

# **FINSKEN, FMI-1 Climate**

## **Progress during 2001 and a workplan for the final year of the project**

### *ROLE IN THE PROJECT*

- *Determination of current climate trends in Finland*
- *Development of scenarios of climate and carbon dioxide*
- *Provision of information and guidance to users of climate scenarios*

## **1. PROGRESS AND RESULTS IN 2001**

### **Analysis of the present climate and trends**

An article on the methodologies of homogeneity testing and adjusting of geophysical time series was prepared (Tuomenvirta 2002). A summary of the recent climatic trends in the Nordic countries was presented as poster at the CLIC Symposium (Tuomenvirta 2001). At the same meeting, Jylhä (2001) presented a method that can be used to study changes in atmospheric circulation. It uses geostrophic flow speed, direction and vorticity calculated from NCAR reanalysis, or AOGCM simulations, of the mean sea-level air pressure. Results based on reanalysed 6-hour data, as well as those based on monthly means, indicate that nearly directional, south-westerly flow types dominate throughout the year. The first findings, not yet based on the SRES scenarios, suggest that model simulations tend to underestimate this dominance.

### **Development of climate scenarios**

The preliminary FINSKEN climate scenarios were presented at the FINSKEN Seminar of Global Change Scenarios for Finland. The preliminary scenarios are based on the AOGCM simulations forced 1% per annum growth of greenhouse gas concentrations during the period 1990-2099. A method was used where these simulations are scaled to represent simulations forced with SRES marker scenarios (Carter et al. 2000).

Data from the new HadCM3 simulations forced with SRES A2 and B2 emission scenarios have been retrieved. The temperature and precipitation changes in these simulations are in magnitude comparable to preliminary FINSKEN scenarios. Hence, it seems that studies based on somewhat earlier simulations, e.g. SILMU scenarios, still provide useful guidance for estimating the possible impacts of climate change. However, the FINSKEN scenarios based on SRES simulation will become available in 2002.

Results from dynamical downscaling of AOGCM simulations with Rossby Centre regional climate model (RCA1) are available via FINSKEN. These data provide a high spatial (44 km) and temporal (6-hour) resolution 10-year time slices of future climate at

the second half of the present century. Also these results will be superseded by new SRES based simulation later in 2002.

Scenarios of future climate have been used in climate change impact studies. Wajda et al. (2001) calculated changes of heating degree-days (HDD) in Finland, Hungary and Romania. For time periods 1991-2020 and 2021-2050. HDD is widely used to assess heating-energy consumption. Temperature change scenarios have been delivered to be used in glacier modelling (Forsström, pers. comm.).

As an offspring of FINSKEN scenario development FMI-1 is together with SYKE participating to PRUDENCE project (EU 5<sup>th</sup> Framework Programme), and they also participated in projects applying funding from EU 5<sup>th</sup> Framework Programme (ENCACIA, RECHARGE).

### **Scientific meetings with presentations related to FINSKEN**

1. CLIC, Climate Change and Variability in Northern Europe, Climate Change Symposium, Turku 6-8 June 2001 (KJ and HT)
2. Visit to ZAMG and University of Vienna, 19-21 June 2001 (HT)
3. FIGARE Annual meeting 2001: Integrated Global Change Research, Aulanko, Hämeenlinna 17-18 September 2001 (KJ and HT)
4. PRUDENCE kickoff meeting, Snekkersten, Denmark, 3-5 December 2001 (KJ)

### **References**

- Carter, T.R., Hulme, M., Crossley, J.F., Malyshev, S., New, M.G., Schlesinger, M.E., and Tuomenvirta, H. 2000. Climate Change in the 21st Century: Interim Characterizations based on the New IPCC Emissions Scenarios. The Finnish Environment 433, Finnish Environment Institute, Helsinki. 150 pp.
- Jylhä, K. 2001. Changes in the frequency of airflow types over Finland - a preliminary study. Climate Change Symposium "Climate Change and Variability in Northern Europe", Turku, Finland, June 6-8<sup>th</sup> 2001.
- Tuomenvirta, H. 2001. Climate variations in Finland during the 20<sup>th</sup> century. Climate Change Symposium "Climate Change and Variability in Northern Europe", Turku, Finland, June 6-8<sup>th</sup> 2001.
- Tuomenvirta, H., 2002: Homogeneity testing and adjustment of climatic time series in Finland. *Geophysica*. (accepted)
- Wajda, A., Venäläinen, A., Tuomenvirta, H. and Jylhä, K. 2001. The influence of climate change on heating demand in three European countries. Climate Change Symposium "Climate Change and Variability in Northern Europe", Turku, Finland, June 6-8<sup>th</sup> 2001.

## **2. PLANS FOR 2002**

### **Analyses of the present climate and trends**

Time series of regional and national climate indices (temperature, storms) will be calculated. They can be used in the analysis of recent trends and natural climate variability. New precipitation data set taking into account measuring errors (Solantie, pers. comm.) will be used in the analysis. Also, a review of recent climatic trends in the Nordic countries will be prepared.

### **Development of climate scenarios**

Many new AOGCM simulations based on the marker SRES emission scenarios will become available in 2002. Simple validation of simulations against observed climate will be performed. Changes of key climatic elements (temperature, precipitation and circulation) will be calculated based on AOGCM SRES simulations. Uncertainties in estimates of future climate over Finland will be represented using a pattern-scaling method to take into account the full range of SRES scenarios. Regional climate change simulations (RCA2 of Rossby Centre) will be available for some of the AOGCM simulations. Scenarios of atmospheric carbon dioxide concentration are based on global mean estimates by the IPCC for the SRES emissions scenarios.

### **Provision of information and guidance**

All climate related information will be compiled into a report. This will include: sources of baseline climate information, analysis of climatic trends, validation of AOGCM runs against observed climate, description of scenario development, and scenario results.

Maps of change fields from GCM and RCM simulations will be prepared for the FINSKEN web pages.