Detecting irrigation signals from SMAP L3 and L4 soil moisture: A case study in California's Central Valley

The authors propose an approach for detecting irrigation signals through discrepancies between SMAP L3 (potentially able to track irrigation) and L4 data (unable to track irrigation). The strength of the methodology consists in solely relying on data without the need of any modeling. Analyses are performed rigorously and results are clearly presented. Nevertheless, the study appears as a bit out-of-date with respect to the current status of the art in terms of irrigation monitoring through satellite data. In fact, in light of several well-established methodologies for detecting in space and time irrigation events and for estimating irrigation water use, with some of them even close to facing operational implementation, the current study appears limited in its scope. In addition, the capability of SMAP retrievals in detecting irrigation in California has been already proved in previous studies (see, e.g., https://doi.org/10.1002/2017GL075733, https://doi.org/10.1016/j.hydroa.2023.100169). On top of this, in addition to limitations discussed by the authors, those linked to the mismatch between the spatial resolution of SMAP retrievals and the extent of irrigated areas elsewhere are not mentioned but represent a critical point in the irrigation detection domain (https://doi.org/10.1016/j.jag.2022.102979). In my opinion, the limited scope of this paper with respect to the current status of knowledge does not incentivize its publication. The paper does not propose an irrigation quantification method (because of the limits in retrieving irrigation fluxes clearly explained by the authors) neither an irrigation mapping approach (as the a priori knowledge of irrigated and non-irrigated pixels is required). It could be seen as a method for detecting irrigation events but definitely an effort is required for highlighting advantages with respect to previous studies (e.g., https://doi.org/10.3390/rs15051449 or https://doi.org/10.3390/rs12091456, to cite a few). Please find some specific comments as follows:

L 21: To what temporal resolution do the correlation coefficients refer?

L 62-75: SM-based methodologies for retrieving irrigation information can be divided into two main categories, namely baseline approaches (as for instance https://doi.org/10.5194/hess-23-897-2019, https://doi.org/10.3390/rs13091727) or methodologies based on the soil water balance (e.g.,

https://doi.org/10.5194/essd-15-1555-2023). Note that such methodologies led to the development of satellite-based irrigation water use datasets (https://doi.org/10.5281/zenodo.8086046), also available for the US (https://doi.org/10.5281/zenodo.14988198).

L 90-92: So why California only is mentioned in the title?

L 170: performances of ZL21 should be reported to understand its reliability as a comparative dataset.

L 195: is flood irrigation an issue for detecting the irrigation signal?

Figure 2: grid cell e) seems to show slightly different dynamics.

L 309: what is the entity of MD discrepancies?

Figure 7: panel c), how il this map converted to m3/m3? Is porosity taken into account?

L 420-421: what about GLEAM, Sen-ET, …