Title: Implementing a Travel Time Model for the Entire River Adige: the Case on JGrass-NewAGE

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Abstract

JGrass-NewAge (Formetta et al., 2014) is a new hydrological system for forecasting and modeling of water and related resources. It is based on the object modeling framework version 3 (OMS3), on the JGrasstools, and the GIS toolkit Geotools. Differently from traditional models, it is built upon components, that can be connected at run-time, to provide a variety of modeling solutions. The components can be selected, adopted, and connected according to the modeler needs, without rewriting the whole model. Different hydrological components simulate different hydrological

processes, or simply model tasks as human actions. Therefore the framework is well suited to estimate impacts of the climate crisis or of land-use changes. In order to expand the possibilities of JGrass-NewAge, in this work we developed some new components to integrate in the framework the theory of transport for travel times of Botter et al. (2011), and Benettin, P (2015), that we coupled with the existing ones (Formetta et al., 2011, 2013, 2014).Treatment of the hydrologic response for travel time is deemed important to allow subsequent treatment of natural tracers, temperature, nutrients or pollutants, at catchment level.In this contribution, however, we focused on the estimation of the outflows , at hourly time-step, and water age of river Adige, the second longest and largest in Italy, covering approximately 12 thousand square kilometers. The modeling solution presented is based on a small hydrologic response units, approximately coincident with the hillslope, and, for each of them, we solve the hydrological budget, including snowfall and melting, and runoff production, evapotranspiration. The hydrological budget of the river is therefore presented, and travel time distributions of water are also discussed.
