Geophysical Research Abstracts
Vol. 13, EGU2011-7482, 2011
EGU General Assembly 2011

A stochastic approach for hydrological models to bridge the gap between modelling and monitoring activities.

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In the last decades the advances in the knowledge of hydrological processes and in computer science have taken to a growing number of modeling tools for the simulation of complex water resources systems. Physical-based and distributed hydrological models that involve complex systems of partial differential equations are wide used also in practical application of scenario analysis e.g. climate change, land use change. A serious limitation of current model applications is however the non-availability of representative input parameters as a consequence of discrepancy in scales, lack of data and measurement errors. Moreover the need for proper calibration and validation of models is generally recognized in all the models considered especially when the model is used in conditions different from those for which it was tested.
In order to improve the performance and the reliability of the hydrological models a global uncertainty analysis is used as a tool to evaluate the performance of the models. Global sensitivity analysis will be defined and used as complementary tool to find the most important sources of uncertainty and to define the new monitoring activities. Particular attention is done to all the sources of uncertainty i.e. data, parameters and model structure. This procedure is iterated in a loop for improving the performance of the models and optimize the resource allocations. The procedure is applied as first experiment in a cropped field in Northern Germany with SWAP model. The simulation results are compared with the soil moisture detected at plot scale in different depths with common instruments (e.g. Theta Probes, Profile Probes) and at intermediate scale by the new method based on Cosmic ray recently developed by Zreda et al. (2008).