**Dear Reviewer 2, Thank you very much for your two valuable questions, we will answer them and add the responses to the Introduction and Discussion sections of our paper.**

***Sunshine data is generally used to estimate global radiation, rarely the other way round, so the purpose and significance of this paper is unclear.***

We apologize for our lack of clarity in the introduction.

Sunshine duration (SD) the is widely used for Global Radiation (GR) estimation and was presented in FAO56 (Allen et al., 1998), and subsequently many relationship models with GR have been proposed for the SD to the maximum SD available (N) ratio (Chen et al., 2019; Prieto et al., 2022). SD measurement is long, continuous, spatially dense, and reliable, and are considered to be the best alternative to solar radiation (Xia et al., 2010). SD is an important indicator for assessing climate change trends, the probability of human diseases (Chang et al., 2022; Gu et al., 2019) and a crucial parameter for seasonal carbon cycle modeling (Fang et al., 2022; Zhao et al., 2021).

The two main ways of estimating GR, satellite remote sensing and ground measurement, are presently biased. The satellite remote sensing may be **susceptible to atmospheric inverse radiation from clouds and aerosols** (Mei et al., 2018; Letu et al., 2020) for its sensors receive reflectance information from land surface. **The GR ground measurement stations in the Chinese region are very few (145), much fewer than conventional meteorological stations (2408) which observed SD**, even on a global basis, the distribution of radiation stations is very sparse (Bao et al., 2019; Wang et al., 2012). Therefore, the large-area GR verification is difficult.

Although SD is often used to estimate GR, it may be necessary to utilize high-precision SD as a support for obtaining higher precision GR, so we believe that it is necessary to invert high spatiotemporal precision SD against the background of the low spatial and temporal resolution and reproduction errors in the GR remote sensing data.

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***Secondly, the author mentions the shortcomings of the Himawari-8 official radiation data in the introduction, so it is confusing to use such a flawed data as the basis for the SD estimation.***

We apologize for the confusion of the article. **We have described the advantages of this AHI in terms of spatiotemporal resolution** before presenting the shortcomings of the its radiation data (this part of the introduction will be explained in more detail in the revised manuscript). The problem of the Himawari AHI radiation data is not an isolated case, but is a problem that exists in all satellite remote sensing radiation data (as explained in the first question). Meanwhile, we had added the advantages of AHI over other geostationary satellites in the “Data and method” section in the new revised version of the manuscript.