Geophysical Research Abstracts
Vol. 17, EGU2015-943-1, 2015
EGU General Assembly 2015

Establishing the Capability of a 1D SVAT Modelling Scheme in Predicting Key Biophysical Vegetation Characterisation Parameters

Gareth Ireland (1), George P. Petropoulos (1), Toby N. Carlson (2), and Sarah Purdy (1)

(1) Department of Geography and Earth Sciences, University of Aberystwyth, SY23 3DB, Wales, UK, (2) Department of Meteorology, Pennsylvania State University, University Park, PA 16802, USA

Sensitivity analysis (SA) consists of an integral and important validatory check of a computer simulation model before it is used to perform any kind of analysis.

In the present work, we present the results from a SA performed on the SimSphere Soil Vegetation Atmosphere Transfer (SVAT) model utilising a cutting edge and robust Global Sensitivity Analysis (GSA) approach, based on the use of the Gaussian Emulation Machine for Sensitivity Analysis (GEM-SA) tool. The sensitivity of the following model outputs was evaluated: the ambient CO_2 concentration and the rate of CO_2 uptake by the plant, the ambient O_3 concentration, the flux of O_3 from the air to the plant/soil boundary, and the flux of O_3 taken up by the plant alone.

The most sensitive model inputs for the majority of model outputs were related to the structural properties of vegetation, namely, the Leaf Area Index, Fractional Vegetation Cover, Cuticle Resistance and Vegetation Height. External CO_2 in the leaf and the O_3 concentration in the air input parameters also exhibited significant influence on model outputs. This work presents a very important step towards an all-inclusive evaluation of SimSphere. Indeed, results from this study contribute decisively towards establishing its capability as a useful teaching and research tool in modelling Earth's land surface interactions. This is of considerable importance in the light of the rapidly expanding use of this model worldwide, which also includes research conducted by various Space Agencies examining its synergistic use with Earth Observation data towards the development of operational products at a global scale.

This research was supported by the European Commission Marie Curie Re-Integration Grant "TRANSFORM-EO". SimSphere is currently maintained and freely distributed by the Department of Geography and Earth Sciences at Aberystwyth University (http://www.aber.ac.uk/simsphere).

Keywords: CO_2 flux, ambient CO_2, O_3 flux, SimSphere, Gaussian process emulators, BACCO GEM-SA, TRANSFORM-EO.