Earth Syst. Sci. Data Discuss., referee comment RC2
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Comment on essd-2021-395

Anonymous Referee #2

Referee comment on "STAR NDSI collection: a cloud-free MODIS NDSI dataset (2001–2020) for China" by Yinghong Jing et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2021-395-RC2, 2022

Comments to authors

The manuscript titled "STAR NDSI collection: A cloud-free MODIS NDSI dataset (2001–2020) for China" estimates cloud-free snow data for China. The authors use Spatio-Temporal Adaptive fusion method with erroR correction (STAR) to derive snow cover. Cloud cover is the main obstacle in passive remote sensing snow monitoring and is important to overcome. The study is important but there are few major issues in the present form which needs to be addressed.

Major comments

- The authors use combined Terra and Aqua MODIS data in this manuscript. They combine the data first and then use STAR method consisting of spatio-temporal adaptive fusion (STAF) and error correction (EC). Combining Terra and Aqua this way potentially overestimates snow (Muhammad and Thapa, 2020, 2021). The authors are suggested to either revise the TAC or explain the potential uncertainty.
- The authors missed to share the code to generate STAR NDSI dataset. It is incomplete without sharing the code. The code is also required to evaluate the methodology as well.
- The C6 snow is in NDSI ranging between 0 and 100. It is not explained how the authors reconstructed the snow data. It is a challenge to improve the data on how to replace the cloudy pixel, so it is significant to understand the way the value is replaced.
- The authors indicate they have derived data between 2000 and 2020. The Aqua data is available from July 2002, the authors should clearly mention the observed period. As the data is combined Terra and Aqua, therefore, it should be between 2002 and 2020 not starting from the year 2000.
- One of the major issues is the remaining overestimation. The authors have to consider the existence of overestimation mainly due to the larger solar zenith angle. It is, therefore, necessary to estimate the overestimation in the combined Terra and Aqua as

in the combined product the uncertainty increases.

Minor comments

Line 45-65: The authors missed to point out one of the most recent cloud-free 8-day (Muhammad and Thapa, 2020 - https://doi.org/10.5194/essd-12-345-2020) and daily (Muhammad and Thapa 2021 - https://doi.org/10.5194/essd-13-767-2021) snow data, combining Terra and Aqua satellites data, reducing up to 50% of uncertainty. These datasets uniquely combine Terra and Aqua, to avoid overestimation after temporal and spatial filters are applied to individual products for clouds removal. The authors are advised to add these important papers.

MODIS is onboard on Terra and Aqua satellites, the authors are advised to clearly mention which constellation they use in e.g. to clearly mention in "A daily spatio-temporal continuous MODIS C6 NDSI dataset with a spatial resolution of 500 m for China (Fig. 1) from 2001 to 2020 is generated for the first time."