

In western Europe, two severe windstorms at the start of 1990 caused insured losses of around £6.5 billion and 160 deaths. At the end of 1999 storms destroyed 10% of French forests. The objective of this Tyndall Centre Theme 3 research is to assess the implications of future European windstorm activity for the forestry and insurance industries in the UK.

# Potential changes in storm activity over Europe

## Method

This research has two main themes. The first is concerned with investigating future changes in cyclone behaviour over the North Atlantic and Europe in response to global warming. A storm-tracking model will be applied to sea level pressure data from a state-of-the-art global climate model from the UK Met Office's Hadley Centre. Regional climate models will also be used, because their improved resolution will allow us to look at details such as landscape and topography, which have a large influence on wind speeds. The second theme is concerned with developing two GIS-based windstorm hazard models. The first will predict the distribution of insured losses from future windstorms with data kindly provided by Royal and Sun Alliance and CGNU; the second, constructed with the assistance of the Forestry Commission, will assess the distribution of forest damage.

## Key results

The NCEP/NCAR reanalysis dataset has recently been extended, adding a further 15 years (1948-57 and 1997-2002) to the available time series. We have used these data to extend the previously constructed cyclone climatology of the North Atlantic and European region, so that now we can assess the nature of cyclone activity (size, intensity, distribution and frequency) for the period 1948-2002 (previously 1958-1996).

Initial results show that the large-scale nature of the GCM (spatial resolution of 2.5° latitude x 3.75° longitude and temporal resolution of 24 hours) is incompatible with the assessment of storm tracks (Figure 1). As a result, and in collaboration with the Hadley Centre, pressure data from HadAM3H (the high resolution (1.25° latitude x 1.875° longitude, 12 hourly) atmosphere-only model) are being

analysed in respect of their suitability for cyclone tracking. Once their suitability has been confirmed, cyclone climatologies similar to those which have been constructed for the present-day period will be developed.

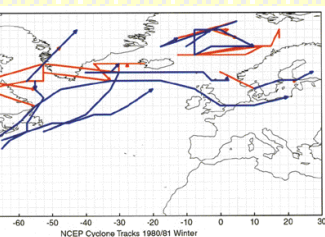


Figure 1: Comparison of cyclone tracks produced from twice daily and daily NCEP mean sea level pressure data

Forest impact functions are being constructed using the ForestGALES model (Figure 2) developed by Roger Dunham, Barry Gardiner, Chris Quine and Juan Suárez of the Forestry Commission. Insurance claims data have been provided by Royal and Sun Alliance, in addition to those already provided by CGNU, and are being analysed

with the aim of widening the applicability of the damage model to the insurance industry as a whole.

## Implications

Insurance and forestry industries may need to prepare for a future increase in severe windstorm occurrence. The period from about 1970 to the mid-1990s has seen an increase in storm frequency, although this increase cannot necessarily be blamed on global warming. Although results are inconclusive, most climate models predict an increase in storm activity in the future and a consensus is emerging that storms will intensify over Europe in response to increasing greenhouse gas concentrations.

## Tyndall Centre links

This project contributes to Research Theme 3 by developing tools that can be utilised by the insurance and forestry sectors of the British economy to assess the vulnerability of regions to windstorm damage, and thus support the development of climate change adaptation strategies. Furthermore, the results produced by this project, namely changes in storm track positions and activity, will be used to assess the vulnerability of our coastline in the Research Theme 4 flagship project.

## Wider relevance

Although windstorm hazard models exist, many have been developed by commercial enterprises such as reinsurance and hazard assessment institutions (EQE International, Risk Management Solutions). The models developed from this research will be novel in two respects: first, they will be transparent in their methodology and, second, they will be available to the wider community. This project involves several industry experts who will help to further the mutually beneficial industry-academic relationship.

## More information:

Project IT1.4 (Integrated assessment of the potential for change in storm activity over Europe: Implications for insurance and forestry)

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## Other researchers involved in this project:

Professor Trevor Davies, Drs Andrew Dlugolecki, Tom Holt and Tim Osborn – Climatic Research Unit, University of East Anglia.

Dr Chris Quine – The Forestry Commission, Nicholas Michaelides – CGNU.

## Project duration:

May 2001 to May 2003

## Websites:

[www.cru.uea.ac.uk/cru/projects/storms](http://www.cru.uea.ac.uk/cru/projects/storms)

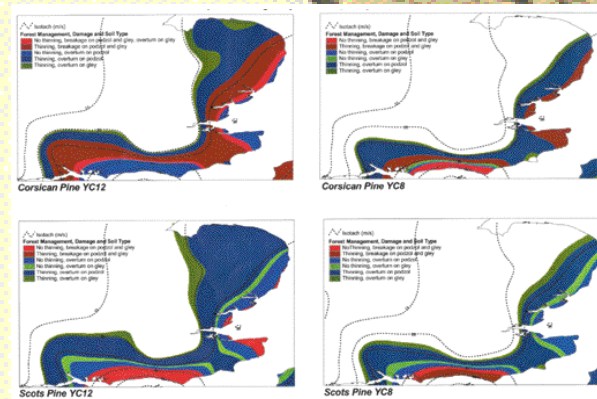


Figure 2: Areas susceptible to overturn or breakage of trees for the 'Great Storm' wind field (October 1987).