

ORAL PRESENTATION

SMOOTHED PREDICTION OF THE ONSET OF TREE STEM RADIUS INCREASE BASED ON TEMPERATURE PATTERNS

Mikko Korpela¹, Harri Mäkinen², Mika Sulkava³, Pekka Nöjd⁴, Jaakko Hollmén⁵¹³⁵ *Helsinki University of Technology, Department of Information and Computer Science;* ²⁴ *Finnish Forest Research Institute, Vantaa Research Unit*

Possible changes of the growing season of trees would have significant consequences on forest production. Predicting the onset of tree growth on the basis of climate records can be used for estimating the magnitude of such changes. Conventional methods for estimating the onset of tree growth use cumulative temperature sums. These estimates, however, are quite coarse. In this work, we propose a prediction method based on several temperature features. The features are computed from a fixed-length record of past daily temperatures, which are weighted with Bernstein polynomials [Prautzsch, Boehm, Paluszny, (2002) Bézier and B-Spline Techniques. Springer]. Different features represent different parts of the history. The predictor is a combination of k-nearest neighbor regression and linear regression. The output of the predictor is smoothed by combining previous estimates and new information. Our test data were based on dendrometer measurements. Sample trees of Scots pine and Norway spruce were monitored in 2001-2005 at two sites in southern Finland [Sulkava, Mäkinen, Nöjd, Hollmén, (2008) *Environmetrics* (submitted)]. A subset of the temperature features was selected with the feature selection method BFS [Kohavi, John, (1997) *Artificial Intelligence* 97(1-2): 273-324] in a cross-validation setting. In our tests, the proposed temperature features outperformed the traditional temperature sum. However, prediction accuracy still showed a large year-to-year variation. There are at least two plausible reasons for the variation: the nature of the dendrometer data (swelling, shrinking), and factors left out of the model.

Mikko Korpela, P.O. Box 5400, FI-02015 TKK, Finland

E-mail address: Mikko.V.Korpela@tkk.fi

Academy of Finland, research project: Analysis of dependencies in environmental time series data (AD/ED) (grant number 116853)

ORAL PRESENTATION

A SPATIO-TEMPORAL MODEL FOR ANTARCTIC SEA ICE FORMATION

Theodoro Koulis¹, Mary Thompson², Ellsworth LeDrew³¹ *Centre Hospitalier de l'Université de Montréal;* ²³ *University of Waterloo*

The temporal variability of polar sea ice is complex and closely linked to global climate. The amount of sea ice over an area can have a significant effect on the energies transferred between the atmosphere and the ocean. Statistics derived from sea ice observations are therefore of great interest to scientists. We showcase a new method of analysis which may be used to examine the annual variability in sea ice formation. We demonstrate our method using sea ice concentration images derived from Earth-orbiting satellites that span several decades. The growth and melt of Antarctic sea ice is modelled using a simple two parameter spatial nearest-neighbour process that treats ice and water as two species competing for territory. Simulations of the model are used to estimate two time series representing rates of competition. With techniques of functional data analysis, these series may be used to detect both amplitude and phase variation, and to isolate major modes of annual variation in sea-ice formation.

Theodoro Koulis, Centre de Recherche du CHUM, 3875 Saint-Urbain, 1er étage, Montréal (QC), H2W 1V1

E-mail address: theodoro.koulis@elf.mcgill.ca