

## Egusphere-2024-1929

The manuscript proposes an approach for mapping irrigated areas leveraging discrepancies between satellite-derived and modeled land surface temperature (LST) into a random forest model. The topic is surely timely and in line with the journal's aims. Nevertheless, some authors' choices are a bit unclear to me. I also believe there is room for improvement in the manuscript presentation. Please find specific comments as follows:

- Line 42. For the Ebro basin several methodologies for deriving irrigation amounts also have been published:  
<https://essd.copernicus.org/articles/15/1555/2023/>  
<https://www.sciencedirect.com/science/article/pii/S0378377424001082>  
<https://hess.copernicus.org/articles/28/441/2024/>;
- Line 52. Irrigation mapping through optical remote sensing is a rapidly evolving topic... maybe more recent works could be cited;
- Lines 59-78. The end of the Introduction generally presents the purpose of the study, but in this case this part is too long and detailed, more than what is required in the introduction section. Also, I believe that it could be mentioned the use of MODIS data as a source of satellite LST estimates;
- Line 81. The wflow\_sbm should be briefly introduced earlier;
- Line 118. You may add a reference here;
- Lines 121 and 123. I believe the reference should be moved to the end of each sentence;
- Lines 138-141. I believe this is not needed. Please refer to the specific comment about this part;
- Line 150. The meaning of the terms of Eq (1) should be explained here (net radiation, sensible heat flux, etc.), not later in the text as in the current form;
- Figure 2 is not recalled in the main text;
- Line 181. The passage from Eq (12) to Eq (13) is not straightforward. It seems you are expressing H according to the bulk transfer equation (Monteith, 1973) and equalizing to Eq (12) to derive LST, if I am not wrong. However, this should be specified. Also,  $\rho_a$  and  $c_p$  are not defined.
- Lines 198-202. You are actually using remote sensing observations to derive the modeled LST to be used as a baseline. Can irrigation effects be present in such observations (e.g., lower albedo)?
- Line 218. Sentence 2 sounds as a bit redundant at this point;
- Lines 221-222. Please quantify the magnitude of data gaps due to cloud coverage (% rate);
- Line 225. Please note that the methodology proposed by Dari et al. (2021) has been implemented with vegetation indices also (<https://www.mdpi.com/2073-4441/16/5/644>);
- Line 227-230. If spatiotemporal features have been considered, why not applying the methodology to satellite LST directly? The authors should stress more the rationale of using a baseline approach;
- Section 2.4.2. One may argue that it is a Landsat-based irrigation mapping method;
- Lines 244-249. In this way, uncertainties associated to Landsat and land cover data are embedded in the irrigation maps produced. Have they been assessed/quantified somehow?

- Section 3.1. I believe this section does not add value to the paper. I suggest to move it to Appendix and enclose random forest performance instead in the main text, as it has surely impact on the irrigation maps developed;
- Lines 298-299. Please rephrase;
- Lines 300-306. It sounds a bit as a discussion;
- Lines 315-320. Yes, it is definitely a matter of spatial resolution;
- Lines 320-330. This part also seems to be a discussion rather than presentation of results;
- Lines 344-345. This is interesting. I also appreciate the related discussion later on. To fully understand if less rainfall actually means lower water availability for irrigation is reasonable in this case, one should have more information on the irrigation infrastructure (i.e., source of irrigation water, presence of reservoir, etc.);
- Figure 9. Can crop rotation explain the variability found in the irrigation frequency?
- Lines 351-354. This sounds again as discussion;
- Lines 393-395. This is a valuable result.
- Line 423. The study of Deines et al. (2019) is focused on the High Plains Aquifer, not on the Ebro basin;
- Lines 438. 10 years? N=10 is not clear;
- Lines 445. This is a known issue, corroborated by outcomes of several papers. Maybe some work could be cited. Also, I would say "irrigation maps" rather than "irrigation products".