Geophysical Research Abstracts
Vol. 18, EGU2016-413, 2016
EGU General Assembly 2016

Effects of land-use and climate on Holocene vegetation composition in northern Europe

Laurent Marquer (1), Marie-José Gaillard (2), Shinya Sugita (3), Anneli Poska (1), Anna-Kari Trondman (2), Florence Mazier (4), Anne Birgitte Nielsen (1), Ralph Fyfe (5), and Anna Maria Jönsson (1)

(1) LUND UNIVERSITY, Dept of Physical Geography and Ecosystem Science, Sweden (laurent.marquer@nateko.lu.se), (2) Linnaeus University, Department of Biology and Environmental Science, Sweden, (3) Tallinn University, Institute of Ecology, Estonia, (4) Université de Toulouse Le Mirail, France, (5) University of Plymouth, School of Geography, Earth and Environmental Sciences, United Kingdom

Prior to the advent of agriculture, broad-scale vegetation patterns in Europe were controlled primarily by climate. Early agriculture can be detected in palaeovegetation records, but the relative extent to which past regional vegetation was climatically or anthropogenically-forced is of current scientific interest. Using comparisons of transformed pollen data, climate-model data, dynamic vegetation model simulations and anthropogenic land-cover change data, this study aims to estimate the relative impacts of human activities and climate on the Holocene vegetation composition of northern Europe at a subcontinental scale.
The REVEALS model was used for pollen-based quantitative reconstruction of vegetation (RV). Climate variables from ECHAM and the extent of human deforestation from KK10 were used as explanatory variables to evaluate their respective impacts on RV. Indices of vegetation-composition changes based on RV and climate-induced vegetation simulated by the LPJ-GUESS model (LPJG) were used to assess the relative importance of climate and anthropogenic impacts.
The results show that climate is the major predictor of Holocene vegetation changes until 5000 years ago. The similarity in rate of change and turnover between RV and LPJG decreases after this time. Changes in RV explained by climate and KK10 vary for the last 2000 years; the similarity in rate of change, turnover, and evenness between RV and LPJG decreases to the present.
The main conclusions provide important insights on Neolithic forest clearances that affected regional vegetation from 6700 years ago, although climate (temperature and precipitation) still was a major driver of vegetation change (explains 37% of the variation) at the subcontinental scale. Land use became more important around 5000-4000 years ago, while the influence of climate decreased (explains 28% of the variation). Land-use affects all indices of vegetation compositional change during the last 2000 years; the influence of climate on vegetation, although reduced, remains at 16% until modern time while land-use explains 7%, which underlines that North-European vegetation is still climatically sensitive and, therefore, responds strongly to ongoing climate change.