Stay informed – get involved!

Briefing Sheets inform every six months on the progress within the activities and can be downloaded from our website. If you are interested in receiving the *EcoChange newsletter* on a six month basis, please subscribe to ecochange@seri.at or register on our website. You will then also get an invitation to the stakeholder workshop in summer 2011, where EcoChange results will be discussed with the public.

Find more information at www.ecochange-project.eu!

The EcoChange Project

Aim and Focus

The aim of EcoChange is to assess and forecast changes in terrestrial biodiversity and ecosystems. The project will assess the ability of biodiversity and ecosystems to supply humans with required goods and services and to buffer against climate and land use change.

The project concentrates on the one hand on the improvement of models and the generation of new data. On the other hand it will integrate the findings with socio-economic analysis. The work is organised within six activities.

Project information

EcoChange -"Challenges in assessing and forecasting biodiversity and ecosystem changes in Europe" is an Integrated Project with 22 Partners from all across Europe. It is supported by the 6th Framework Programme of the European Union.
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Project duration: January, 2007 - December, 2011

The consortium of EcoChange is led by the National Centre for Scientific Research (CNRS), Grenoble, France. Project Co-ordinator: Pierre Taberlet, pierre.taberlet@ujf-grenoble.fr

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EcoChange

Briefing Sheet Series
July 2010

Plants' life conditions in topographic rich mountain terrains

Results from EcoChange Activity 4

Activity 4 addresses changes in biodiversity and plant species distribution in time and space. This Briefing Sheet describes the results from investigations on the thermal living conditions of plants in topographically rich mountain terrain. The results suggest that topographically rich mountain terrain is, for the majority of species, a much 'safer' place to live under conditions of climate change than flat terrain, as a wide range of micro-habitats is available within a short distance. Moreover, it can be concluded that modeling the responses of plants to climate change in alpine regions should not be based solely on elevation data.

EcoChange Briefing Sheet

Activity 4
Establishing Standards

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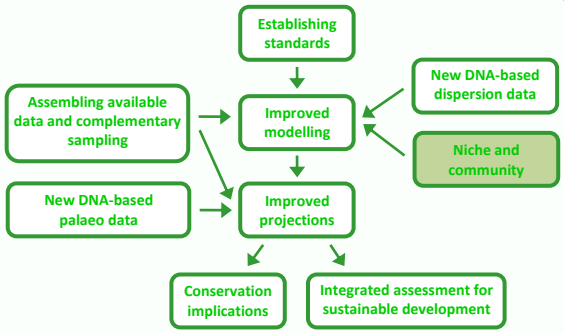

Overview on Activity 4

There is an ongoing debate whether the ecological requirements of species (so-called ecological niches) are rather stable in time and space, or whether a niche is labile and constantly adjusting.

Having information about the current niche diversity and stability in time and space, one may make guesses about the organization of ecological communities and their development in a warming environment. This enables us to better forecast biodiversity changes under a changing climate.

Investigating thermal habitats

This task investigated the thermal living conditions across topographically rich mountain terrain. We combined data on 2 m above ground air temperature, surface temperature and the temperature at 3 cm soil depth. The measurements were made in six alpine slopes situated in Norway, Sweden, Svalbard and the Alps of which we had detailed vegetation surveys.

Based on the results we aimed to explore the preferences of alpine plant species for certain thermal conditions across patterns of topography-controlled micro-habitats. Moreover, we aimed at concluding on implications for modelling the responses of plant species to climate change.

Results

Surface and soil temperature strongly differs from air temperature on bright days and clear nights. As to be expected, south oriented slopes are warmer than west and north slopes, but seasonal mean soil temperature, surface temperature and season length strongly vary within a given slope. Thus, a large range of thermal micro-habitats is created.

Plant species commonly found in cooler habitats grew in significantly colder micro-habitats than plants usually found in warmer habitats – at the same elevation. This leads to the fact that within a given slope we find species that would be expected to grow at different elevations (montane, alpine, nival) – as long as their thermal micro-habitats are available.

Conclusions and implications on modelling

Topographic variability of steep alpine terrain creates a multitude of thermal habitats that is mirrored in plant species distribution. The variability of soil and plant surface temperatures that we found within a given slope exceeds the range of warming in IPCC projections for the next hundred years.

These local thermal contrasts lead to the lack of clear species or life form limits (isolines) such as the treeline. The topographic induced thermal mosaic enables the coexistence of montane, alpine and nival species depending on the micro-environmental conditions of their habitats.

Based on our data we warn against projections of alpine plant species responses to climatic warming which adopt a large scale isotherm approach, i.e. projections that base their results mainly on temperature data in regard to the elevation.

In fact, the results suggest that topographically rich mountain terrain is, for the majority of species, a much ‘safer’ place to live under conditions of climate change than is flat terrain which offers no short distance escapes from the novel thermal regime.

At larger scales, the topographically controlled mosaic of thermal micro-habitats of mountain areas cannot appropriately be reflected by single temperature values, especially when interpolated from weather station data. We therefore advocate the use of frequency distributions instead of single values. Frequency distributions of temperature might superiorly reflect the thermal mosaic of landscapes with highly variable topography and can be adjusted depending on the roughness of the terrain.

Publications

Scherrer D, Körner C (2010) Infra-red thermometry of alpine landscapes challenges climatic warming projections. Global Change Biology, in press, doi: 10.1111/j.1365_2486.2009.02122.x.

Scherrer D, Körner C (2010) Topography driven thermal habitat differentiation buffers alpine biodiversity against climate warming impact. Journal of Biogeography, in revision.

Scherrer D, Schmid S, Körner C (2010) Weather station data are unsuitable to predict future species ranges in mountain terrain. International Journal of Bioclimatology, submitted.