Geophysical Research Abstracts
Vol. 14, EGU2012-8952, 2012
EGU General Assembly 2012

Varying trends in precipitation and temperature at different elevations in the European Alps? – A regional climate modelling perspective with COSMO-CLM

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To assess future climate impacts in Austria high resolution data sets for past, present and future climate are required. These imperative data sets shall be provided by the project "reclip:century" for which the ZAMG contributed with regional climate model data computed with the COSMO-CLM (CCLM) model. Apart from past and future simulations driven with the Global Circulation Model ECHAM5 a hindcast driven with ERA40 reanalysis data for the period 1961-2000 has been carried out.

To evaluate the uncertainty emerging from the regional climate model an extensive analysis of this hindcast was accomplished. The simulations cover the Greater Alpine Region in a 10km x10km spatial resolution. The most interesting issue is the different trend signal of near surface temperature dependent on elevation, were high alpine regions show a positive signal and the lowlands a negative signal in summer over the investigation period of 40years. The height dependence of the bias and the correlation of precipitation shows larger variations as it is for temperature values. These facts contradict the findings of investigations of long term, high quality datasets of temperature and precipitation in the Alpine region, where the trend signal for the is consistent over all levels of altitude. The climate model driven by perfect boundary conditions should be able to reproduce the observed trends, but this is obviously not the case.

In this investigation we try to address this altitude dependent trend signal to a certain reason. In particular we focus on possible problems like model initialisation of soil water content, errors in humidity and/or atmospheric layering, or missing physical processes.