Geosci. Model Dev. Discuss., 6, C2594–C2600, 2014
www.geosci-model-dev-discuss.net/6/C2594/2014/

Geoscientific Model Development Discussions

Interactive comment on "Suitability of modelled and remotely sensed essential climate variables for monitoring Euro-Mediterranean droughts" *by* C. Szczypta et al.

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Received and published: 19 February 2014

Response to Reviewer #1

The authors thank the anonymous reviewer #1 for his/her review of the manuscript and for the helpful comments.

1.1 [I believe that the manuscript should be accepted subject to minor revisions with respect to its structure and the rephrasing of some part of the text.]

RESPONSE 1.1 The suggested minor revisions will be made accordingly in the final version of the manuscript.

1.2 [Abstract: You define some acronyms (LAI, SSM, LGP) but not others (ORCHIDEE, ISBA-A-gs) Please double check GMD(D) policy for acronyms.]

RESPONSE 1.2

Yes, all the acronyms will be defined in the abstract of the final version of the manuscript.

ORCHIDEE: ORganizing Carbon and Hydrology In Dynamic EcosystEms.

ISBA-A-gs: Interactions between Soil, Biosphere and Atmosphere, CO2-reactive (A-gs).

1.3 [L1 "Two new remotely sensed Leaf Area Index (LAI) and Surface Soil Moisture (SSM) satellite products [...]" It might be fair to use 'satellite-derived' products .]

RESPONSE 1.3

Yes, "satellite" will be replaced by "satellite-derived" here.

1.4 [L7 "The leaf onset and the Length of the vegetation Growing Period (LGP) are derived from the satellite-derived LAI and from the modelled LAI." could be rephrased by "The leaf onset and the Length of the vegetation Growing Period (LGP) are derived from both the satellite-derived and modelled LAI."]

RESPONSE 1.4

Yes, this sentence will be reworded accordingly.

1.5 [Introduction: P.5554, L.25, Please define what is an Essential Climate Variable. P.5555, L.3-11, I am missing a transition here, while most of the introduction is fairly well written, the paragraph on LAI reads more as a technical point. Please rephrase the beginning of the Introduction section.]

RESPONSE 1.5

The beginning of the introduction section could be rephrased as:

"The Global Climate Observing System (GCOS) has defined a list of atmospheric, oceanic, and terrestrial Essential Climate Variables (ECVs) which can be monitored at a global scale from satellites. The terrestrial ECV products consisting of long time series are needed to evaluate the impact of climate change on environment and human activities. They have high impact on the requirements of the Intergovernmental Panel on Climate Change (IPCC). Over land, new ECV products are available and they can be used to characterize extreme events, such as droughts. Leaf Area Index (LAI) is one of the terrestrial ECVs related to the vegetation growth and senescence. Monitoring LAI is essential for assessing the vegetation trends in the climate change context, and for developing applications in agriculture, environment, carbon fluxes and climate monitoring. LAI is expressed in m2 m-2 and is defined as the total one-sided area of photosynthetic tissue per unit horizontal ground area."

1.6 [Data and Methods: P.5557, L.5-12, This paragraph should introduce section 2 (?) No transition at all between the different sentences, it seems that just 'bullets' are expressed. P.5557, L11-12, "From 1991 onward, SSM observations from active (ERS-1/2, ASCAT) and passive (SSM/I, TMI, AMSR-E) microwave sensors are available." OK, I understand that you will use them latter on in the manuscript but as it is, this sentence is useless. Do you mean that additionally to the ESA-CCI SSM data set this study makes use of SSM observations from active (ERS-1/2, ASCAT) and passive (SSM/I, TMI, AMSR-E) microwave sensors over yyyy-yyyy and available from...If you prefer you could also dedicate a sub-section to all the soil moisture data set used in this study.]

RESPONSE 1.6

This paragraph could be reworded as:

"In this study, several data sets (either model simulations, atmospheric variables, or satellite products) were produced or collected, over the Euro-Mediterranean area. In order to force the two LSMs simulations of SSM and LAI (Sect. 2.1), the ERA-Interim

atmospheric variables are used. The ERA-Interim data are available on a reduced Gaussian grid (of about 0.7° x 0.7°) and projected to the 0.5° x 0.5° grid of the LSM simulations (Szczypta et al., 2012). The 1991-2008 18 yr period is considered in this study, as in Szczypta et al. (2012). During this period, SSM products from both active (ERS-1/2, ASCAT) and passive (SSM/I, TMI, AMSR-E) microwave sensors are available and can be combined (Sect. 2.2), together with LAI products (Sect. 2.3). In order to compare the LSM simulations with the satellite products, the latter are aggregated on the same 0.5° x 0.5° grid using linear interpolation and averaging techniques."

1.7 [P.5557-5558, while you provide acronyms for SECHIBA, STOMATE, LPJ, you do not provide that of ORCHIDEE (or ISBA-A-gs).]

RESPONSE 1.9

ORCHIDEE and ISBA-A-gs acronyms will be detailed in the new version of the manuscript (see response 1.2.)

1.8 [2.1.3 Design of the simulation: P.5559, L19-20, after a quick look to Szczypta et al., 2011, it seems that the underestimation of precipitation in ERA-Interim was observed over France. How realistic is to correct the rain over your much bigger domain?]

RESPONSE 1.8

The underestimation of precipitation in ERA-Interim was observed over France by Szczypta et al. (2011) and over the Euro-Mediterranean area by Szczypta et al. (2012). In the latter study, the correction of the precipitation was applied over the whole Euro-Mediterranean area and indirectly validated using river discharges simulations and observations.

1.9 [2.3 GEOV1 LAI: P.5561, L.7-8, "The GEOV1 scores are better than those obtained by other products." such as?]

RESPONSE 1.9

The GEOV1 LAI scores are better than those obtained by other products such as MODIS c5, CYCLOPES v3.1, and GLOBCARBON v2.

1.10 [2.4.1 should be Surface Soil Moisture instead of 'SSM' only ; 2.4.2 should be Leaf Area Index instead of 'LAI' only. "Three metrics are calculated to characterize LAI seasonal and interannual variability [...]"]

RESPONSE 1.10

Yes. Will be reworded accordingly.

1.11 [3 Results: P.5564, L.2 'squared correlation coefficients', coefficient of determination (?) [as P.5569]]

RESPONSE 1.11

Yes, the coefficient of determination corresponds to the squared correlation coefficient. For the sake of consistency, only one term will be used.

1.12 [3.2 Simulated and observed phenology: Could Authors provide an indication of the ability of GEOV1 product to capture observed LAI amplitude (if any evaluations are available)?]

RESPONSE 1.12

The direct validation of the GEOV1 LAI product by Camacho et al. (2013) is based on an ensemble of ground observations at 30 sites but it does not completely address the seasonality of LAI as for a given site, LAI observations are available at only one or very few dates.

1.13 [3.3 Representation [...] P.5565, sometimes r^2 is used and sometimes it is r, please be consistent.]

RESPONSE 1.13

Squared correlation coefficient plots are used in this study when all the corresponding

r values are greater or equal to zero. When r presents negative values, r is plotted instead of the square correlation coefficient.

1.14 [4.1. Representation of soil moisture: L.1, first sentence does not reflect the title of the subsection. Also this sentence is not clear (to me), do you mean that the difficulty of the model to represent LAI inter-annual variability can be partly explained by [...] (?)]

RESPONSE 1.14

Yes. The first sentences of this section could be reworded as:

"In the two LSMs considered in this study, soil moisture impacts the LAI seasonality and interannual variability. The interannual variability of the simulated LAI is often driven by changes in the soil moisture availability, which for the soil models of the versions of ORCHIDEE and ISBA-A-gs used in this study consist of rather simple parameterizations that are unable to simulate detailed soil moisture profiles including the ability of different root layers in the profile to take up water. Therefore, while the difficulty in representing the modelled LAI interannual variability, as illustrated in Sects. 3.3 and 3.4, can be partly explained by shortcomings in the phenology and leaf biomass parameterizations, another factor is the inadequate simulation of root-zone soil moisture. For example, [...]"

1.15 [4.2 Representation of LAI: P.5568, the algorithm used to produce GEOV1 LAI should be indicated in section 2.3]

RESPONSE 1.15

Yes, the description of GEOV1 could be moved to Sect. 2.3.

1.16 [Section 4.3 could be presented in section 3 'Results']

RESPONSE 1.16

Yes, the content of Sect. 4.3 could be redistributed in Sections 2, 3 , and 4.

1.17 [5. Conclusions: P.5572, L.13, "[...] and highlighted the regions where the ESA-CCI product can be improved." But did not mention how to improve this product .]

RESPONSE 1.17

The ESA-CCI SSM could be improved by revising the procedure for blending the active and passive microwave products.

1.18 [Figure 3 (also 4), it is not clear to me if the white areas have a r value close to 0 or if no data are available for the evaluation.]

RESPONSE 1.18

In both Figs. 3 and 4, white areas correspond to r values lower (higher) than 0.1 (-0.1).

1.19 [Figure 8, considered period should be indicated in the caption.]

RESPONSE 1.19

Yes, the considered period (1991-2008) will be indicated in the caption.

Interactive comment on Geosci. Model Dev. Discuss., 6, 5553, 2013.