POSTER 18

에디공분산 플럭스 관측 자료 동화 기법을 이용한 관측지 맞춤형 JULES 지면모델 파라미터 최적화

박주한[1,2], 이승재[1*], 강민석[1], 류영렬[1,2], 김준[1,2]

[1]국가농림기상센터, [2]서울대학교

Site-specific Parameter Optimization of the JULES Land Surface Model using Eddy Flux Measurement

Juhan Park[1,2], Seung-Jae Lee[1*], Minseok Kang[1], Youngryel Ryu[1,2] and Joon Kim[1,2]

[1]*National Center for Agro-Meteorology, Seoul National University, Seoul 08826, Korea,*

[2]*College of Agriculture and Life Science, Seoul National University, Seoul 08826, Korea*

Land-surface models (LSMs) are used to estimate the ecosystem response to changes in atmospheric conditions, and are widely used as a component of earth system models. In order to allow more realistic representation of the land surface, LSMs now incorporate additional complex processes, such as light and nitrogen distribution within multiple canopy layers and photosynthate distribution among different plant organs. However, additional parameters should be introduced as a cost of including more complex processes, which give rise to increase in parameter uncertainties as well. These parameters could vary among distinct plant functional types (PFTs), geographic locations, and weather and climatic conditions. In this paper, data assimilation techniques were used to estimate the optimal values of plant-, soil-, and crop-related parameters in JULES (Joint UK Land Environmental Simulator) in cases where site flux measurement data were available. Sensitivity tests of these parameters were carried out for the Cheorwon rice paddy flux site in the Republic of Korea using version 4.8 of JULES, which is equipped with a crop module. A total of 64 parameters were artificially modified from -30% to +30% of their default values, and sensitivities to these modifications of gross primary productivity (GPP), total ecosystem respiration (RE), latent heat flux (LE), and sensible heat flux (H) were calculated. The six most sensitive parameters were found and optimized by the gradient-based L-BFGS-B algorithm in the optim package in R software. In addition, these optimized parameters were tested against other rice paddy flux sites in the USA. Most of the JULES parameter changes had little impact on GPP, RE, LE, and H; the six selected parameters controlling light use efficiency, concentration and distribution of leaf nitrogen, and the ratio of carbon distribution to the leaf dominated changes to the surface fluxes. There were large differences in default and optimized values of the six parameters. The optimized parameters improved model-data fit significantly, reducing the model-data RMSE by up to 90%. However, transferring this

* Correspondence to : sjlee@ncam.kr

single-site parameter optimization did not improve model performance at the other site, which may be a result of parameter overfitting and the different site environments. This indicates that site-customized work is necessary, even when they have the same PFTs and similar atmospheric conditions.