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Stochastic spatio-temporal modelling with PCRaster Python

D. Karssenberg, O. Schmitz, and K. de Jong

Faculty of Geosciences, Utrecht University, Department of Physical Geography, Utrecht, the Netherlands (d.karssenberg@uu.nl)

PCRaster Python is a software framework for building spatio-temporal models of land surface processes (Karssenberg, Schmitz, Salamon, De Jong, & Bierkens, 2010; PCRaster, 2012). Building blocks of models are spatial operations on raster maps, including a large suite of operations for water and sediment routing. These operations, developed in C++, are available to model builders as Python functions. Users create models by combining these functions in a Python script. As construction of large iterative models is often difficult and time consuming for non-specialists in programming, the software comes with a set of Python framework classes that provide control flow for static modelling, temporal modelling, stochastic modelling using Monte Carlo simulation, and data assimilation techniques including the Ensemble Kalman filter and the Particle Filter. A framework for integrating model components with different time steps and spatial discretization is currently available as a prototype (Schmitz, de Jong, & Karssenberg, in review). The software includes routines for visualisation of stochastic spatio-temporal data for prompt, interactive, visualisation of model inputs and outputs. Visualisation techniques include animated maps, time series, probability distributions, and animated maps with exceedance probabilities. The PCRaster Python software is used by researchers from a large range of disciplines, including hydrology, ecology, sedimentology, and land use change studies. Applications include global scale hydrological modelling and error propagation in large-scale land use change models. The software runs on MS Windows and Linux operating systems, and OS X (under development).

References

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