Reviewer 1

The authors are in a unique position to have access to 1-min rainfall data for a large number of stations (>60,000) in China. The authors used the 1-min data to compute the peak 30-min intensity and storm energy in accordance with recommendations from the RUSLE/RUSLE2 manual. Based on what is presented, the data are of good quality and data analysis were rigorously undertaken. Compared to previously published R-factor maps, the one produced by the authors has the potential to be regarded as the definite map of the R-factor for the period considered (2014-2022), because 1-min data were used to compute EI30 directly for so many stations.

As a data product publication, the quality of data product, particularly the margin of error and associated uncertainty are of great importance. The authors compared their R-factor map to that from Panagos et al (2017) and Yue et al. (2022), and concluded that the previous R-factor values for this region (China) were overestimated by 31%-65%. While Panagos et al. (2017) used hourly rainfall data and bias correction was crude, Yue et al (2020) and Yue et al. (2022) addressed the effect of data resolution thoroughly and Yue et al (2020) used in fact 1-min data for 62 sites in China to bias-correct estimated R-factor values. The main reason for me to recommend Major Reason is that authors need to explore/explain why there are systematic differences between the erosivity map submitted and that published in Yue et al. (2022), and the implications of using 1-min data for only 10 years for the uncertainty associated with computed R-factor values.

Response: Firstly, a comparison of the data and algorithms used in the three studies has been added to **Table 1** of the revised manuscript. This highlights discrepancies in both the spatial-temporal accuracy of precipitation data and the kinetic energy algorithms employed. Secondly, we examined the impact of different precipitation data and algorithms on estimating rainfall erosivity. Since the data from other studies were not accessible, we instead used minute-level and hour-level precipitation data from 300 stations collected during 2020-2022 to assess the effects of discrepancies in precipitation data and kinetic energy algorithms on rainfall erosivity estimation (**Lines 232-252 and Figure 7**). Overall, both the spatial-temporal accuracy of precipitation data and the kinetic energy algorithms influence rainfall erosivity estimates. Notably, the variation in I_{30} resulting from precipitation data with differing temporal resolutions is significantly larger than the variation in *E* caused by differences in temporal resolution of data and algorithmic methods.

It is imperative to compare EI30/R-factor values for the 62 sites used in Yue et al. (2020) that underpins the map in Yue et al. (2022). The record length for many of the 62 stations was much longer than 10 years. Could the record length have contributed the discrepancy between these maps? Could rainfall erosivity have decreased over the past 10 years?

For *R*-factor calculations, procedures, definition, and equations, recommended for RUSLE2 were closely followed, which is great. However, the record length for the calculated R-factor (10-year) was short. The recommended record length is minimum 20 years to have a reliable estimate of the R-factor. I would actually argue for 30+ years just like the mean annual precipitation to define 'climate' of a region. Too short a period of 10 years is particularly relevant and problematic for areas of low precipitation and fewer erosive rainfall events in western China for instance.

Authors either wait for 10+ years to produce a more reliable R-factor map or compare and explain the discrepancy with a view to improve the uncertainty associated with the latest attempt at erosivity mapping for China in spite of the fact that 1-min rainfall data have just become more widely available for the past 10 years.

References:

Yue, T. et a. (2020) Effect of time resolution of rainfall measurements on the erosivity factor in the USLE in China. International Soil and Water Conservation Research. 8: 373-382.

Response: 1) Assessing climate-scale precipitation-related characteristics typically requires data spanning 20 years or more. Using data of approximately 10 years to create an R factor map indeed carries some uncertainty. We have addressed this issue in the revised manuscript (Lines 215-220). On the other hand, increasing the density of observation stations enhances the sample size of erosive rainfall events, especially in the northwestern regions of China, which can somewhat compensate for the shorter time series.

Additionally, precipitation data with 1-minute temporal resolution is very limited. Yun et al. (2022) used 1-minute data from 18 stations with 29-40 years of records and 44 stations with 2-12 years of records.

2) Given that changes in I_{30} largely determine the trend of rainfall erosivity, we attempted to analyze the temporal evolution of I_{30} . Ayat et al. (2022) reported an increasing trend in extreme sub-hourly rainfall near Sydney, Australia, over the past two decades, although no similar evidence exists for hourly or daily scales. However, trends in extreme sub-hourly rainfall across mainland China remain unclear. It is currently difficult to determine whether rainfall erosivity has changed over the past few decades. In future research, we will consider using long-term radar data to explore this issue.

3) It is known that E calculations in RUSLE are approximately 12% lower than those in RUSLE2 for precipitation intensities below 35 mm/hr, but 2% higher for intensities above 100 mm/hr (Nearing et al., 2017). However, there has been no conclusive assessment as to which method is more suitable for China. In the revised manuscript, we have added a section that quantitatively evaluates the impact of these two kinetic energy calculation methods on the results (**Figures 7c and 7d and Lines 241-243**).

4) Although this dataset can be used to identify the current spatial and temporal patterns of rainfall erosivity nationwide, as well as to assess ecosystem service functions, post-fire debris flows, and other environmental hazards (Lines 30-34), it still holds practical value despite some inherent uncertainties.

Minor and editorial comments:

I have attached an annotated pdf with minor comments and highlighted where attention to English expression, and grammar is required.

Line 21

Response: The sentence has be revised in the revised MS. Please refer to Lines 20-23.

Line 39~40

Response: The references have been added in the revised MS. Please refer to Lines 41-44.

Line 98

Response: I am Sorry. This monthly gridded precipitation dataset is released by the National Meteorological Information Center (NMIC) of the China Meteorological Administration CMA, and it doesn't documented the available references.

Line 104

Response: It has been revised into hourly in-situ precipitation records in the revised MS. Please refer to **Line 120** in the revised manuscript.

Line 124

Response: The phrase "in minutes" has been added (Line 141).

Line 127

Response: The phrase "erosive event rainfall erosivity" has been revised to "event rainfall erosivity" in the revised manuscript (Line 144).

Line 190

Response: In the revise manuscript, the Figure 4 has changed to **Figure 5**. The newly generated R factor map for mainland China was compared with the existing maps on a grid-to-grid basis. For consistency in the comparison, all three maps were resampled to the same spatial resolution.