Hydrology and Earth System Sciences Discussions

Interactive comment on "Integrating MODIS images in a water budget model for dynamic functioning and drought simulation of a Mediterranean forest in Tunisia" *by* H. Chakroun et al.

Anonymous Referee #1

Received and published: 6 June 2012

Review of 'Integrating MODIS images in a water budget model for dynamic functioning and drought simulation of a Mediterranean forest in Tunisia'

This paper discusses the use of LAI values derived from MODIS imagery for improving a water budget model. Unfortunately, the paper only presents a very brief description of the model. A more elaborate discussion is necessary in order to understand its functioning. Also the validation of the model at the study site is not demonstrated.

I have problems with the 'framework for integrating remotely sensed LAI in a model'. Basically, what is done is that the original module in the model which calculates LAI from leaf biomass is replaced by the remotely sensed observation. I wouldn't call this a framework! A better (?) way may have been to assimilate the MODIS-LAI into the model? In this way, uncertainties in the RS-LAI could be accounted for when updating the model.

The LAI derived from MODIS is hardly validated: this definitely forms a problem for interpreting the results of the study. Problems are reported, and some references are made to literature. However, a more in depth analysis is needed: how are the groundtruth LAI values measured? Can one compare these with those of MODIS (due to spatial resolution). How well do the model LAI values (calculated with the original model based on the leaf biomass) compare to the ground-based observations and to the MODIS LAI? Can you perform a statistical analysis to compare results? Where does the maximum value of LAI=2.5 come from? With respect to the model results (section 4), results are hardly validated. Also a comparison between the original model (where LAI is calculated) and the 'new' model (where MODIS LAI is used) is lacking: how much do both runs deviate? Can these deviations be explained? The sensitivity analysis discussed in section 4.2 should be improved. Now, only two different simulations are run and a comparison between both runs is made. I don't believe one can call this a sensitivity analysis! It is also not clear what the authors want to learn from this sensitivity analysis. In section 4.3. a spatial analysis is made on drought conditions. Again, this section is very weak with respect to its analysis and conclusions are very flew. The objective of this analysis is not clear: what is the merit of MODIS LAI for this analysis? What should we learn?

In the conclusions, some statements are made, which I believe, were not properly addressed in the paper: Integration of LAI of MODIS 'could' improve results of the simulation: this was not validated as the model without MODIS info (i.e. the original model) was not run and compared with. Only through comparing both runs, one could

argument whether or not improvements are made. The conclusion states that an alternative solution is to calibrate LAI-MODIS with other sources of satellite data or with in situ LAI: this was not performed. The conclusion furthermore states that, based on LAI from MODIS, one could demonstrate that increase in LAI is accompanied by increase in drought conditions: Was this based on LAI from MODIS, or is this merely due to the model? One cannot make such statement if the results are not compared to a model run where MODIS data is not used!

Unfortunately, I find that the paper lacks sufficient validation to prove the statements that are made. I hope that the authors may perform some additional research that could lead to more validated conclusions.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 6251, 2012.