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Innovation for Consistent Integrated Modeling across Scales

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Jagers, Bert, "Innovation for Consistent Integrated Modeling across Scales" (2016). *International Congress on Environmental Modelling and Software*. 29.
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International Environmental Modelling and Software Society (iEMSs)
8th International Congress on Environmental Modelling and Software
Toulouse, France, Sabine Sauvage, José-Miguel Sánchez-Pérez, Andrea Rizzoli (Eds.)
http://www.iemss.org/society/index.php/iemss-2016-proceedings

Innovation for Consistent Integrated Modeling across Scales

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Abstract: In the context of environmental management policies and implementation plans, we are often faced by complex questions about the environment and human interaction. In order to be able to identify solution pathways forward, we need to understand the dynamics of the natural system as a whole and the human role therein. Our understanding of the system is reflected by the components of our numerical models: from highly specific detailed models to more integrated lumped models. We use models across a wide range of scales. Since policies and implementations interact across these scales and the expertise of relevant authorities involved varies we prefer to have a set of tools that can represent our knowledge consistently at different levels of aggregation and simplification: from detailed models for experts to simplified representations for the general public. At the heart of these tools we have models that represent the dynamics of water, sediments, water quality, and ecology throughout the whole system from catchment to coast both at the surface and in the subsurface using open source simulation components that represent the 1D, 2D, and 3D dynamical interaction of the processes involved. These components interact via open standards to form integrated models, which can be run locally or remotely on dedicated high-end computational clusters, in batch mode or interactively to give dynamic feedback to the users. This contribution describes how we use common standards (such as BMI, OpenMI, NetCDF-CF, UGRID, and various OGC and web standards) and open source and Python scripting components to develop innovative modelling tools to support the environmental managers in their daily work.

***Keywords**:* numerical models; standards; management tools.