Dear Topical Editor :

We appreciate your insightful comments on our paper. The comments offered have been immensely helpful. We have responded to every question, indicating exactly how we addressed each concern or problem and describing the changes we have made. The revisions have been approved by all authors. The point-to-point responses to your comments are listed below in **blue**.

Comments to the author:

Before the formal acceptance, the authors need clarify several issues:

Point 1: The wheat and maize distribution maps were constant, which inevitably brought uncertainties. In fact, there are currently available related products including those developed by the authors. Therefore, at least, the authors need give a paragraph or several statements discussing the limits in the datasets and the methodology.

Response: Thanks very much for your constructive comment. We have followed you to insert deeper and more extent discussions into the dataset and the methodology sections (Line 303~308).

"Third, to provide more extensive SM data as possible as we can, a constant layer integrated with all pixels planting wheat/maize during 2000−2015 (http://dx.doi.org/10.17632/jbs44b2hrk.2) was applied to generate our ChinaCropSM1 km. Such merged areas could lead to uncertainties in their spatial distributions because annual wheat/maize planting areas are dynamic over time. To avoid the uncertainties, potential users should mask our products with explicitly annual wheat/maize planting maps to obtain accurate SM data including spatial dynamic information."

Point 2: The first comment by Reviewer 2 was not well addressed.

There is a problem with the resolution. The ground observation data is point measurement data, how to match the resolution of 1km? Please explain this in the

manuscript.

Response: Extending pointed-observations into gridded-results (e.g. 1 km) is accepted widely by many studies at a larger region scale (Hengl et al., 2017; He et al., 2022). For example, assessing rice cultivar suitability by crop model simulating at points have successfully applied into gridded areas mainly planted by maize across China (Zhang et al., 2022b); estimating wheat productions by training model at sampling sites has been used to accurately retrieve the gridded-area and gridded-yield of wheat worldwide (Luo et al., 2022); gridded-phenological information has been retrieved successfully by extending pointed-observation into main areas planted by rice in Asia (Zhang et al., 2022a). We are sure, up to date, the extending method is reasonable and robust, and has been recognized as an alternative way for conducting larger scale study. As for the resolution, it is strongly depended on the quality of independent variables (e.g. climate, environment and remote sensing products) and ground observations.

As for the quality of our ground observations, we inserted the relevant text in the revised manuscript (Please check our revisions in Lines 91-95 in bold):

The in situ SM observation data (http://data.cma.gov.cn/data/detail/dataCode/AGME_AB2_CHN_TEN.html, last accessed: 18 April 2021) from 1993 to 2018 were obtained from agricultural meteorological sites (AMS) in China, which recorded the location, crop type, phenology, soil depth and SM. SM was measured at the depths of 10 cm and 20 cm at each AMS on the 8th, 18th and 28th of each month. For each sample, crop phenology was observed and recorded by well-trained agricultural technicians in experimental fields (the average field size was 0.15 ha) and then were checked and qualified by the Chinese Agricultural Meteorological Monitoring System (CAMMS). **"The location of AMS is generally selected in areas with relatively homogeneous soil properties. Also the fact that crops were quite well managed by irrigation according to weather variability and crop growth status makes the crop SM records largely representative the overall level of pixels (1 km×1 km) (Zhang et al., 2020; Li et al., 2021).**" The first layer (0–10 cm) has been widely used to investigate spatial and

temporal characteristics of SM and validate SM retrieved from microwave across China.

As for how to extend our pointed observations into 1 km grids, we followed the below steps: “We used the Extract Values to Points tool to extract the 1 km resolution raster information of the environmental (i.e., SP, RSD and GI) data to AMS point data, output point data attributes and save it in CSV format to obtain a dataset of environmental factors through ArcGIS 10.5.”. “All these point samples were used to develop the pointed SM model, and then these pointed models are applied to inversely calculate the gridded SM by inputting 1-km raster environmental variables.”.

Reference:

He, Q., Wang, M., Liu, K., Li, K., and Jiang, Z.: GPRChinaTemp1km: a high-resolution monthly air temperature data set for China (1951–2020) based on machine learning, Earth Syst. Sci. Data, 14, 3273–3292, https://doi.org/10.5194/essd-14-3273-2022, 2022.

Hengl, T., Mendes de Jesus, J., Heuvelink, G. B. M., Ruiperez Gonzalez, M., Kilibarda, M., Blagotić, A., Shangguan, W., Wright, M. N., Geng, X., Bauer-Marschallinger, B., Guevara, M. A., Vargas, R., MacMillan, R. A., Batjes, N. H., Leenaars, J. G. B., Ribeiro, E., Wheeler, I., Mantel, S., and Kempen, B.: SoilGrids250m: Global gridded soil information based on machine learning, PLoS ONE, 12, e0169748, https://doi.org/10.1371/journal.pone.0169748, 2017.

Li, Z., Zhang, Z., and Zhang, L.: Improving regional wheat drought risk assessment for insurance application by integrating scenario-driven crop model, machine learning, and satellite data, Agricultural Systems, 191, 103141, https://doi.org/10.1016/j.agsy.2021.103141, 2021.

Luo, Y., Zhang, Z., Cao, J., Zhang, L., Zhang, J., Han, J., Zhuang, H., Cheng, F., and Tao, F.: Accurately mapping global wheat production system using deep learning algorithms, International Journal of Applied Earth Observation and Geoinformation, 110, 102823, https://doi.org/10.1016/j.jag.2022.102823, 2022.

Zhang, J., Wu, H., Zhang, Z., Luo, Y., Han, J., and Tao, F.: Asian Rice Calendar Dynamics Detected by Remote Sensing and Their Climate Drivers, Remote Sensing,

14, 4189, https://doi.org/10.3390/rs14174189, 2022a.

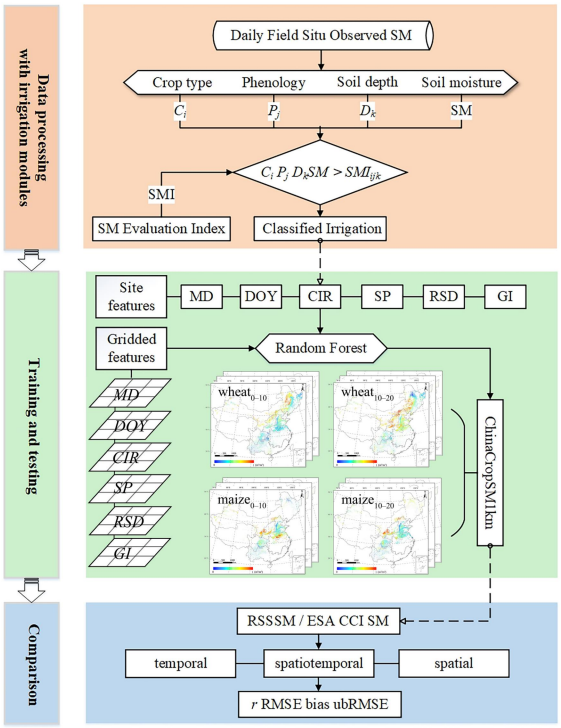
Zhang, L., Zhang, Z., Tao, F., Luo, Y., and Cao, J.: Adapting to climate change precisely through cultivars renewal for rice production across China: When, where, and what cultivars will be required?, Agricultural and Forest Meteorology, 316, 108856, https://doi.org/10.1016/j.agrformet.2022.108856, 2022b.

Zhang, Z., Li, Z., Chen, Y., Zhang, L., and Tao, F.: Improving regional wheat yields estimations by multi-step-assimilating of a crop model with multi-source data, Agricultural and Forest Meteorology, 290, 107993, https://doi.org/10.1016/j.agrformet.2020.107993, 2020.

Point 3: The final product only covers wheat and maize while the title writes all crop drylands. The authors need either revise the title or really complete retrievals for all types of crop drylands.

Response: Thanks for your suggestion. We have revised the title to "**ChinaCropSM1 km: a fine 1 km daily Soil Moisture dataset for dryland wheat and maize across China during 1993–2018**".

We have made corresponding modifications in the revised paper, and we have declared that crop refers specifically to maize and wheat, please see in Figure 2 and Data availability.



Symbols	Definitions
Crop	Wheat and Maize
SM	Soil moisture
C_i	The i th crop type
P_j	The j th phenology
D_k	The k th soil depth
SMI_{ijk}	The soil moisture evaluation index corresponding to the k th soil depth and the j th phenology of i th crop
MD	Meteorological data
DOY	Day of year
CIR	Classified irrigation
SP	Soil properties
GI	Geographical information
RSSSM	The global remote-sensing-based surface soil moisture dataset (2003–2018)
ESA CCI SM	The European Space Agency Climate Change Initiative SM v05.2 (1978–2020)
ChinaCropSM 1km	1-km daily Soil Moisture dataset for dryland wheat and maize across China
$maize_{0-10}$	ChinaCropSM1km for maize harvesting areas at 0–10 cm soil depth
$maize_{10-20}$	ChinaCropSM1km for maize harvesting areas at 10–20 cm soil depth
$wheat_{0-10}$	ChinaCropSM1km for wheat harvesting areas at 0–10 cm soil depth
$wheat_{10-20}$	ChinaCropSM1km for wheat harvesting areas at 10–20 cm soil depth

Figure 2 Flow chart for producing ChinaCropSM1 km.

Data availability:

The 1 km gridded daily soil moisture dataset for main crops (i.e., wheat and maize) dryland in China from 1993 to 2018 (ChinaCropSM1 km) are publicly available at https://zenodo.org/record/6834530 ($wheat_{0-10}$) (Cheng et al., 2022a), https://zenodo.org/record/6822591 ($wheat_{10-20}$) (Cheng et al., 2022b), https://zenodo.org/record/6822581 ($maize_{0-10}$) (Cheng et al., 2022c) and https://zenodo.org/record/6820166 ($mazie_{10-20}$) (Cheng et al., 2022d).

Point 4: There are still many language errors or typos in the text (e.g., the usage of "however" in Line 55 and "still further" in Line 239).

Response: Thank you a lot for the suggestion. We have revised the text with the assistance from a native English speaker who is a competent technical writer. The language has been improved throughout the manuscript. Also, we provided the certificate for the language editing below. Please see the revised manuscript for more details.

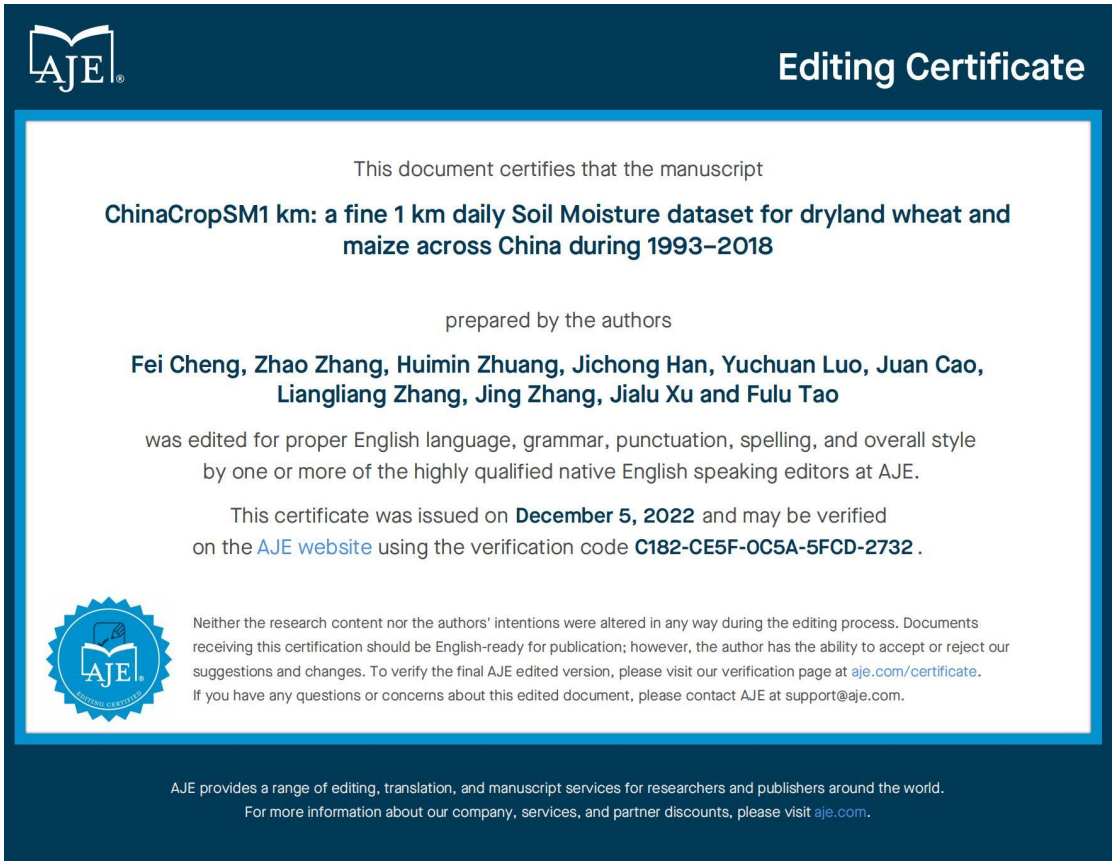


Figure R1. Certificate of editing