**Response to RC2**

This manuscript presents a valuable contribution to the field of energy meteorology by integrating ground-based observations with ERA5 reanalysis through a spatially adaptive optimal interpolation scheme. The resulting dataset includes both standard meteorological variables and a well-defined set of high-impact weather events tailored to power system operations. The topic is highly relevant to the growing field of energy meteorology, and the dataset has clear potential value for both research and practical applications. Overall, this manuscript is well-structured, and the authors have made a reasonable effort to compare their product against existing datasets. I recommend publication of the manuscript after addressing the following issues.

**Re:** Thank you very much for your constructive comments on this study. We have revised the manuscript carefully according to your suggestions. Below are our point-by-point responses.

1. Several high-impact weather events are defined using hourly or sub-daily thresholds (e.g., "hourly wind speed ≥ 25 m $s^{-1}$" for cut-out wind speed; "sustained (≥ 3 h) wind speeds ≥ 4 m $s^{-1}$" for galloping). However, the CNPS-Met dataset is provided at daily resolution. It is not clear that how these sub-daily criteria are applied to daily averaged fields. This discrepancy could lead to systematic undercounting or misclassification of events. The authors should clarify the methodology used to derive daily event flags from sub-daily definitions.

**Re:** Thanks, we understand. In fact, the CNPS-Met dataset is generated by assimilating hourly *in-situ* observations into hourly ERA5 reanalysis, therefore, the minimum temporal resolution of the meteorological variables is 1 hour. On this basis, high-impact weather events are identified according to their respective definitions. After all such events are identified at hourly scale, they are aggregated to the daily scale. In other words, the CNPS-Met dataset supports both hourly and daily temporal scales. The hourly variables, including all meteorological elements and high-impact weather events, are subsequently stored and published online at daily scale.

The above discussions have been provided in Lines 349-357 in the revised manuscript.

2. The spatially adaptive optimal interpolation scheme adjusts the influence radius based on station density, but the manuscript provides no spatially explicit uncertainty estimates for the analysis fields. Users of the dataset would greatly benefit from information on where the dataset is most and least reliable. Therefore, the authors should consider providing analysis error variance fields or a similar uncertainty metric as part of the dataset.

**Re:** According to your suggestion, the error variance fields of different meteorological variables in CNPS-Met dataset are provided in Figure R8 below. The error variance can be calculated using Eq. (4) below:

$$\sigma^2 = \frac{1}{N}\sum_{i=1}^{N}\left(e_i - \bar{e}\right)^2 \qquad (4)$$

where $\sigma^2$ represents the error variance; $N$ represents the overall sample size, which refers to the period of 1980-2016; $e_i$ represents the *MAE* in $i$-th year; $\bar{e}$ represents the mean *MAE* during 1980-2016.

Results in Figure R8 show that, the regions with high specific humidity error are mainly distributed in northern Xinjiang, central and western Inner Mongolia, and some regions in North China; the variance of humidity error in most southern regions is less than 0.04 g/kg. The regions with high precipitation error are mainly distributed in the southwest of the Tibetan Plateau, the northeast, and most regions south of the Yangtze River; the variance of precipitation error is generally low, mostly below 0.32 mm, and the overall spatial difference is very significant. The high air temperature error zone is mainly distributed in Northeast China and the central eastern part of Inner Mongolia; the air temperature error variance in most regions of North China and South China is mostly below 0.06 °C, showing an overall distribution characteristic of high in the north and low in the south. The high error regions of wind speed are mainly distributed in northern Xinjiang, central and western Inner Mongolia, and northern Qinghai Tibet Plateau in China; the variance of wind speed error in most regions south of the Yangtze River Basin is generally low, basically below 0.024 m/s; The overall error level of surface pressure is relatively low, with spatial differences smaller than other meteorological elements, and only scattered high error values in some regions of northwest and northeast China.

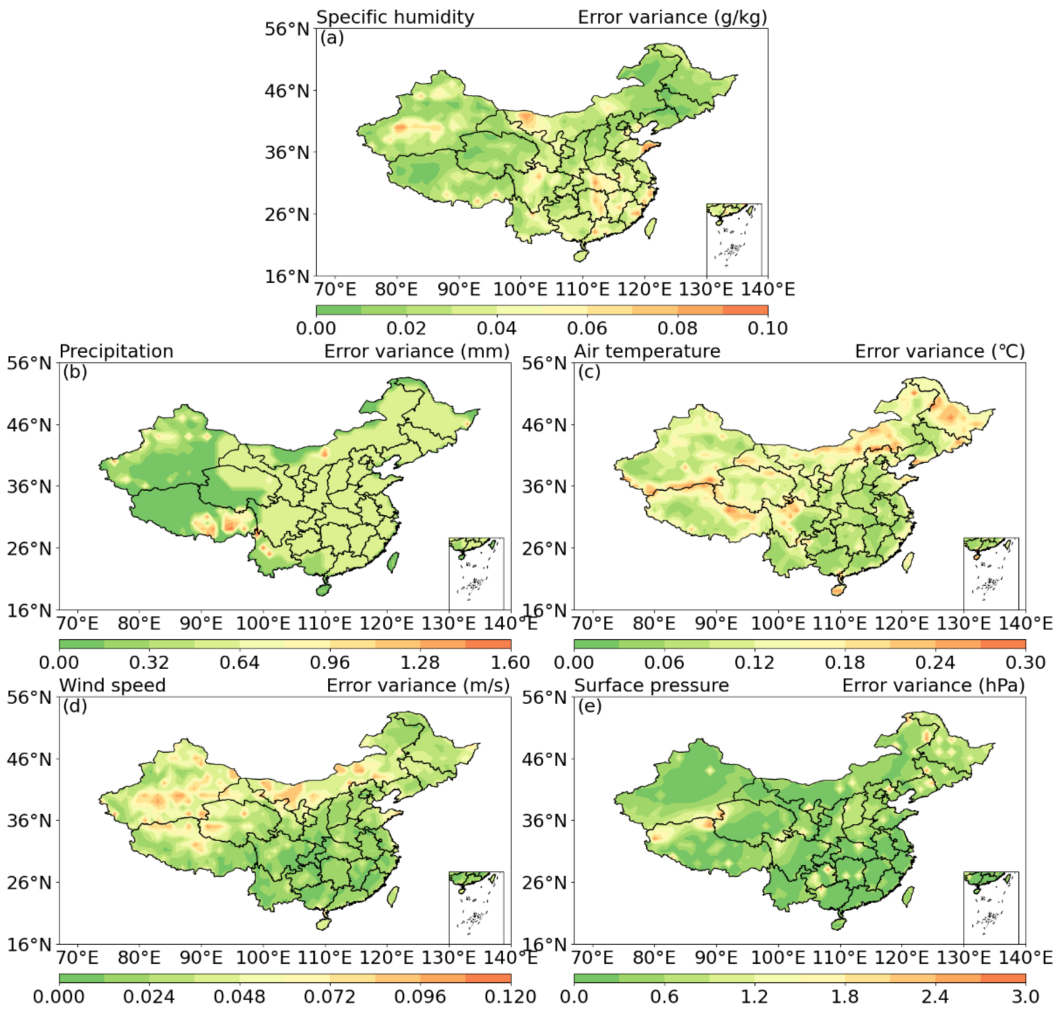


**Figure R8.** Spatial distribution of the error variance (averaged over 1980-2016) of (a) 2-m specific humidity, (b) precipitation, (c) 2-m air temperature, (d) 10-m wind speed, and (e) surface pressure in the CNPS-Met dataset.

3. The manuscript introduces an improved OI scheme, which is a positive contribution. However, it lacks a direct comparison with a traditional OI baseline using a fixed influence radius. A comparison between the improved OI and traditional OI for a representative period is suggested.

**Re:** According to your suggestion, the assimilation performance of the new scheme and the traditional scheme is compared over the sample period from January to December 2013 (Figures R9-10). Results show that, compared with the traditional OI scheme (using a fixed influence radius), the new scheme proposed in this study (using a spatially adaptive influence radius) obviously reduces the simulation errors for different regions, different months, and different meteorological variables across China. This indicates that the new scheme proposed in this study outperforms the traditional scheme. The above discussions have been stated in Lines 250-256 in the revision.

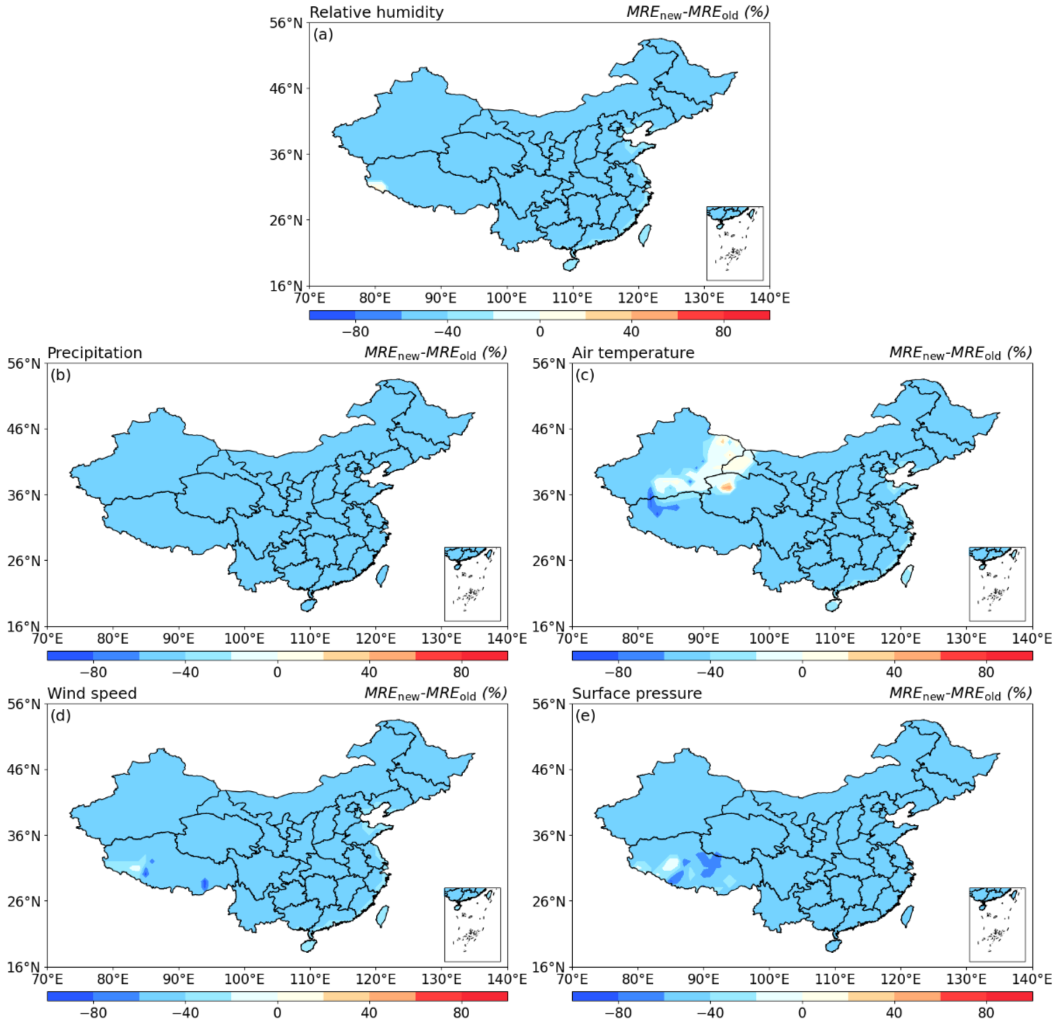


**Figure R9.** Spatial distribution of the differences of *MREs* between the new scheme and the traditional scheme for (a) 2-m specific humidity, (b) precipitation, (c) 2-m air temperature, (d) 10-m wind speed, and (e) surface pressure in China. The negative (positive) color indicates that the mean *MREs* of the new scheme is smaller (larger) than that of the traditional scheme.

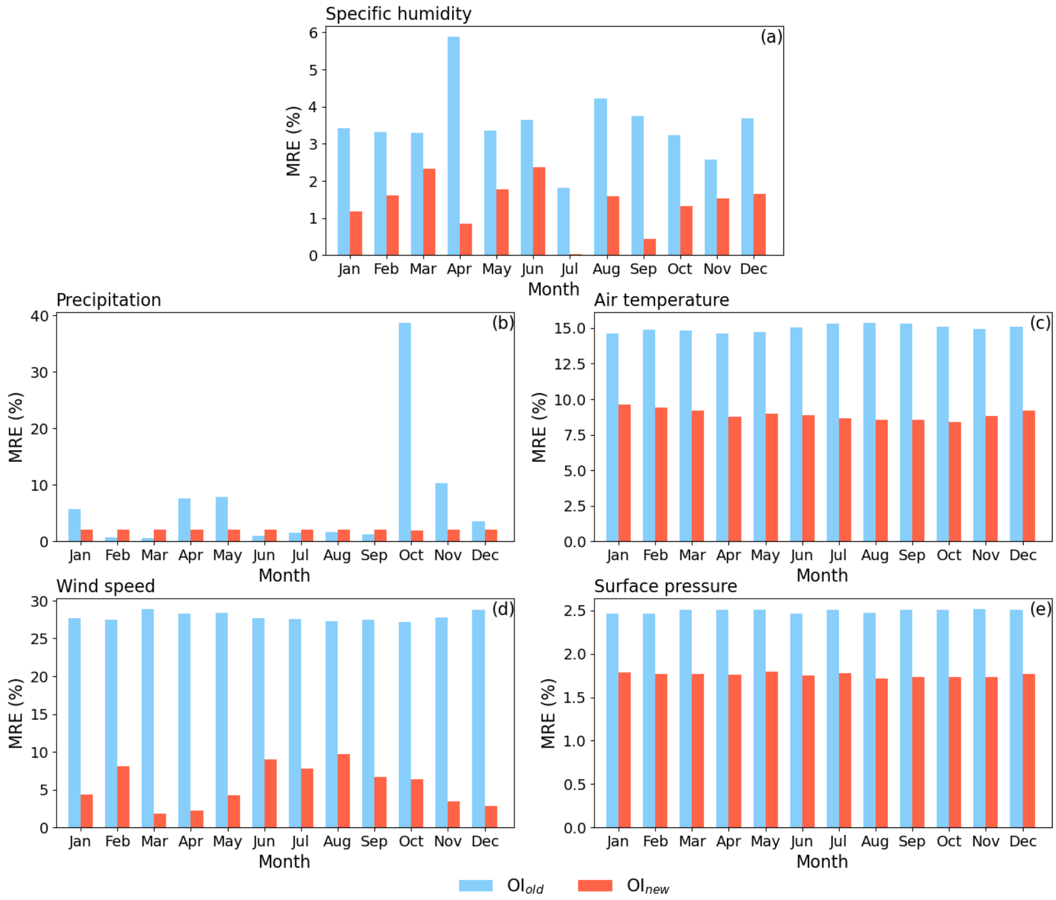


**Figure R10.** The *MREs* of (a) 2-m specific humidity, (b) precipitation, (c) 2-m air temperature, (d) 10-m wind speed, and (e) surface pressure in different months in China. The blue and red color represent the traditional scheme and the new scheme, respectively.

4. The dataset ends in 2016, nearly a decade ago. Given the rapid expansion of renewable energy infrastructure in China and the increasing frequency of extreme weather events in recent years, a dataset that is regularly updated would be more valuable for long-term applications. It is suggested that the authors consider treating this as a living dataset that can be continuously extended in the future. To reflect its potential for ongoing updates, it may be preferable to remove the time range from the title.

**Re:** We agree. Our dataset is designed to be a living dataset that can be continuously extended. Accordingly, we have removed the time period from the title to reflect its potential for ongoing updates.

5. Line 49: The number of ground-based stations is stated as "exceed 2400" in the introduction but later given as 2598 in the methods; please reconcile.

**Re:** This statement is cited from original reference, thus, we follow the original expression from Xu et al. (2019).

6. Line 58: “IPCC AR6” is cited without a complete reference; provide the full citation (e.g., IPCC, 2021).

**Re:** Revised, please see Line 59 in the revised manuscript.

7. Line 69: “It has at spatial resolution” — should be “It has a spatial resolution”.

**Re:** Revised, please see Line 71 in the revised manuscript.

8. Line 161: “three-sigma rule method” — clarify whether this was applied to daily values or to the full time series; also state how many records were excluded.

**Re:** The three-sigma rule method was applied to the full time series. Approximately 0.18% records were excluded. These statements have been added in Lines 162-163 in the revised manuscript.

9. Line 237: “statistics for verification” — consider renaming to “Evaluation Metrics” to better reflect the content.

**Re:** Revised, please see Line 257 in the revised manuscript.

10. Line 249: “referred as” — should be “referred to as”.

**Re:** Revised, please see Line 269 in the revised manuscript.

11. Figure 7: The caption states “intensity extremes (90% confidence level)” but does not explain the statistical method used; add a brief explanation.

**Re:** Revised, the “intensity extreme (90% confidence level)” is obtained through T-test and refers to the $90^{th}$ percentile of intensity of high-impact weather events. We have added this statement in Lines 472-473 in the revised manuscript.

12. Line 431: “Northern Tibet Plateau”, consider “northern Tibetan Plateau” for consistency.

**Re:** Revised throughout the manuscript.

13. Line 460: “relative weak” — should be “relatively weak”.

**Re:** Revised, please see Lines 503-504 in the revised manuscript.

14. Line 503: “there is a pronounced ‘weather dependency’ and ‘system vulnerability’” — the use of quotes is inconsistent; consider rephrasing.

**Re:** Revised, please see Line 546 in the revised manuscript.