Contact: Agricultural Research and Education Center, A-8952 Irdning, www.raumberg-gumpenstein.at

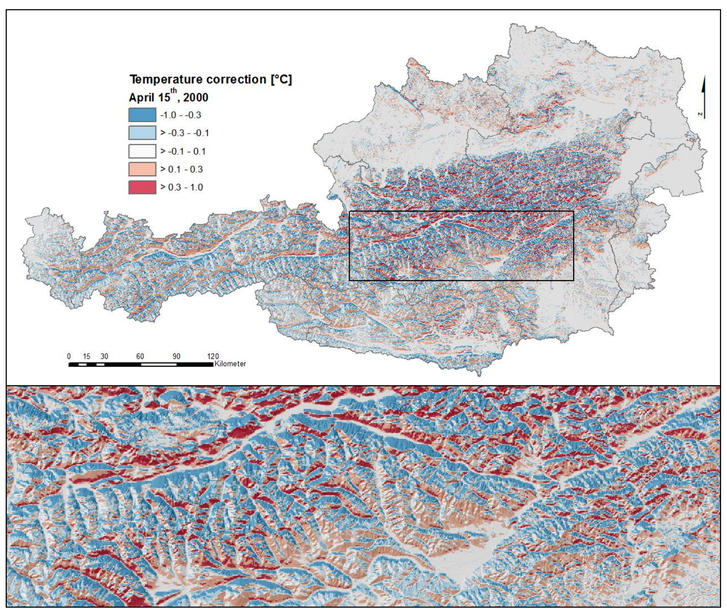
Improvement of air temperature interpolation in mountainous regions for grassland specific spatial analysis of growth dynamics

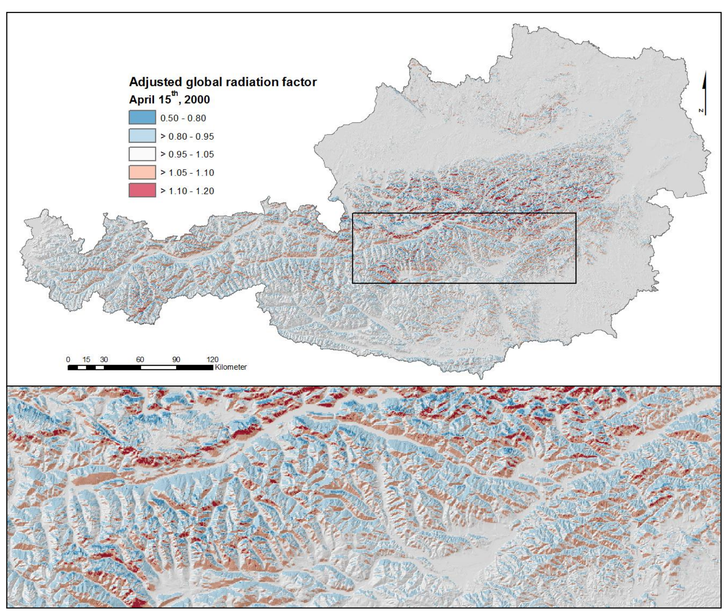
Schaumberger, A.[1], Scheifinger, H.[2] and Formayer, H.[3]

Introduction

A simple temperature sum model (TSM) has been adapted for the purpose of estimating the growth dynamics of grassland in a complex terrain. It requires time series of daily mean temperatures and model parameters calibrated and optimized on phenological observations.

The shift of mean daily temperature values due to topographical effects and the atmospheric transmissivity on daily global radiation sums is expressed by daily grids of temperature correction values.

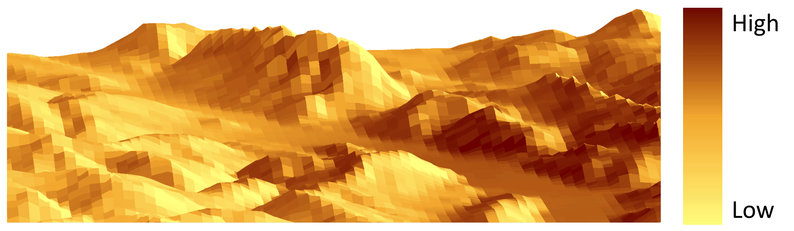




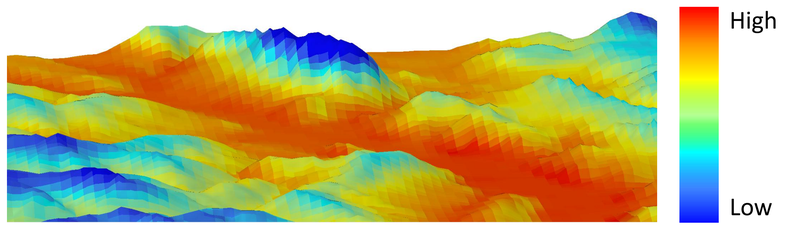
Materials and Methods

By using the Solar Analyst tool in ArcGIS the geometrical aspect of radiation was considered to cover the topographic impact on temperature.

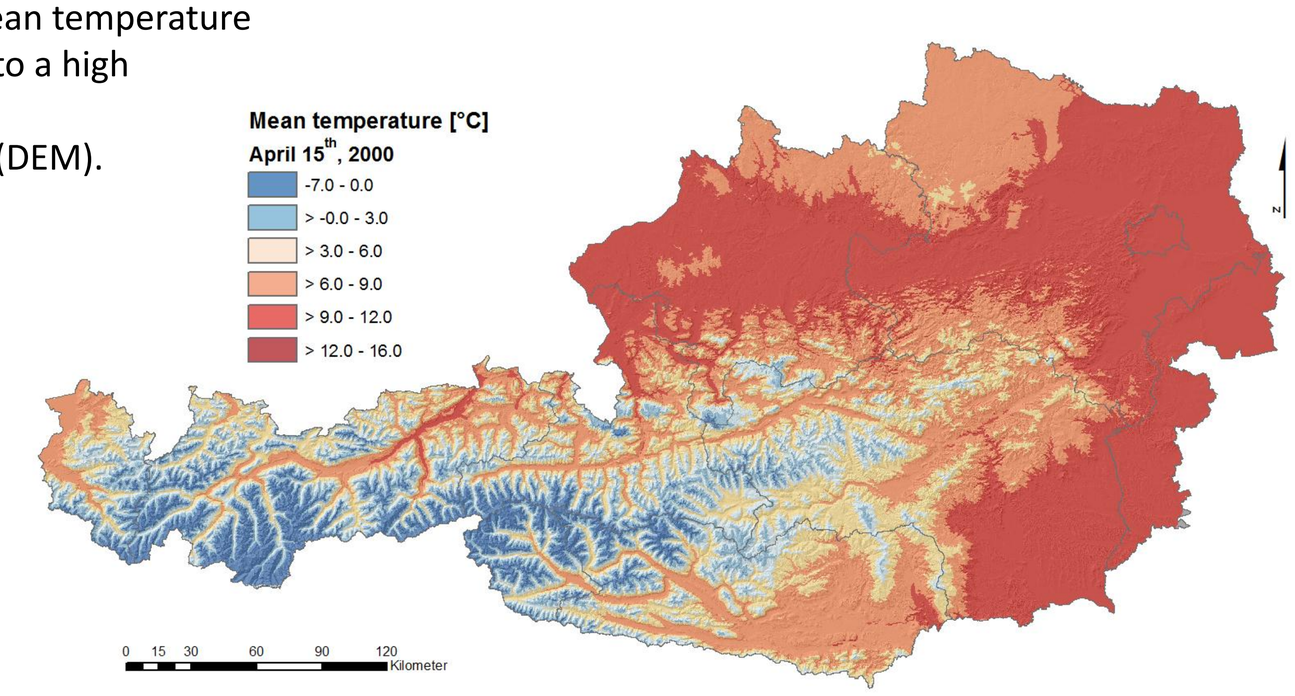
Global Radiation [MJ m^{-2}]



Mean Air Temperature [°C]

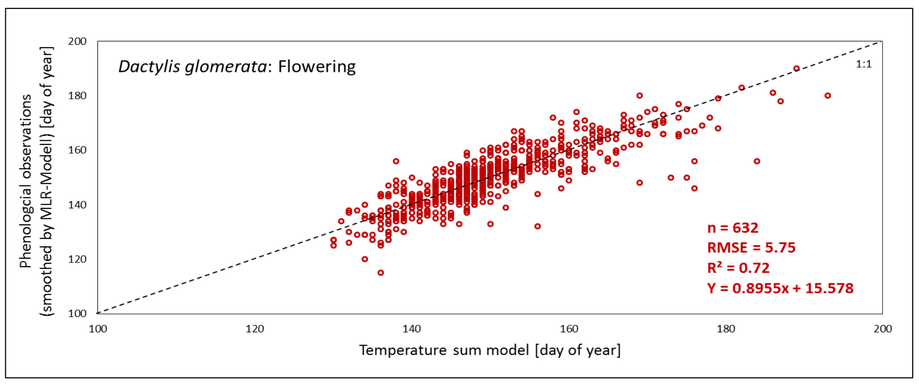


By means of geostatistical methods time series of daily mean temperature are interpolated to a high resolution Digital Elevation Model (DEM).

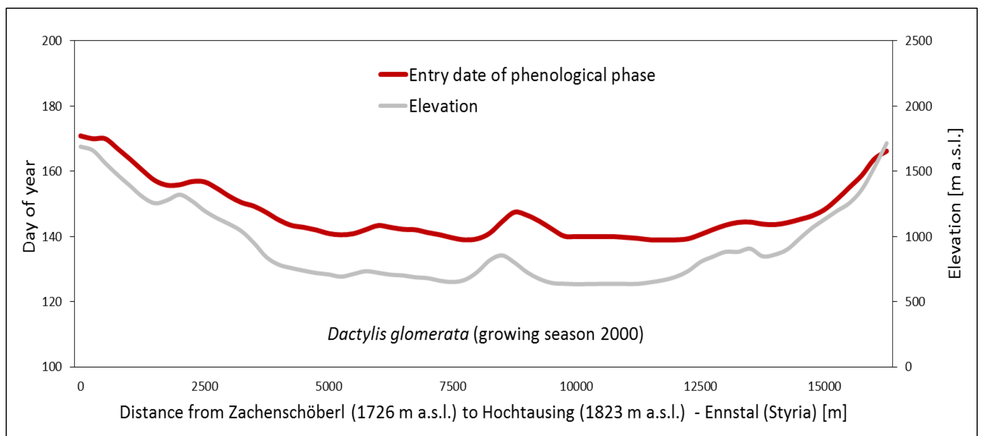


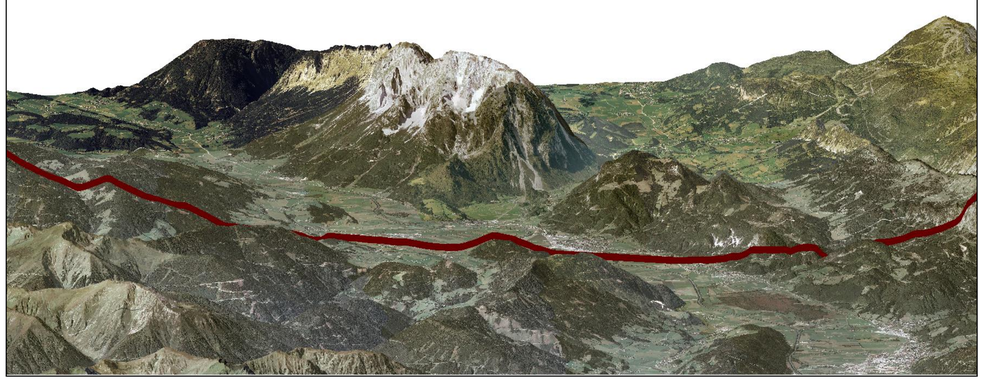
Results

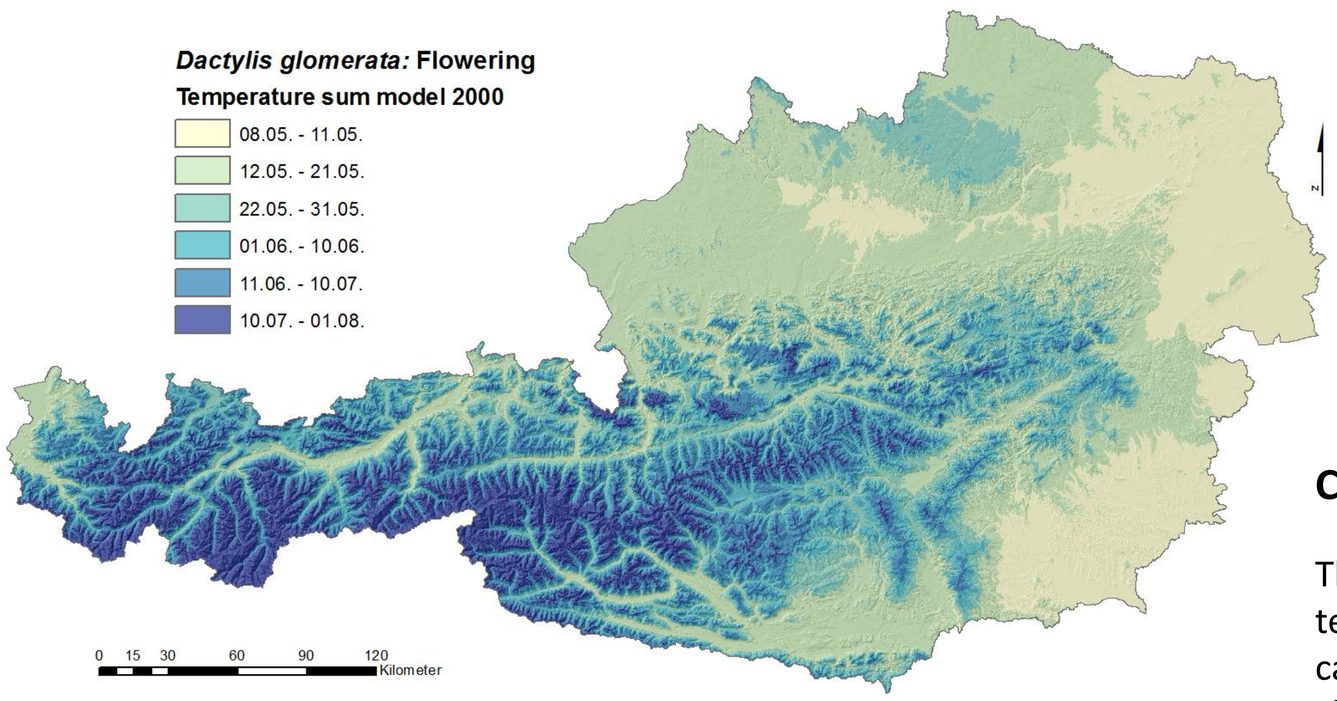
The spatial algorithms of temperature summation are built on three optimized parameters, which are the commencement date of temperature summation, the temperature threshold and the temperature sum at the entry date of the phenological phase.



Feeding the spatial data sets into the phenological model, the entry dates of the grassland phases can be calculated at each grid element of the DEM.







Conclusions

This approach is particularly adjusted for the requirements of a complex terrain. Temperature time series (e.g. possible future climate scenarios) can be fed into the modelling system in order to assess the effect of climate variability and change on grassland growth.

[1] Agricultural Research and Education Centre Raumberg-Gumpenstein (AREC), Irdning, Austria
[2] Central Institute for Meteorology and Geodynamics (ZAMG), Vienna, Austria
[3] Institute of Meteorology, University of Natural Resources and Applied Life Sciences (BOKU), Vienna, Austria

Acknowledgement: Weather data were kindly provided by the Central Institute of Meteorology and Geodynamics, Austria.

lebensministerium.at