Comment on tc-2022-45

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Community comment on "Towards large-scale daily snow density mapping with spatiotemporally aware model and multi-source data" by Huadong Wang et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2022-45-CC1, 2022

Snow density plays a critical role in estimating water resources and predicting natural disasters such as floods, avalanches, and snowstorms. A GTWNN model was constructed for snow density estimation and achieved daily snow density mapping from 2013 to 2020 in China with the support of remote sensing, ground observation, and reanalysis data. This study provides important spatiotemporal parameters for snow cover hydrology and other aspects. The main suggestions and opinions are as follows:

- L115, "Based on the SCA data, the snow cover duration (SCD) is calculated to account for the impact of gravity on snow density", How to understand that snow density is affected by gravity, and what does it have to do with SCD?
- "Spatiotemporally Aware Model" in the title is not mentioned in the manuscript and should be explained.
- Whether the lack of observation data in 2019-2020 is related to the epidemic, making it impossible to conduct a large number of observations.
- The verification result in Fig.4 is that all the data as a whole is added to the training model, or is the training divided by region and month? Is it the 10-fold validation result of the trained model? Please explain further
- L200, Does the reason for the lower accuracies in Northeast China-Inner Mongolia consider the effect of different underlying surfaces on snow density? Forests and farmland in the Northeast, and grasslands in Inner Mongolia may have very different effects on snow density.
- The reasons for the slightly lower accuracy in the snow melting and accumulation periods are not only the rapid changes in the snow density itself, and insufficient sampling in observation time and space, but also because the snow accumulation in the early stage of snow accumulation is less, and the water content when the snow melts Therefore, the observation is more difficult, and the observation error is relatively large.
- The verification result of the snow density of ERA5 is worse than that of the model in this paper, but many parameters of ERA5 are used in the machine learning model of this paper, so the accuracy of these parameters, if there is also a large error, will not affect the final model accuracy?