Regional Decadal Predictability (DecReg)

Abstract:
DecReg is a part of the BMBF project MiKlip (2011-2015) and is also subject to MiKlip Modul-C, aiming on the research challenge of regionalization of decadal climate predictions.

The main goals of DecReg:
• provision of high resolution gridded observation data for Europe
• analysis of the influence of different factors affecting the predictive potential of regional decadal prognoses: coupling between the global and the regional model, spatial resolution, parameterizations used, modeling and initialization of soil moisture and soil temperature
• generation and analysis of high resolution hindcast ensembles for Europe, estimation of the uncertainty of the prognoses and of the dependence of the predictability on region and season, using suitable metrics
• validation of the ensembles using gridded observations and reference simulations, including for extreme events
• provision of sample prognoses for impact studies and pre-operational implementation of the methods.

To assess the feasibility, added value and uncertainty range of decadal regional climate forecasts, high resolution climate simulations for Europe over the past decades will be performed. Generating these ensemble hindcast simulations with the regional climate model COSMO-CLM, will allow to assess the spatial and temporal variations of climate variables. Validating these hindcasts against observations constitutes the basis for recalibrating ensemble forecasts using simple methods like bias correction or more sophisticated approaches like climate conserving recalibration or Bayesian model averaging. Ensemble recalibration is a necessary post-processing step, because of the incapability, even for very large ensembles, to completely represent all possible forecast outcomes. Nevertheless, the combination of high resolution with ensemble simulations is the key to derive reliable statistics of extremes, like heavy precipitation and droughts.

During the development stage 1 (DS1) of MiKlip, ensemble simulations have been performed on an 0.22° grid for the region of Europe (EURO-CORDEX domain). However, to analyze extremes and fully exploit the potential of the dynamical downscaling, higher resolution COSMO-CLM runs on an 0.11° grid for the same region are desirable during DS2, which starts at the beginning of 2013. The main focus directs to analyzing 2m air temperature and precipitation in the framework of extreme value theory, which includes the investigation of e.g. heat waves, heavy precipitation and droughts. Such extreme events have an enormous impact on for instance agriculture, economy, society as well as on workaday life.