Hydrology and Earth System Sciences

Discussions

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Interactive comment on "The value of satellite remote sensing soil moisture data and the DISPATCH algorithm in irrigation fields" *by* Mireia Fontanet et al.

Anonymous Referee #1

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OVERVIEW

The manuscript investigates the capability of satellite soil moisture observations to detect irrigation in a small agricultural area in north eastern Spain. Specifically, the 1-km disaggregated soil moisture product obtained by using SMOS and MODIS sensors, through the DISPATCH algorithm, is considered. Results for one-year observations

are shown and also compared with in situ soil moisture observations.

GENERAL COMMENTS

The topic of the manuscript is surely of interest for the readership of HESS. The use of satellite soil moisture observations for detecting and quantifying irrigation water is an emerging topic and we have to investigate which product is performing better in reproducing the irrigation signal depending on its spatial and temporal resolution plus accuracy, and also by considering the irrigation practices, the climatic conditions, soil and land use, etc. The paper investigated this interesting topic with a well-defined

ground-based observations network including not only meteorological observations but also in situ soil moisture data and irrigation water observations (usually missing). The ground-based dataset is perfectly designed for the purpose of the paper. Therefore, I believe the paper might deserve to be published. However, at this stage, I found some important shortcoming that, in my opinion, must be addressed before the publication. I listed below the general comments with also their importance.

1) MAJOR: The text of the manuscript does not read well in many parts. In the specific comments, I added some suggestions for the abstract only. The whole text should be revised avoiding repetitions, improving English writing (but I am not mother-tongue), and taking care to write accurately symbols, equations, acronyms. Being a scientific paper, the structure and the methodology used should be clear to the readerships.

2) MAJOR: The authors found that the 1-km SMOS soil moisture product is not suitable to detect small scale irrigation, even though theoretically the 1-km resolution of the

product should be suitable for detecting irrigation in the investigated area. The authors investigated spatial variability of NDVI and LST and found it is much larger than soil moisture observations. However, the spatial extent of LST and NDVI is much larger (even if not specified in the text) than the extend of in situ soil moisture measurements, therefore the comparison should not be carried out. Moreover, the problem is not related to the spatial variability of NDVI or LST, but to their capability to detect the irrigation signal. Much better should be to carry out a specific analysis with NDVI and LST images to assess if they are able to "see" irrigation.

3) MAJOR: Related to point (2), I believe that the problem is the strong dependency of the disaggregated SMOS 1-km product to SMOS soil moisture product. SMOS has a spatial resolution of around 40 km, therefore it is not sensitive to small scale irrigation in the area. As the 1-km product is strongly dependent on SMOS, it is simply not suitable for detecting irrigation at field scale (we obtained similar results in scientific analyses we are doing). As mentioned above, the analysis of the NDVI and LST signal by MODIS should be carried out, even though the temporal resolution might be not good due to cloud coverage. I believe that if we want to consider a disaggregated soil moisture product for irrigation detection, a different strategy should be implemented.

4) MODERATE: As mentioned before, the text should be improved and specifically the structure of the paper. In Section 4 "Discussion" the theoretical background of geostatistical analysis is described. It should be moved to the methodology section.

SPECIFIC COMMENTS
Page 1, line 8: Soil moisture data are not really important for climate change studies.

Page 1, line 10: "with both space and time" is not correct, to be revised.

Page 1, line 12: Currently we can obtain soil moisture estimated through 1) in situ

observation (fixed stations and field measurements), 2) remote sensing (satellite, airplanes, drones), and 3) modelling (hydrological and/or climate). Please revise.

Page 1, line 13-14: "where soil moisture measurements ...". Which measurements? Please revise.

Page 1, line 16: Currently we have Sentinel-1 that can provide 1-km soil moisture measurements...and also new techniques (e.g. CYGNSS).

Page 1, lines 19: Acronyms should be defined (SMOS, NDVI, LST, ...).

Page 1, line 27: "reason for why" remove "for"

RECOMMENDATION

On this basis, I found the topic of the paper relevant and interesting but a major revision is required before the publication in Hydrology and Earth System Sciences.

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