Dear Editor and Reviewers:

We would like to thank the editor and reviewers for reviewing the paper and providing comments. Detailed responses to all reviewers' comments were provided below. We believe that answering to the reviewers' comments/suggestions substantially improved the manuscript.

**Reviewer #1**

This paper presents a valuable dataset that may encourage greater application of soil erosion modelling in China. The results of the cross-validation show good agreement, and an interesting comparison of ordinary and universal kriging is made. Some details of the methodology could be clarified, particularly in terms how the covariates and parameter layers are used in universal kriging. Importantly, spatial interpolation error could also be discussed more. Overall, the paper is well written and describes a valuable dataset.

Comment (1): Line 22: Word "in" is not needed in this context.

Response: It has been deleted, see line 23 of the revised manuscript.

Comment (2): Line 23: typo: available

Response: It has been corrected to available, see line 24 of the revised manuscript.

Comment (3): Line 78: WGEN has not been defined. This is another stochastic weather generator?

Response: WGEN is the abbreviation of the Weather GENerator, which is a weather generator developed by Richardson and Wright (1984). More description and the corresponding reference have been added to the manuscript, see line 76-78 of the revised manuscript.

Comment (4): Line 152: This statement could be clarified: "Rainfall intensity is basically assumed to be ranked from high to low in CLIGEN".

Response: In CLIGEN (Nicks et al., 1995), also Arnold and Williams (1989), it's basically assumed that the magnitude of precipitation intensity decreases exponentially from the

maximum rate when time distribution of precipitation intensities is discarded. We have added more description in line 151-152 of the revised manuscript to make it clearer.

Response: For hourly data as we collected, the time to peak intensity, $t_p$, can be calculated for every storm directly using equations (9) to (11) listed in the revised manuscript. For example, if the storm duration is 4 hours, and the peak intensity occurs in the $2^{nd}$ hour, then $t_p = (2-0.5)/4 = 0.375$ based on equation (10). Then using equation (11), parameters TimePk can be obtained for all stations. From Wang et al. (2018), we know that two sets of TimePk parameter values prepared using hourly rainfall and 1-min rainfall generate very similar CLIGEN outputs. Therefore, we used hourly rainfall to prepare TimePk for all stations following equations (9) to (11) for this study.

Ideally, MX.5P values should be prepared using rainfall intensity data with an observed time interval of no more than 30 minutes. Depending on the temporal resolution, $I_{30}$ can be calculated directly from moving averages of the original data over successive 30-min.

More sentences have been added to explain how TimePk and MX.5P were calculated in the revised manuscript, see line 147-150 and line 172-176.

Response: It has been revised.

Response: Twelve groups means twelve months for each parameter, and the expression is not clear. The statement has been revised to "The longitude, latitude, elevation, and annual rainfall

amount were found correlated with the parameters one for each month for CLIGEN" to make it clearer, see line 193-194.

Response: Yes, this is correct. For each interpolated parameter, the leave-one-out cross-validation procedures were iterated for 2405 times, which equals to the number of stations. More descriptions have been added to line 199-202 of the revised manuscript for clarification.

Response: There was a typo here. There were 13 groups of input parameters required for CLIGEN for temperature, precipitation and solar radiation, and in each group, there are 12 parameters. The total number of interpolated parameters is 155, which is equal to 12 parameters × 13 groups-1, as the 12$^{th}$ parameter of TimePk is always equal to 1. Therefore, there were 155 parameters involved in the interpolation, and this has been revised in line 201-203 of the revised manuscript.

Response: It has been revised, see line 212 of the revised manuscript.

Response: Please refer to the comment (9).

Response: It has been revised to "spatial variance became smaller from the cold season to the warm one", see line 239 of the revised manuscript.

sparse areas, interpolation error is much higher. The leave-one-out cross-validation does not account for the fact that data sparse areas could actually represent large parts of the total interpolated area, so it could be the case that error would be much higher if more observations were available to check error in data sparse areas. Is it indeed the case that error is higher in western China? Would it be possible to make an error map for MEANP and TMAX as examples? Or, consider some way of presenting spatial error.

Response: We agree with you that the interpolation error for data sparse areas is higher. We've discussed the influence of spatial distribution of stations on the interpolation accuracy in the second paragraph in the second paragraph of the Discussion. We calculated and compared the mean absolute relative error (MARE) derived from leave-one-out cross-validation for three regions in China (the Eastern Monsoon Area, the Northwest Arid Area and Qinghai-Tibet Plateau) with different station density. Results were listed in Table 6 and showed that the station density has an influence on the quality of the interpolation. Error in the Eastern Monsoon Area is the lowest and the highest in the Qinghai-Tibet Plateau.

Considering that the station density is quite sparse in the western region of China, and the leave-one-out cross validation can't show the interpolation error in regions without stations. We've plotted the standard error of the interpolation results for two parameters, TMAX AV and MEAN P in August as an example as following. It can be seen from the figures that the errors are relatively high in the western part, especially in the south-western part, where is a large area without stations and characterized with the highest standard errors for both parameters. The following figure has been added to the discussion part as Fig. 9, and the statements has been revised to make this clearer, see Line 366-370 of the revised manuscript.
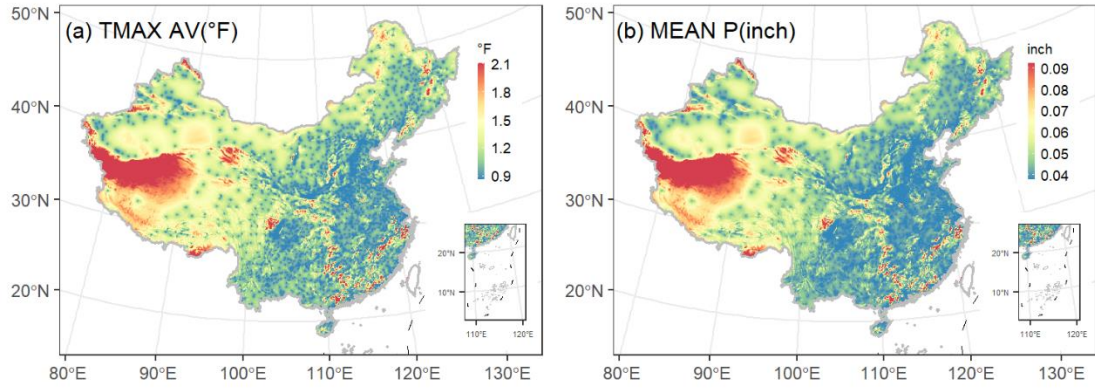
Fig. 1. Spatial distribution of the standard error for interpolation results of TMAX AV and MEAN P in August using Universal Kriging.

Comment (13): Table 3: RMSE for TimePk of 0.01 is very small considering TimePk ranges from 0-1. Why is NSE particularly low for TimePk? Is it the small numeric scale of TimePk?

Response: Thank you for your comment. We've checked the computation and data that the results are without mistake. TimePk is a group of dimensionless parameters, which represents the cumulative probability distribution of the time to peak. The equation for NSE is,

$$\text{NSE} = 1 - \frac{\sum_{i=1}^{n}(P_{ij}^{obs} - P_{ij}^{K})^2}{\sum_{i=1}^{n}(P_{ij}^{obs} - \overline{P^{obs}})^2}$$

where $i$ = 1, 2, …2045 stations, $j$ = 1, …11 parameters. It's only 11 parameters of TimePk need to be interpolated because the 12th parameter of TimePk is always equal to 1, which is known already. NSE for 11 parameters can be calculated, and the average value over 11 NSEs is the number listed in Table 3 of the original manuscript.

As the equation for NSE represents the ratio between predicted errors and the variation of the observed values. The variation of the observed values depends on its specific shape of distribution. For each of the 11 TimePk values, the variation of observed values across the whole study area is relatively small compared with the predicted errors (as showed in Fig. 7m in the manuscript), leading to a particularly low NSE value. However, if we put all 11 parameters of TimePk together to calculate NSE, it will become much better and equal to 0.998 for both OK and UK.

Reviewer's comment reminds us that NSE may be not a good indicator for parameters in

interval scales which are without true zero, neither for PBIAS. Therefore, we reorganized results listed in Table 3 that the NSE and PBIAS were only kept for parameters in ratio scales (MEAN P, S DEV P, SKEW P, SOL.RAD, and SD SOL). RMSE were kept for all the 13 groups of parameters. The statements in Results were reorganized correspondingly. Fig.6 were revised, the NSE of 12 months were replaced with RMSE.

Response: We agree with the reviewer that the original meaning of "GCMs" is "General Circulation Models". While, nowadays it often refers to "Global Climate Models (GCMs)" along with the development of Atmosphere, Ocean and Land coupled models. GCM in this manuscript is referred to as Global Climate Models.

Response: It has been revised, see line 39-40 of the revised manuscript.

WEPP, and actually is not mentioned in Flanagan and Livingston (1995). Suggest this text be deleted.

Response: Thank you for pointing out this problem, and it has been deleted.

Comment (4): Line 85 - change "have attempted" to "have been attempted".

Response: It has been revised, see line 83 of the revised manuscript.

Comment (5) Line 91 - change "in WEPP application" to "in the WEPP application".

Response: It has been revised, see line 89 of the revised manuscript.

Comment (6) Line 113 - change "have been quality" to "had been quality".

Response: It has been revised, see line 111 of the revised manuscript.

Comment (7) Line 121 - change "in the North China" to "in North China".

Response: It has been revised, see line 119 of the revised manuscript.

Comment (8) Line 133 - change "transition probabilities $P(W|D)$ and $P(W|W)$" to "day transition probabilities $P(W|W)$ and $P(W|D)$".

Response: It has been revised, see line 131 of the revised manuscript.

Comment (9): Line 141 - change "amount in CLIGEN" to "depths in CLIGEN".

Response: It has been revised. See 139 of the revised manuscript.

Comment (10): Line 149 - change "MX.5P are" to "MX.5P values are".

Response: It has been revised. See line 147 of the revised manuscript.

Comment (11): Line 187 - change "images were commonly" to "images are commonly".

Response: It has been revised. See line 189 of the revised manuscript.

Response: This sentence has been revised to "parameters one for each month for CLIGEN", see line 194 of the revised manuscript.

Response: This paragraph has been revised and the sentence "assumed ..." has been deleted. See line 200-205 of the revised manuscript.

Response: This paragraph has been revised and the sentence "Use the..." has been deleted. See line 200-205 of the revised manuscript.

Response: This paragraph has been revised and the sentence "to evaluate two..." has been deleted. See line 200-205 of the revised manuscript.

Response: It has been revised that the punctuation marks has been deleted from all equations.

Response: This paragraph has been revised, and "for each input parameter values" has been deleted. See line 212 of the revised manuscript.

Response: It has been revised and the punctuation marks has been deleted.

Response: It has been revised, see line 231 of the revised manuscript.

Response: It has been revised, see line 244 of the revised manuscript.

Response: It has been revised, see line 253 of the revised manuscript.

Response: It has been revised, see line 261 of the revised manuscript.

Response: It has been revised, see line 275 of the revised manuscript.

Response: It has been revised, see line 281 of the revised manuscript.

Response: It has been revised, see line 305 of the revised manuscript.

Response: This sentence has been revised to "For TimePk, the RMSE using OK were slightly lower than those using UK for the $3^{th}$, $4^{th}$, and $5^{th}$ parameters, but slightly higher for the others".

TimePk is a group of dimensionless parameters, which represents the cumulative probability distribution of the time to peak and is not calculated by month.

Comment (27): Line 307 - change "results agreed that" to "results indicated that".

Response: It has been revised, see line 307 of the revised manuscript.

Comment (28): Line 308 - change "higher than OK" to "than those based on OK".

Response: It has been revised, see line 308 of the revised manuscript.

Comment (29): Line 311 - change "on the CLIGEN" to "on the CLIGEN outputs".

Response: It has been revised that the "outputs" has been added to line 311 of the revised manuscript.

Comment (30): Line 335 - change the word "under-estimated" to "underestimated".

Response: It has been revised, see line 346 of the revised manuscript.

Comment (31): Line 336 - change the word "over-estimated" to "overestimated".

Response: It has been revised, see line 346 of the revised manuscript.

Comment (32): Lines 352-353 - You could have used degrees Kelvin instead of degrees Centigrade. That would have resulted in better Relative Error calculations.

Response: Thank you for your suggestion. Convert the unit from Celsius to Kelvin will lead to lower relative errors for temperature. But temperature is parameter in interval scale and without true zero, for which the absolute error is a better indicator to describe the estimated error.

Comment (33): Line 353 - change "was 2912.7%" to "of 2912.7%".

Response: It has been revised, see line 354 of the revised manuscript.

Comment (34): Line 354 - change "temperature simulated using two data sets" to "temperature values simulated using the two data sets".

Response: It has been revised, see line 355 of the revised manuscript.

Comment (35): Line 378 - change "US is regionalized" to "US are regionalized".

Response: It has been revised, see line 379 of the revised manuscript.

Comment (36): Line 384 - change "NSE improved" to "NSE improving".

Response: It has been revised, see line 385 of the revised manuscript.

Comment (37): Line 387 - change "The girded CLIGEN" to "The gridded CLIGEN". change "is availability at the hompage of" to "is available at the homepage of the".

Response: It has been revised, see line 389 of the revised manuscript.

Comment (38): Line 390 - consider changing "Conclusion" to "Summary and Conclusions".

Response: It has been revised, see line 392 of the revised manuscript.

Comment (39): Line 404 - change "parameters expect for" to "parameters except for".

Response: It has been revised, see line 405 of the revised manuscript.

Comment (40): Line 410 - change "are less than" to "were less than".

Response: It has been revised, see line 411 of the revised manuscript.

Comment (41): Line 427 - change "gave advises" to "provided advice".

Response: It has been revised, see line 428 of the revised manuscript.

Comment (42): Line 441 - change this citation to: "Flanagan, D.C., and Livingston, S.J. (eds.): WEPP User Summary. NSERL Report No. 11, USDA-Agricultural Research Service, National Soil Erosion Research Laboratory, West Lafayette, Indiana, USA, 1995.".

Response: This reference has been deleted.

Comment (43): Line 443 - change "107-110, 2001" to "American Society of Agricultural Engineers, St. Joseph, Michigan, USA, pp. 107-110, 2001.".

Response: It has been revised, see line 447-448 of the revised manuscript.

Comment (44): Line 446 - change "1-9, 2014" to "American Society of Agricultural and Biological Engineers, St. Joseph, Michigan, USA, 8 pp., 2014.".

Response: It has been revised, see line 452-453 of the revised manuscript.

Comment (45): Lines 447-448 - This is not correct. RUSLE2 science documentation should be credited to USDA-Agricultural Research Service (2013). Full citation would be: "USDA-ARS: Science Documentation, Revised Universal Soil Loss Equation, Version 2 (RUSLE2), USDA-Agricultural Research Service, Washington, D.C., USA, 2013." Also need to change reference to this in the text at all locations.

Response: The citation of this reference has been revised, see line 453-454 of the revised manuscript.

Comment (46): Line 449 and throughout all of the list of references - be sure to capitalize all words that are part of a journal name. Here it should be the Journal of Hydrologic Engineering.

Response: The references have been revised.

Comment (47): Line 496 - do not capitalize words in the title of a journal article. So here, title should be "Seasonality and three-dimensional structure of interdecadal change in the East Asian monsoon".

Response: It has been revised.

Response: It has been revised.

Response: It has been revised.

In addition, during the revision, we found a data format error related to the solar radiation. The magnitude of the input parameters related to solar radiation are correct in the original datasets, but a decimal point is missing. For example, the following table shows the change of monthly parameters of SOL.RAD (the monthly average daily solar radiation in Langley) in Aihui station. During the simulation, the Fortran code of CLIGEN read this decimal point as one digit, which resulted in the magnitude of CLIGEN-generated solar radiation is 0.1 times smaller in the original version.

| Original SOL.RAD | 127 | 223 | 341 | 400 | 458 | 502 | 450 | 391 | 309 | 216 | 139 | 98 |
| Revised SOL.RAD | 127. | 223. | 341. | 400. | 458. | 502. | 450. | 391. | 309. | 216. | 139. | 98. |

We've rewrite the CLIGEN input parameters' files of all these 96676 interpolated files, and updated the dataset in the website (http://clicia.bnu.edu.cn/data/cligen.html). We also re-calculated and re-evaluated the CLIGEN-generated solar radiation, and revised the results listed in Table 4 and Table 6 and corresponding statements in the Results and Discussion, see line 316-321, line 326-327, line 372-377.