Geophysical Research Abstracts
Vol. 12, EGU2010-4724, 2010
EGU General Assembly 2010

The added value of dynamical downscaling in a climate change scenario simulation:A case study for European Alps and East Asia

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Since anthropogenic climate change is a rather important factor for the future human life all over the planet and its effects are not globally uniform, climate information at regional or local scales become more and more important for an accurate assessment of the potential impact of climate change on societies and ecosystems. High resolution information with suitably fine-scale for resolving complex geographical features could be a critical factor for successful linkage between climate models and impact assessment studies. However, scale mismatch between them still remains major problem. One method for overcoming the resolution limitations of global climate models and for adding regional details to coarse-grid global projections is to use dynamical downscaling by means of a regional climate model. In this study, the ECHAM5/MPI-OM (1.875 degree) A1B scenario simulation has been dynamically downscaled by using two different approaches within the framework of RegCM3 modeling system. First, a mosaic-type parameterization of subgrid-scale topography and land use (Sub-BATS) is applied over the European Alpine region. The Sub-BATS system is composed of 15 km coarse-grid cell and 3 km sub-grid cell. Second, we developed the RegCM3 one-way double-nested system, with the mother domain encompassing the eastern regions of Asia at 60 km grid spacing and the nested domain covering the Korean Peninsula at 20 km grid spacing. By comparing the regional climate model output and the driving global model ECHAM5/MPI-OM output, it is possible to estimate the added value of physically-based dynamical downscaling when for example impact studies at hydrological scale are performed.