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Automation of SimSphere Land Surface Model Use as a Standalone Application and Integration With EO Data for Deriving Key Land Surface Parameters

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Use of simulation process models has played a key role in extending our abilities to study Earth system processes and enhancing our understanding on how different components of it interplay. Use of such models combined with Earth Observation (EO) data provides a promising direction towards deriving accurately spatiotemporal estimates of key parameters characterising land surface interactions, by combining the horizontal coverage and spectral resolution of remote sensing data with the vertical coverage and fine temporal continuity of those models.

SimSphere is such a software toolkit written in Java for simulating the interactions of soil, vegetation and atmosphere layers of the Earth's land surface. Its use is at present continually expanding worldwide both as an educational and as a research tool for scientific investigations. It is being used either as a stand-alone application or synergistically with EO data.

Herein we present recent advancements introduced to SimSphere in different aspects of the model aiming to make its use more robust when used both as a standalone application and synergistically with EO data. We have extensively tested and updated the model code, as well as enhanced it with new functionalities. These included for example taking into account the thermal inertia variation in soil moisture, simulating additional parameters characterising land surface interactions, automating the model use when integrating it with EO data via the "triangle" method and developing batch processing operations.

Use of these recently introduced to the model functionalities are illustrated herein using a variety of examples. Our work is significant to the users' community of the model and very timely, given the potential use of SimSphere in an EO-based method being under development for deriving operationally regional estimates of energy fluxes and soil moisture from EO data provided by non-commercial vendors.

KEYWORDS: land surface interactions, land surface process model, SimSphere, triangle