## **Response to Reviewer #1's Last Question:**

Yuxin Zhao et al. (Author)

**Question:** As a last question, would you have any explanation for why in Figure 2, the ISCCP cloud cover is sometimes larger than the CATS cloud cover? Do you think ISCCP is overestimating the cloud cover by e.g. mistaking aerosols for clouds? Or do you think on the contrary that CATS is somehow underestimating the cloud cover? If so, how would that be possible?

Since in the rest of the paper you consider the CATS cloud cover as the "truth", it is important to clarify this point.

**Response:** We are very appreciated for reviewer providing this important comment! We think that ISCCP sometimes overestimates the total cloud cover during daytime compared with CATS. By comparing the spatio-temporal matched total cloud cover from ISCCP, CALIPSO alone and the combined product from CALIPSO and CloudSat (that is, 2B-GEOPROF-lidar) during daytime, we find that ISCCP still overestimates the total cloud cover over TP compared with those of other space-based lidar and radar (figure not shown). Similar, Boudala and Milbrandt (2021) also found that ISCCP has larger cloud cover than that of CALIPSO over mid-latitudes (e.g., the European continent). Tzallas et al. (2019) noted that the larger cloud cover of ISCCP in the European continent is link to the relatively large viewing zenith angle (VZA) of ISCCP. Knapp et al. (2021) also suggested that there is a VZA dependence in the cloud cover of systematic errors in ISCCP results. For ISCCP, it is difficult to distinguish between aerosols and thin cirrus clouds, which may lead to spurious cloud detections and thus to an overestimation of clouds (Rossow and Schiffer, 1999). Above discussions are added in the revised manuscript (see the Line 333-343).

## Reference

- Boudala, F. S. and Milbrandt, J. A.: Evaluations of the Climatologies of Three Latest Cloud Satellite Products Based on Passive Sensors (ISCCP-H, Two CERES) against the CALIPSO-GOCCP, Remote Sens., 13, 10.3390/rs13245150, 2021.
- Knapp, K. R., Young, A. H., Semunegus, H., Inamdar, A. K., and Hankins, W.: Adjusting ISCCP Cloud Detection to Increase Consistency of Cloud Amount and Reduce Artifacts, J. Atmos. Ocean. Technol., 38, 155-165, 10.1175/jtech-d-20-0045.1, 2021.
- Rossow, W. B. and Schiffer, R. A.: Advances in understanding clouds from ISCCP, Bull. Amer. Meteorol. Soc., 80, 2261-2287, 10.1175/1520-0477(1999)080<2261:aiucfi>2.0.co;2, 1999.
- Tzallas, V., Hatzianastassiou, N., Benas, N., Meirink, J. F., Matsoukas, C., Stackhouse, P., Jr., and Vardavas, I.: Evaluation of CLARA-A2 and ISCCP-H Cloud Cover Climate Data Records over Europe with ECA&D Ground-Based Measurements, Remote Sens., 11, 10.3390/rs11020212, 2019.