Geophysical Research Abstracts
Vol. 19, EGU2017-13031, 2017
EGU General Assembly 2017

Land surface parameter optimisation through data assimilation: the adJULES system

Nina Raoult, Tim Jupp, and Peter Cox
University of Exeter, Exeter, United Kingdom (nr278@exeter.ac.uk)

Land-surface models (LSMs) are crucial components of the Earth system models (ESMs) that are used to make coupled climate–carbon cycle projections for the 21st century. The Joint UK Land Environment Simulator (JULES) is the land-surface model used in the climate and weather forecast models of the UK Met Office. JULES is also extensively used offline as a land-surface impacts tool, forced with climatologies into the future. In this study, JULES is automatically differentiated with respect to JULES parameters using commercial software from FastOpt, resulting in an analytical gradient, or adjoint, of the model. Using this adjoint, the adJULES parameter estimation system has been developed to search for locally optimum parameters by calibrating against observations. We present adJULES in a data assimilation framework and demonstrate its ability to improve the model–data fit using eddy-covariance measurements of gross primary production (GPP) and latent heat (LE) fluxes. adJULES also has the ability to calibrate over multiple sites simultaneously. This feature is used to define new optimised parameter values for the five plant functional types (PFTs) in JULES. The optimised PFT-specific parameters improve the performance of JULES at over 85% of the sites used in the study, at both the calibration and evaluation stages. The new improved parameters for JULES are presented along with the associated uncertainties for each parameter.