Geophysical Research Abstracts
Vol. 13, EGU2011-3358-2, 2011
EGU General Assembly 2011

JAMS – a Software Framework for Integrated Environmental Modelling

Sven Kralisch, Peter Krause, and Christian Fischer

Department of Geoinformatics, Hydrology and Modelling, Friedrich Schiller University of Jena, Germany
(sven.kralisch@uni-jena.de)

The pressures on environmental systems are increasing worldwide due to population growth, socio-economic development and the consequences of climate change. Therefore, adaptable tools and methods are needed to elaborate information, develop understanding and create strategies for the sustainable use and management of such systems. These tools should assist scientists, natural resource managers and decision makers by providing information about the system's state and help them to identify suitable management strategies, estimate their performance and quantify the impact of future development scenarios.
These objectives are tackled by simulation models that can cope with components and processes of environmental systems, e.g. the hydrological and nutrient cycles. Modelling frameworks and accompanying standards that allow for an easy implementation and extension of such models have therefore gained increasing attention from both model developers and users during the last years.
The Jena Adaptable Modelling System (JAMS) is an open-source software framework that has been especially designed to address the demands of process-based environmental model development and various aspects of model application. The model design and implementation stage is supported by (i) the explicit representation of the spatial and temporal domains via appropriate data types, (ii) a strong separation of process simulation components from the description of more complex models, and (iii) the use of annotations to provide detailed meta-information on the purpose of simulation components and the meaning of their input and output data. In addition, JAMS supports the model application stage by providing (i) flexible interfaces for the input and output of environmental data, (ii) powerful parameter optimization and uncertainty analysis methods, (iii) service-oriented runtime environments for remote and grid-based model execution, and (iv) user-friendly functions for the analysis and visualization of environmental data.
Graphical user interfaces support JAMS users during all stages of model development and application. A model building and parametrization front-end (JUICE) assists users during the creation of problem-tailored models and with the definition of model-related parametrization interfaces. The calibration of existing models is supported by a special graphical assistant (OPTAS) which guides users during the setup and application of different state-of-the-art parameter optimization algorithms. A data explorer (JADE) finally facilitates the analysis of JAMS models by providing plot and map visualizations of a model's input/result data and with the MCAT5 toolbox that offers powerful functionalities for the sensitivity analysis of environmental simulation models. In addition, a web-based user interface allows the definition and deployment of server-side model simulation and calibration tasks, thus providing easy access to high performance computing facilities.
In this presentation we will introduce the JAMS core concepts and give an overview of models, simulation components and supporting tools already available for that framework. Sample applications will be used to underline the advantages of component-based model designs and to show how JAMS can be used to address the challenges of integrated environmental modelling.