



Projected hydrological changes in the 21st century and related uncertainties obtained from a multi-model ensemble

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21st century climate change is likely to have a significant impact on the hydrological cycle and thus has the potential to impose additional water stress in several regions. Thus, this study focuses on the assessment of the implications of climate change for global hydrological regimes and related water resources states for the 21st century. Different climate and hydrological models show quite different projected changes with a large variation of uncertainty within the climate – hydrology modelling chain. Therefore, multiple climate and hydrological models were used within the European project "Water and Global Change" (WATCH) to assess the hydrological response to climate change and to project the future state of global and large scale water resources. Climate model data were taken from projections of three coupled atmosphere-ocean General Circulation Models (GCMs) (ECHAM5/MPIOM, CNRM-CM3, LMDZ-4) following the A2 and B1 emission scenarios. Due to the systematic errors of climate models, their output has been corrected with a statistical bias correction method and then the output was used directly to force global hydrological models (GHMs) (MPI-HM, LPJmL, WaterGAP, VIC, MacPDM, H08, GWAVA, JULES) to calculate the corresponding changes in hydrological fluxes. The analyses focus on the changes in the hydrological characteristics for twelve large, continental river basins without taking into account direct anthropogenic influences in the hydrological simulations. The hydrological cycle was evaluated and multiple-model based projections were analysed for the terrestrial components of the hydrological cycle focusing on the time period of 2071-2100. Global maps are constructed to identify regions where the water cycle and associated water resources are significantly impacted by climate change, and which regions are vulnerable to these changes in terms of e.g. water availability. The uncertainties due to the choice of GCM and GHM are also assessed.