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PyTOPKAPI - an open source hydrological model used to estimate soil moisture in near real time over South Africa for flood potential & drought monitoring and remote sensing model intercomparison

Scott Sinclair and Geoff Pegram
University of KwaZulu-Natal, Civil Engineering, Durban, South Africa (sinclaird@ukzn.ac.za; pegram@ukzn.ac.za)

PyTOPKAPI is a software product used to model soil moisture estimates over South Africa using an Open Source implementation of the TOPKAPI hydrological model written in Python. The model has been extended from its traditional interlinked hydrological role (still the core of the package) to enable it to switch to a country-wide collection of independent 1km cells. In the application presented here, 7000+ cells are located on a grid over South Africa with a spatial resolution of 0.125 deg, using 3 hourly rainfall estimates and evapotranspiration forcing to calculate the Soil Saturation Index (SSI) at each location.

The rainfall forcing used is the TRMM 3B42RT product, while the actual evapotranspiration forcing is based on a modification of the FAO56 reference crop evapotranspiration combined with an adaptation of NDVI information, which accounts for vegetation health and the availability of surface and soil water, as limiting factors on the potential rate of evapotranspiration. This product has already been successfully used in a model intercomparison study involving ASCAT estimates of soil moisture over the region (Sinclair & Pegram, 2010, HESS, 14, 613–626). The SSI modelling system has been running semi-operationally since 2008 and we present some of the soil moisture outlook products we provide to the South African Agricultural Research Council and the Agri-business unit of a major South African bank. This product is about to be used in a new EU project: GLOWASIS - "A collaborative project aimed at pre-validation of a GMES Global Water Scarcity Information Service". The link to obtain the open source model package, recently published on the web, is provided.