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Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Spatially distributed temperature, topographic heterogeneity and ecosystem refugia in a changing climate

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Temperature and humidity are major factors controlling ecosystem development. In a context of changing climate, not only large-scale mean values but also the smaller-scale spatial distribution of temperature is likely to be affected, which may in turn affect species distribution. In particular, topographic heterogeneity affects micro-climate and thus regulates the expansion or restriction of species in a landscape. As climate changes, some species might become restricted to localized refugia, or on the contrary expand from old refugia when the overall landscape becomes favorable.

In this research we are using GIS based modeling of incoming solar radiation and subsequently derived monthly averaged temperatures to increase the understanding of spatial variability and change in local climate and how they affect species repartition. The modeling is based on topography and observed variations in atmospheric conditions and accounts for site latitude, elevation, surface orientation, daily and seasonal shifts in sun angle and the effect of shadows from the surrounding topography.

A forested field site located on the western coast of Sweden is investigated both in terms of temperature heterogeneity and plant communities. We derive 30 m resolution insolation maps and analyze the response of monthly temperature to insolation. The meteorological stations from the Swedish weather service provide us with temperature and cloud cover data over a long period. Surface and near surface temperatures are measured by a dense network of temperature sensors during the spring and summer of 2011 and are used for comparison with the modeled temperature maps. The measurements will be carried out over a 3-year period. We assess the effect of different land cover to the response of temperature to insolation and investigate the potential of this modeling approach to scale climate trend analysis down to local climate change in heterogeneous landscapes.