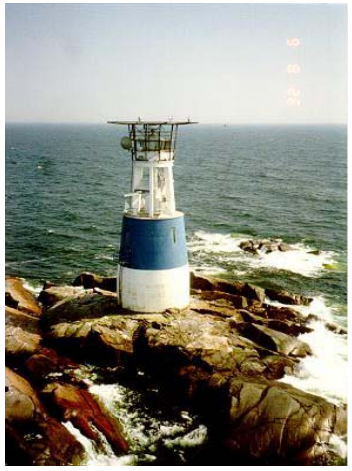
# Weather Observation Instruments

**Automatic surface stations**

**Weather radars**

**Lightning detection**

**Auto launcher**



**Marine stations with GSM data transmission**

# Technical Services

Weather radar network

- Monitoring of snow and rain
- Finland in the vanguard of European weather radar know-how
- The radar in Vimpeli completed the weather radar network
- Availability of radar data ~ 99%

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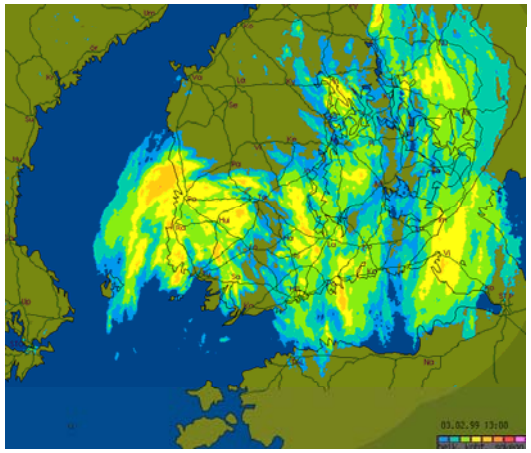
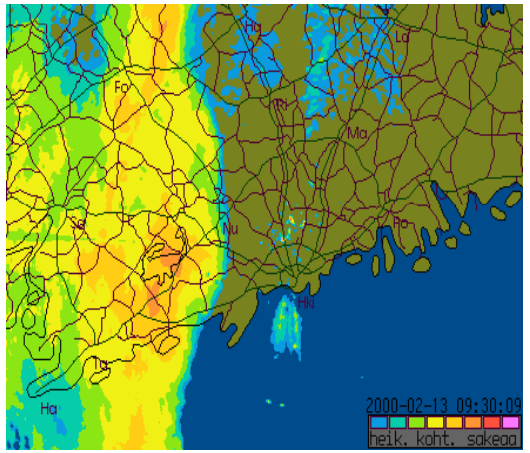
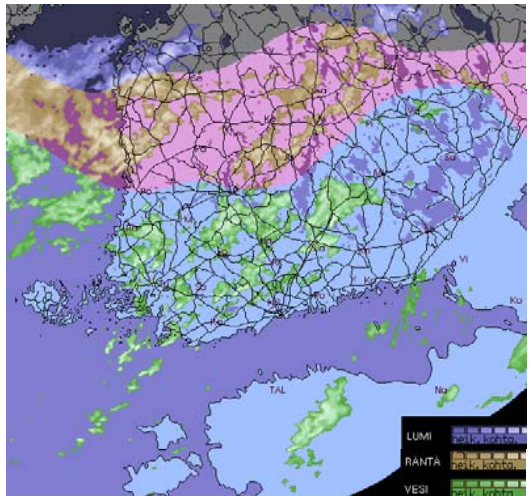
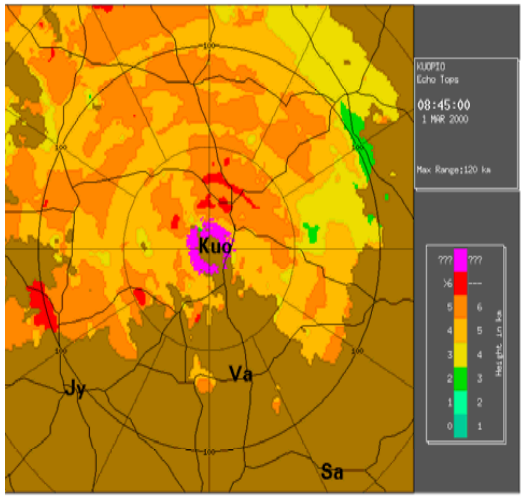
# Radar derived products

- **Location and movement of precipitation**
- **Precipitation intensity**
- **Rain amount**
- **Accumulated precipitation over different time periods**
- **Height of the clouds**
- **Precipitation type defined with automatic weather station data**
- **Forecasted radar images**





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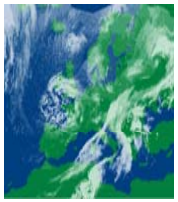
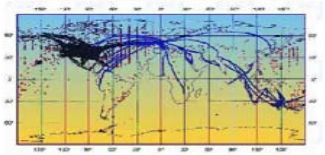
# Automated Weather Service Process

## OBSERVATIONS







Manual editing

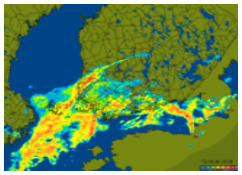
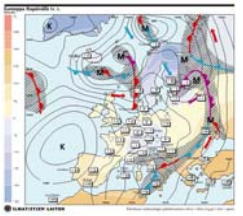
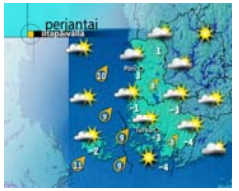
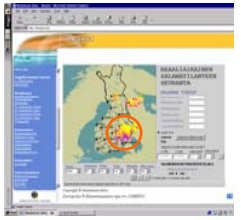
Observations → Real-time data base → Numerical Prediction Models → Production → Basic Products

Production → Commercial products

| | |
|---|---|
| cellular | WWW |
| ftp | E-mail |
| fax | TV |
| newspapers | Radio |

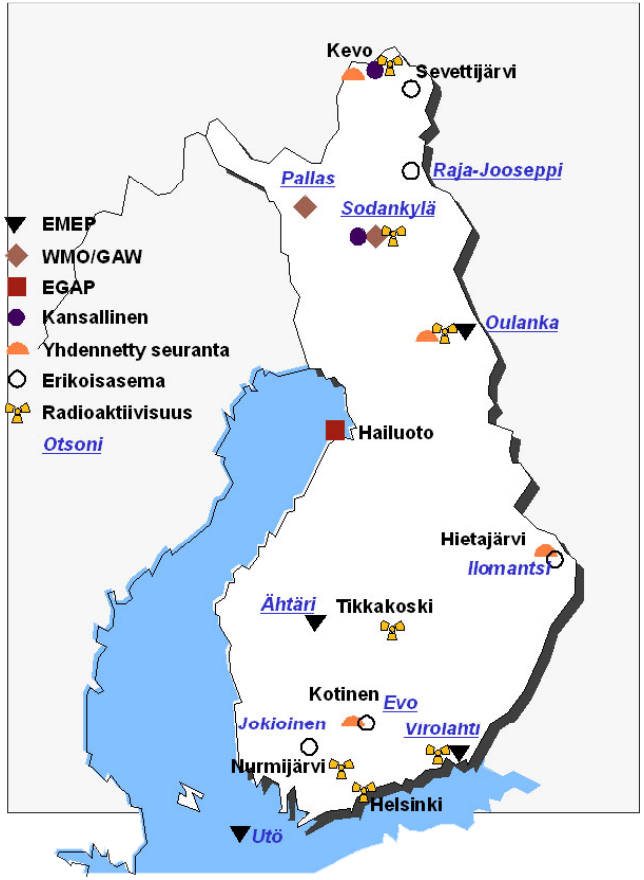
**~ 600.000**
products/day

## PRODUCTS

# Air quality

- The Finnish Meteorological Institute monitors air quality and air composition at 20 measurement stations throughout Finland.
- Most measurements are associated with international monitoring and research programmes.
- The network of stations gives a comprehensive picture of the baseline level of air quality and of its changes in all of Finland.



# Technical Services

## Own supercomputer

- The most powerful of its class in the Nordic countries
- 24h operation & monitoring
- Enables fast HIRLAM runs; increasing resolution
- Joint models: FMI-Institute of Marine Research-Finnish Environment Institute

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# Weather Service

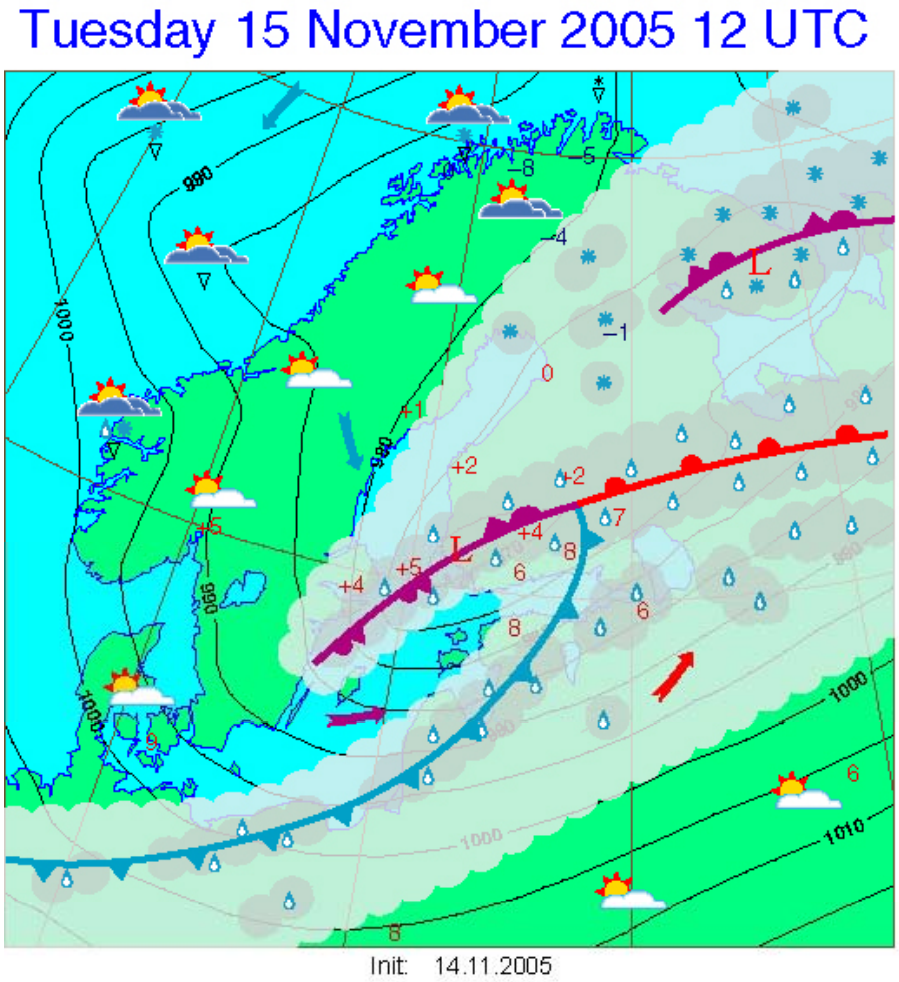
Keeping an eye on the weather

24 hours a day

29/07/2008

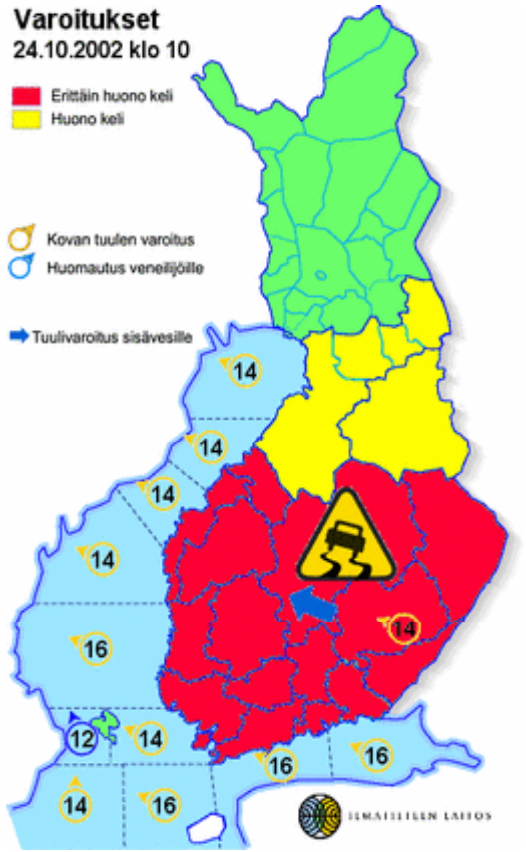
# Daily tasks and services

- Standard forecasts
  - 1-10 day general forecasts
  - 1-2 day forecasts for marine areas
- Distribution channels
  - YLE Radio Suomi, Vega
  - Turku Radio
  - Web pages

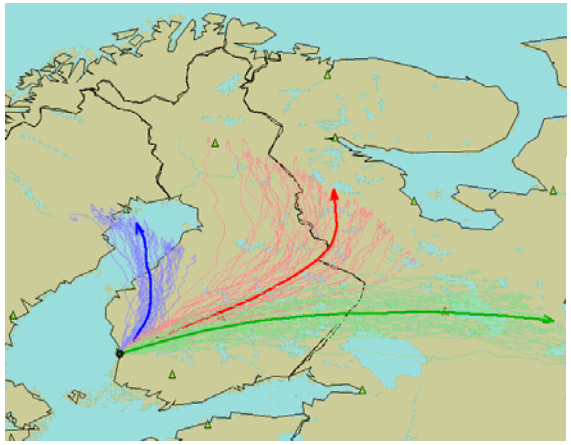


# Daily tasks and services

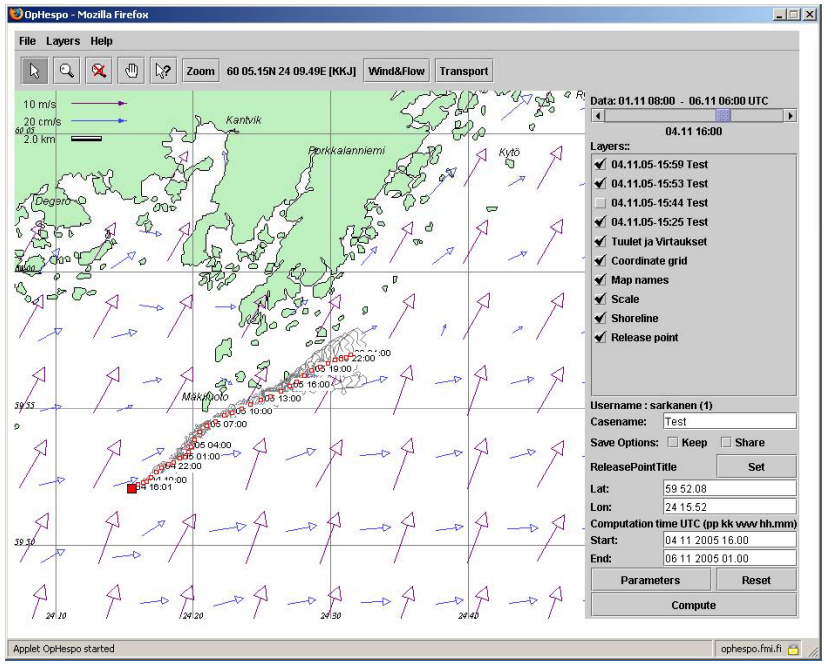
- **Warnings**
  - Storm and wind warnings at sea
  - Ice formation at sea
  - Wind warnings on land
  - Thunderstorms
  - Forest and brush fires
  - Traffic weather
  - Pedestrian weather
  - UV radiation
  - Ozone monitoring



# When danger is imminent

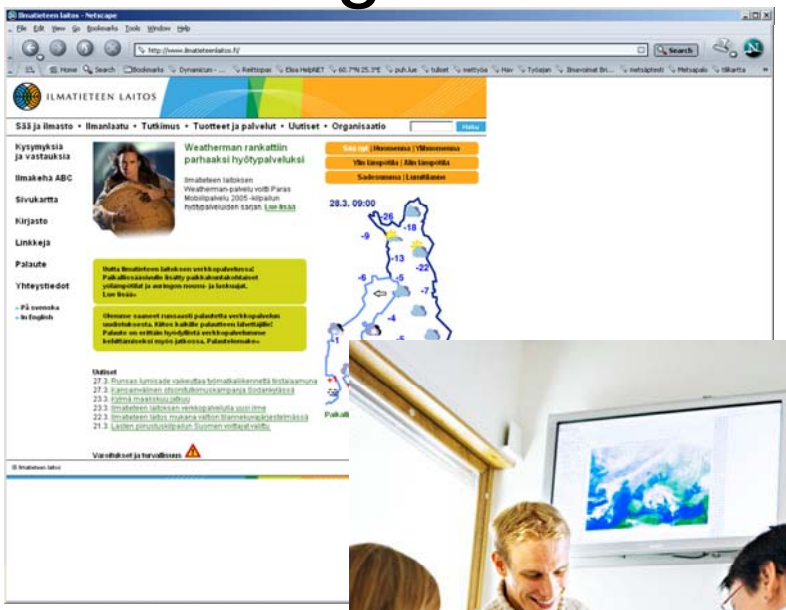


- **Services to other authorities in special situations**
  - Trajectory and fallout calculations for radiation
  - Drift calculations for marine areas to help rescue operations and oil combating at sea
  - Hazardous substances



# Customers of the Weather Warning Service

- General public:
  distributed through the Finnish Broadcasting Company and the Internet
- Authorities:
  Emergency Response Centres, Border Guard, Radiation and Nuclear Safety Authority, Ministry of Transport and Communications, Institute of Marine Research, Finnish Environment Institute, Finnish Maritime Administration, Ministry of the Interior, Finnish Broadcasting Company, Finnish Road Administration, Institute of Occupational Health

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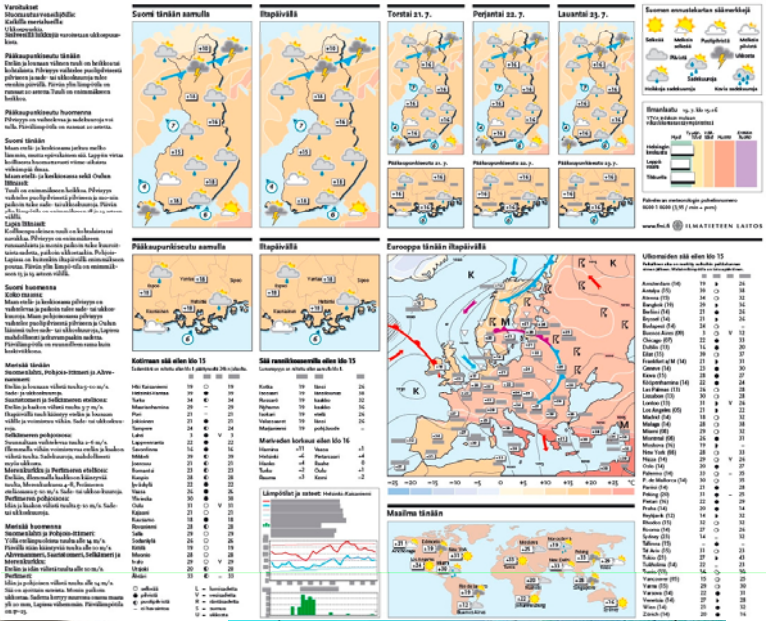
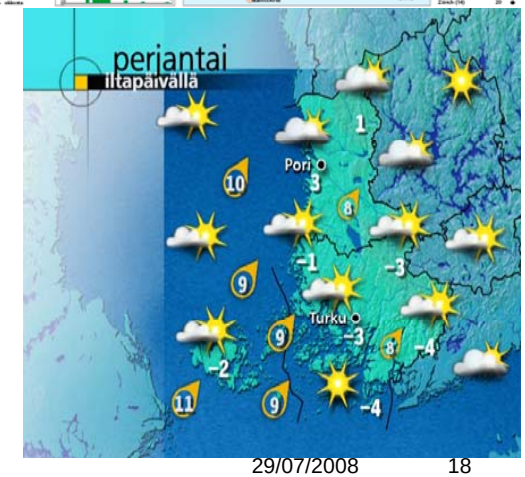
# Customer Services provide forecasts on commercial grounds

- TV, radio and www
- Press
- Mobile services
- Road and marine traffic
- Agriculture and forestry
- Industry and energy



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# Research

# Research – a concentration of excellence meeting international standards

- Modelling
- Measurements
- Centres of excellence
- Cooperation

# Air quality

- The Finnish Meteorological Institute also studies the impacts of air quality on the environment, human health and the climate.
- The Institute's meteorologists monitor the weather in terms of air quality 24 hours a day and issue warnings to the environmental authorities whenever needed.

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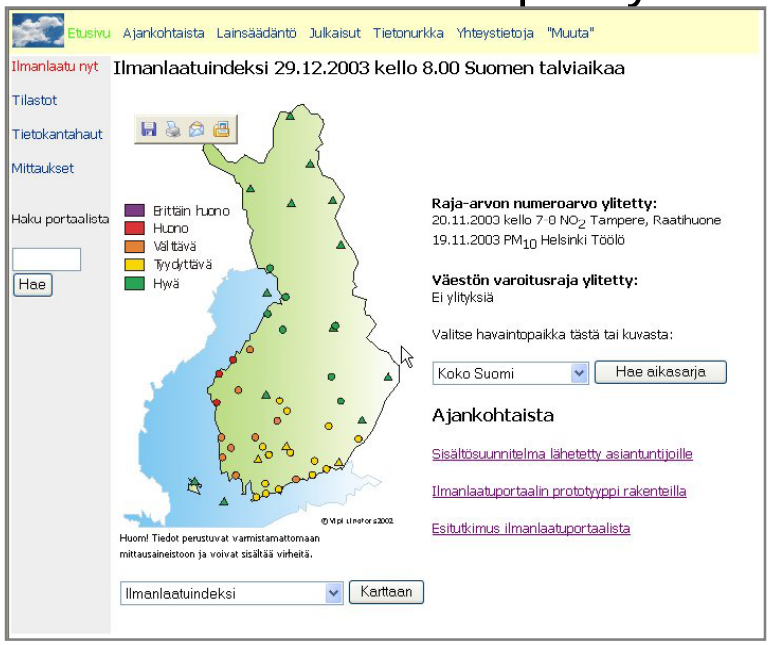
# Air quality

## 1. Obligation to monitor air quality


**Measurements in urban areas (several providers of measurement data)**


**Background stations (FMI)**

## 2. Obligation to provide information on air quality

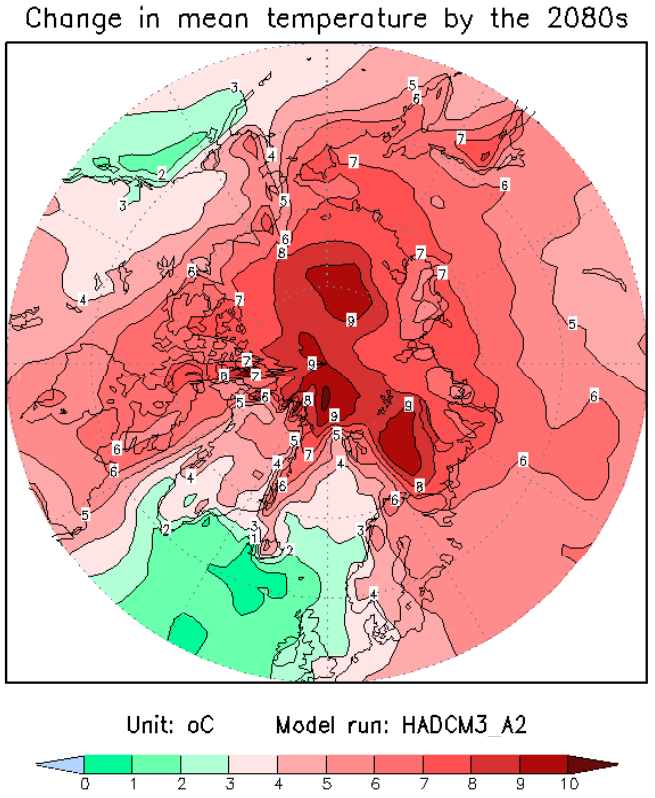



**www.ilmanlaatu.fi**

**Maintained by the Finnish Meteorological Institute**

# Climate change

- The impacts of climate change and the measures that may be taken to adapt to it are studied by means of measurement and modelling data produced by the Finnish Meteorological Institute.
- The effects of climate change on extreme weather phenomena are analysed by using state-of-the-art methods and by considering the needs of all of Finnish society.



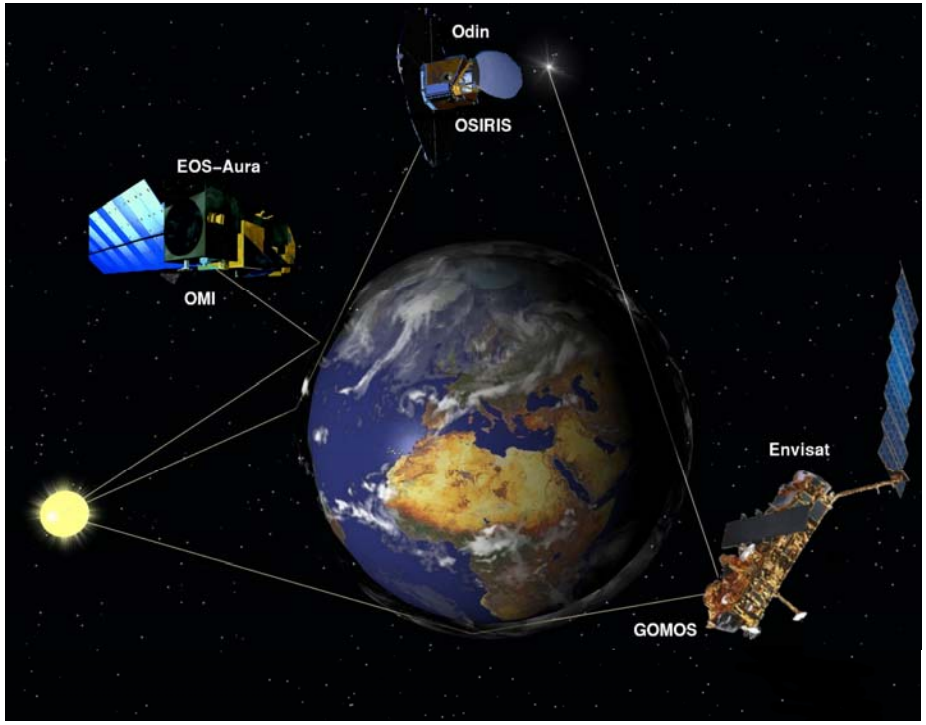
# Climate change

- Atmospheric fine particles and greenhouse gas concentrations are measured at the Pallas-Sodankylä station maintained by the Finnish Meteorological Institute.
- This work lays a solid foundation for monitoring and predicting climate change in northern regions.
- Modelling of the climate system is organised as an extensive project carried out by an international researcher network. Climate models that require high-performance computing are done in cooperation with Max Planck Institute for Meteorology in Germany.

# Earth observation

**Satellite programmes of the FMI**

- Construction of equipment together with the space industry
- Development of computing algorithms
- Reception, processing and filing of data
- Use for operative purposes
- Scientific applications:
  - Ozone depletion, UV radiation
  - Climate change
  - Air chemistry, air quality

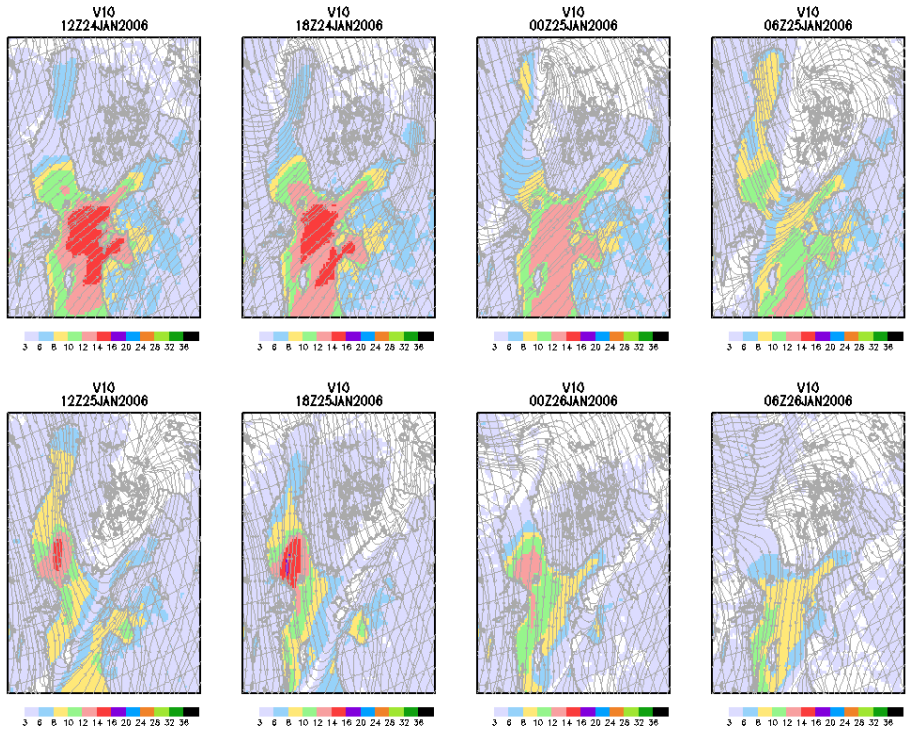


# Space and upper atmosphere

- The FMI studies, among other things, space weather and its effects on satellite operation, on radio traffic and on the operation of power lines and gas pipes.
- Other objects of research in space include auroras, the space environments of other planets and comets, and near-Earth space.
- Space methods are also utilised for researching the Earth atmosphere.

# Meteorological research

- Develops and maintains the HIRLAM weather prediction system based on the physical modelling of atmospheric phenomena and is responsible for the system's operative availability in Finland.
- Develops and processes the forecast production of the European Centre for Medium-Range Weather Forecasts to create products that support weather service.
- As a reference centre of the HIRLAM consortium, the FMI follows the operability of the latest system version and produces reference material to support development.



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# International operations

# FMI: an international operator in Kumpula

- HIRLAM, European High Resolution Limited Area Model: reference runs CSC
- European Centre for Medium-Range Weather Forecasts (ECMWF): Weather forecast models
- Eumetsat: European Organisation for the Exploitation of Meteorological Satellites
- Active participation in EU research programmes and bodies
- Among the main cooperation partners are:
  - NASA, MPI/Germany
  - UK Met Office
  - CMA/China
  - TERI/India
  - SMN/Argentina
  - Sister organisations in neighbouring countries

# International consultation projects

| | | | |
|---|---|---|---|
| India | Atmospheric brown cloud | 2005-2007 | UM |
| Tsunami EWS /Thailand | Feasibility study | 2005 | UM/TTT |
| WMO / EWS | IO/consultation | 2005 | WMO |
| Central America | Renevable energy | 2006 | UM |
| Russia/St Petersburg | Air quality | 2004-2006 | Env Min |
| Lithuania I & II | NMHS upgrading | 2005-2006 | EU |
| Macedonia | Air quality | 2006 | EU |
| Caribbea | Weather forecast system | 2006 | UM/WMO |
| Africa NMHSs | Project plan | 2006 | WMO |
| Pacific NMHSs | Project plan | 2006 | WMO |
| Balkan | Feasibility study | 2005-2007 | UM/TTT |
| Centr Am & Caribbea | Feasibility study | 2005-2006 | UM/TTT |
| EU/ModObs | Networking / MM5 / PhD | 2006-2009 | EU |
| Turkey | NMHS upgrading | 2005-2009 | UM |
| Brazil/Sonabra 3 | NMHS development | 2006-2007 | Brasilia |
| Brazil/ANA | Hydromet development | 2002-2006 | UM/TTT |