Geophysical Research Abstracts
Vol. 12, EGU2010-759-1, 2010
EGU General Assembly 2010

A computationally parsimonious approach for performing spatially distributed hydrological simulation in ungauged basins

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Prediction in ungauged basins is an emerging need for identifying optimal water resources management strategies. To this end, the assessment of water resources availability is an essential requirement, which should be carried out in multiple river cross sections for the investigated catchment. However, river flow observations are rarely available for multiple sections along the river network. A possible solution for obtaining a comprehensive assessment is to perform hydrological simulation, with the problem that most river sections are ungauged. Concerning this, spatially distributed models are a potentially valuable tool, in view of their capability of producing river flow simulations in internal river sections after having calibrated the related parameters at the closure section of the catchment. However, distributed models are computationally intensive and therefore their application for performing long simulations is often problematic. We present a solution for performing computationally parsimonious spatially distributed hydrological simulations in multiple catchments and multiple river section in each catchment. We believe it is interesting to note that the model parameters are invariant over the different catchment. Therefore we obtain a robust modelling approach, in view of the capability to calibrate the above parameters with respect to an increased set of river flow observations. The computational requirements are optimized by adopting a simplified flow routing scheme, which provides a reliable approximation when the time step of the simulation is longer that the concentration time of the basin (for instance, the daily time step for medium size catchments). We present preliminary results obtained for two neighbouring river basins located in northern Italy, which prove the feasibility and robustness of the approach.