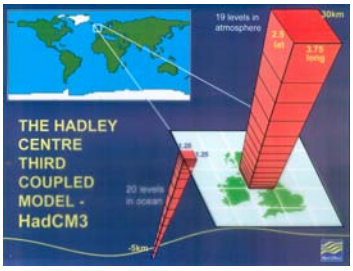
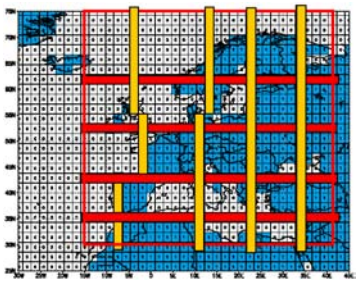
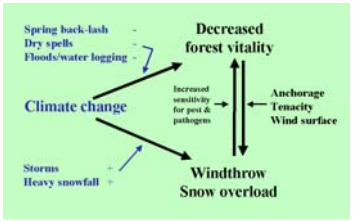
MICE - Modelling the Impacts of Climate Extremes:

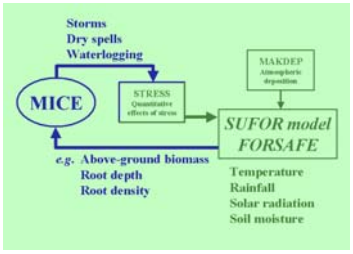
Extreme Weather Impacts on North European Forests

L. Bärring[1], A. M. Jönsson[2], I. Stjernquist[2], P. Schlyter[3], H. Sverdrup[4] & P. Wallman[4]









OTHER COMPONENTS OF MICE

Spatial and temporal patterns of extreme event occurrence will be analysed for a range of climate variables that have severe direct impact on human activities. *MICE* will estimate likely future changes in extremes and define the uncertainties. The impacts of interest are forestry, agriculture, energy use, tourism, and property and life insurance. Interpretation of the results for use by stakeholders and policy-makers is central to the project.

The *MICE* partnership is

University of East Anglia, Norwich, UK (coordinator)
Lunds universitet, Sweden
Universidade Lisboa, Portugal
National Observatory of Athens, Greece
Universität zu Köln, Germany
Fondazione per la Meteorologia Applicata, Florence, Italy
University of Bern, Switzerland
Polish Academy of Sciences, Poznan, Poland

KEY ISSUES

MICE is a newly started European project that studies changes in extreme event occurrence resulting from anthropogenic climate change, as predicted for Europe by state-of the-art global and regional climate models (left). The Lund part of *MICE* focusses on catastrophic impacts on forests of various climatic extremes. The work involves the following the following key components:

- Analyses of climate data for selected transects (left) in northern Europe to deve-lop climatologies of extreme weather situations relevant to forest damages.
- Assess existing knowledge about forest damages and weather extremes.
- In interaction with the SUFOR programme, model the ecological and production effects of forest damages.

CLIMATIC ANALYSIS

Time series of weather observations and output from global and regional climate models will be analysed to establish extreme value statistics for climatic extremes that have immediate catastrophic impact on forests, i.e. winds storm (right), and heavy snowfall, as well as other weather events that more indirectly effect the status of the forests, e.g. spring back-lashes, dry and wet spells. The following issues are in focus:

- recurrence interval for extreme events above specified thresholds,
- peak intensity/severity
- multiplicative effects from adverse combinations of extremes.

Series of recent weather observations are used to establish present day climatic conditions and climate model output will be used to establish possible future conditions according to several IPCC SRES climate change scenarios.

CRUCIAL DIALOGUE WITH STAKE- HOLDERS

Central to the *MICE* project is the development of a dialogue between researchers and stake-holders, end-users and policy-makers in order to ensure that project results are useful to, and will be known by, the community. In the forestry impact sub-programme we are working closely with the National Board of Forestry and the Regional Forestry Boards.

As a first step we will collect existing data about forest damages caused by windstorms and other weather extremes from the Regional Forestry Boards as well as from forest companies and bigger estates. This information will be used as a reference for the evaluation of the extreme-value analyses.

A stake-holder workshop will be held in about two years time, near the end of the *MICE* project to present and discuss *MICE* results of relevance for forestry sector responses to climate change.

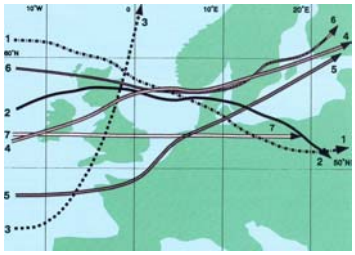
LOGIC AND MODEL

Climate change could have two types of impacts on forests: small but persistent changes in site condition, and changes in the frequency and/or magnitude of extreme events. The LU-*MICE* logic (left) show how these two processes co-operate:

1) An increase in mean temperature and rainfall (soil moisture avalability) results in small but significant changes in the soil and plant processes as well as affecting conditions determining the size and dynamics of pest populations. These types of gradual changes may reduce forest vitality which in turn would increase tree sensitivity to windthrow and snow overload.

2) At the same time an increase in windthrown trees promotes population growth of pest and pathogen populations, i.e bark beetles, providing conditions for negative feedbacks. The potential effect on tree vitality is dependent on forest management.

To model the effect of future stress scenarios (left), the *MICE* project will interact with FORSAFE and its STRESS module.



Lars Bärring *(P.I.)* & **Carin Nilsson**
Climate analyses
Dept. of Physical Geography and Ecosystems Analysis,
Lund University, P.O. Box 118,
S–221 00 LUND, Sweden
Lars.Barring@natgeo.lu.se

Ingrid Stjernquist & **Anna Maria Jönsson**
Ecological stress modelling
Dept. of Ecology, Section for Plant Ecology,
Lund University, Ecology Building
S-223 62 LUND, Sweden

Peter Schlyter
Forest damage surveys, climate impact
Dept. of Physical Geography and Quaternary Sciences,
Stockholm University,
S-106 91 STOCKHOLM, Sweden

Harald Sverdrup & **Patrik Wallman**
Interface to SUFOR models
Dept. of Chemical Engineering II,
Lund Institute of Technology, P.O. Box 124,
S-221 00 LUND, Sweden