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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Using globally available soil moisture indicators for flood modelling in Mediterranean catchments" *by* C. Massari et al.

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Review to Massari, Brocca, Papathanassiou, Mimikou, Moramarco with the title "Using globally available soil moisture indicators for flood modelling in Mediterranean catchments" The manuscript presenting the use of six different soil moisture products to initialise a simple lumped conceptual hydrological model based on the geomorphological united hydrograph for one single catchment in Attica, Greece of medium size for 15 events. The six different products are the following: two different remote sensing products (ASCAT, AMSR-E), the soil moisture reanalysis product of the ECMWF (ERA), the SWB model of Brocca et al. driven by observed meteorological data and one single FDR-probe.

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Interactive Discussion
Discussion Paper

The topic is relevant to the journal. Estimating plausible initial conditions are of great importance and interest for flood forecasting and many other related topics.

To bring the text into a publishable article a lot of work has to be done. The text has to be restructured. In the present stage it is hard to follow the intention of the authors. There is no clear story line. The abstract needs more focus on the presented story and has to be rewritten. There is too much methods block included in the results, which should be moved.

By focussing on runoff response based on a better estimation of initial conditions the two other major aspects of precipitation estimation as input and runoff observation as output are here in a manor presented which is too week. And the aggregation of the different products is not explained.

They are using Thiessen polygons for interpolation of precipitation. As far as I understood the authors they are looking for flood prone events and flash floods. This interpolation method is not the state of the art to estimate the specific patterns responsible for these types of event (Heistermann and Kneis, 2010; Sangati and Borga, 2009).

A definition what is a flash flood has to be given and the relevant literature is missing (Sangati and Borga, 2009; Heistermann and Kneis, 2010; Marchi et al., 2010, Tarolli et al. 2013). Most of these flood prone events are convective events which appear in most cases during the summer period. The authors present only one such event. A description of the events is missing (advective, convective) to have an idea about the size and the speed of the event. The presented events have all low runoff coefficients, even the summer event, below 10 % except two winter events. From that perspective it is hard to follow the flesh flood argumentation and how do the authors think that their model framework is able to estimate larger events if there is no data of that size to test it.

Relevant information about meteorological input is missing and the block is more refer-

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encing different networks than describing them. How many rain gauges where used for the estimation of the precipitation, 13 or more? What kind of gauge is used? In figure 1 only 6 stations are plotted. Where are the other 7? Are they not taken into account? Two rainfall radars (GR41 Imittos and GR45 Aigina) are available for the study area why are they not integrated? The rainfall observation is the major point by modelling the runoff response especially in areas with a flashy response. That factor is even more important than initial conditions.

The second issue is the raiting curve. What kind of velocity measurement device was conducted? Why used the authors such a short period to measure flow velocities. As far as I understood them correctly the sediment loads in the channel in the region are high. How could they guaranty that the geometry on the investigated channel profile of 2009 is representative for the complete time series? With such low knowledge about the second mass balance variable it is not possible to be sure that the authors are able to quantify the correct runoff response or even able to estimate runoff coefficients. Can the low runoff coefficients explained by an underestimation of runoff? In the description part four runoff gauges were mentioned but in figure 1 only one is shown and in the analysis as well. Are they taken into account and what was the quality of their simulation?

Add a table with the different parameters of the specific soil moisture products (resolution, points taken into account, frequency of the remote sensing products, algorithm, penetration depth, etc.).

It is not clear how they estimate the mean soil moisture of the initial conditions and how do they link soil moisture to model storage. It is just not presented. Have they taken variability into account? The block in the model part does only give information that the authors think there is a linear relationship between storage and soil moisture. That has to be presented.

There is only ONE FDR – probe for ground truthing in the 100 km^2 catchment. FDR

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method is error prone to dry states, clay soils and organics. They do not present what kind of soil texture is dominant in the study site. It is hard to interpret if that kind of probe which is only one for 100 km^2 in 25 cm depth is able to observe accurate soil moisture data. Is it located on a representative position? They do not present what kind of probe they use.

It is still unclear what the influence of vegetation is on the two different remote sensing products. For bare soil the algorithms will work well. With increasing vegetation density like for forest or crops at the end of vegetation state the presented algorithms will be not able to estimate soil moisture (Wagner et al. 2013; Jagdhuber et al., 2013). And even low vegetation coverage will have an effect on the algorithm (Jagdhuber et al., 2013). There are 30 % forest and 20 % of urban areas in the study site, how do they have taken that into account? How are landuse especially urban areas and soil types integrated into EMCWF data?

In the modelling study again a lot of unclear statements were presented. How is the soil moisture data introduced to the continuous model? Graeff et al. (2012) had a quit bad not linear relationship between storage and soil moisture. What is a simplified continuous model? In the model description it sounds like they are only presenting event based modelling. Are the soil moisture data used to update the state variables?? If so have they tested antecedent runoff to update the model state? For a more profound review of the results and conclusion the authors first have to present a better structure of their manuscript.

Specific comments:

P 11001- 11002: Explain at the end of the intro what the reader can be expect from that manuscript! P 11002, L 20-26: Geology is irrelevant, soil physics are important. P 11003-1104: What kinds of sensors are used? Shorten that paragraph to the important facts. P 1104, L 23: add the SWB model as the fives method. P 11008-11009: Integrate 3.2 and 3.3 to 2.3. The SWB model is the fourth method to estimate initial

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conditions. Present the parameters of the model and how they have been estimated. Is it lumped or distributed and how is aggregated. P11011, L 3: How is the normalisation realised? P11011 L9: Is the comparison done between the observed soil moisture at the probe location and the simulated value with the different products at that point or is the mean value of the catchment soil moisture presented? P11011, L 10-17: Which method was used for the calibration? Which was the calibration period and which the validation period? P11011, L 19: Explain the T parameter in the method block. P11012 4.2.1 Move parts to the method block. Is it important to present all events in fig. 4? 11013 4.2.2 and 4.3 Again methods and results are mixed. 11013, 21-23: Unclear sentence. All tables and figures need a more profound description in the caption. They have to be stand alone. Table 1: Add the mean antecedent soil moisture or water level, to have a value of the catchment conditions. Table 3: What is NS the mean Nash of all results? Figure 3: The figure is difficult to read. Increase size and quality. Legend is too small and symbols are indistinguishable. What is ASCAT (a) and (b)? T is not explained in the text and ASCAT (b) is not identifiable in the plot. Explain the different correlation coefficients and T values in c). Figure 5: a) and b) is not in the figure. Where is Sobs in a)? Figure 7: Simplify the labels and plot one legend.

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