

Research Project

A functional explanation of low temperature tree species limits TREELIM

Third-party funded project

Project title A functional explanation of low temperature tree species limits TREELIM

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Project Website <http://plantecology.unibas.ch/treelim/index.shtml>

Project start 01.04.2009

Probable end 30.03.2014

Status Completed

The number one question in ecology is why certain organisms occur where they do, and what the traits are which make them successful. This project aims at arriving at a mechanistic rather than a correlative explanation of the climatic limits of major European broad leaved tree taxa. It will focus on and explore their temperature-related limits and aims at reviving Europe's traditional strength in physiology based ecology by training a group of young scientists to answer such questions. The project builds upon the PIs experience in mechanism-oriented ecology (e.g., synthesis in Körner 2003) and should help trading those rapidly disappearing skills to a next generation of experimental ecologists. The project adopts a three-step approach: (1) Assess the current extreme positions of tree taxa along thermal gradients, using existing data bases and site visits (data mining, biogeography). (2) Associate those patterns with bioclimatic information, both available and newly acquired (climatology). (3) Empirically test hypotheses of causes of growth limitation and stress survival, both in the field and in the laboratory (ecophysiology). The project will account for ecotypic differentiation by using the marginal and central (optimal) positions of taxa and will explore plant establishment as well as adult plant performance. It will use in situ measurements, transplant and common gardens as well as phytotron testing. Genotypic control of phenology, frost hardiness, thermal constraints for shoot and root growth and reproductive system (fitness) will play a central role. The results will, for the first time, offer a mechanistic (rather than correlative) explanation for broad leaf tree species distribution in Europe and thus, will provide a basis for improved parameterization and evaluation of species distribution models in a climate change context. The new European Research Council (ERC) has granted Prof. Körner one of the extremely rare 5 year 'advanced grants', which contrast any previous granting regime by being personal. The 2 Mio Swiss Francs will permit to explore where, why and how major European tree taxa find climatic range limits. A team of two PhD students and two postdocs plus a technician will be established for a period of four years each (overlapping). The project has various tasks, such as •Identification of tree species range limits as precise as possible based on GIS and archive data, interviews and site visits •Climatology of those limits based on climate stations and climate data bases •Assess local climate by a large data logging programm with backward cross correlating •Assess marginal versus non marginal location dendrological responses •Assess seedling versus adult positions and viability of seeds •Common garden experiments across climatic gradients (recipical transplants) •Assess freezing resistance of key tissues at key phenophases and link with climatic extremes In a first phase starting 1st April 2009, we will focus on GIS and climatology, in the second (overlapping) phase (starting 1 April, 2010) growth and physiology

will come in. A revival of freezing resistance research and broad screening in Europe will be a central aim (building a powerful freezing lab).

Keywords treeline, climatic limits, tree taxa, broad leaved

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Add publication

Published results

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