We sincerely thank the referee for being interested and recognized our article and providing important and valuable comments and suggestions, which would help enhance the readability and quality of our article. All the comments are addressed accordingly and have been partially incorporated into the revised manuscript (quoted). Detailed responses to the referee's concerns and suggestions are described as follows.

**Referee #1 (RC C5184):**

*(1) Page 9677 Lines 23-25. The authors stated that "A number of studies have investigated the applicability of neural networks with geostatistics and provided promising results", which sounds closely related to the main idea of this study. I would suggest considering a slight re-wording on this sentence and/or more specifically enhanced explanation of the novelty of this study and the main difference between this study and other related studies.*

**Reply:** OK! The sentence has been revised as

"A number of studies have investigated the applicability of neural networks with geostatistics to environment, such as climatic data (Demyanov, 1998), fallout (Kanevsky et al., 1996), temperature (Koike et al., 2001), etc."

In addition to clearly enhance the explanation of the novelty of this study and the main difference between our work and other related studies, several sentences have been given as follows.

"Nevertheless, all of the abovementioned studies merely performed the spatial estimations through two-dimensional coordinate (latitude and longitude). The spatial estimation of evaporation developed in this study was achieved by using three-dimensional information including latitude, longitude and elevation. Moreover we specifically take the meteorological variables related to evaporation for estimating the pan evaporation at ungauged sites by integrating kriging into ANN which never been investigated previously."

*(2) Page 9679 Lines 21-22. It is interesting to learn how to select the emphatic weight and what its impact is.*

**Reply:** Thanks for the referee's comment. In this study, we selected emphatic weights base on the training and validation subsets of 16 stations. The evaporation at each station was calculated from the data of the other 15 stations by using the spatial weight method. Therefore, there were 16 evaporation estimations in total to estimate RMSE (root-mean-square-error) and the average RMSE of these 16 evaporation estimations was used as the select criteria. "Because elevation is a key factor for evaporation and the elevation difference (less than 2000m) is much smaller than the distance (less than 300km) between gauged and ungauged sites. Based on a great number of trial-and-error process, the emphatic weight is set as 1000, which can also refer to Hutchinson (1995) that indicated that the weighted values of elevation and distance should be approximately equal."

The following figure shows the result of the trial-and-error process. The RMSE decreases rapidly when the emphatic weight falls within [0, 1000] and has a steady trend when the emphatic weight falls within [5000, 10000]. It clearly shows that the lowest RMSE can be found when the emphatic weight is at about 1000 in this case study.

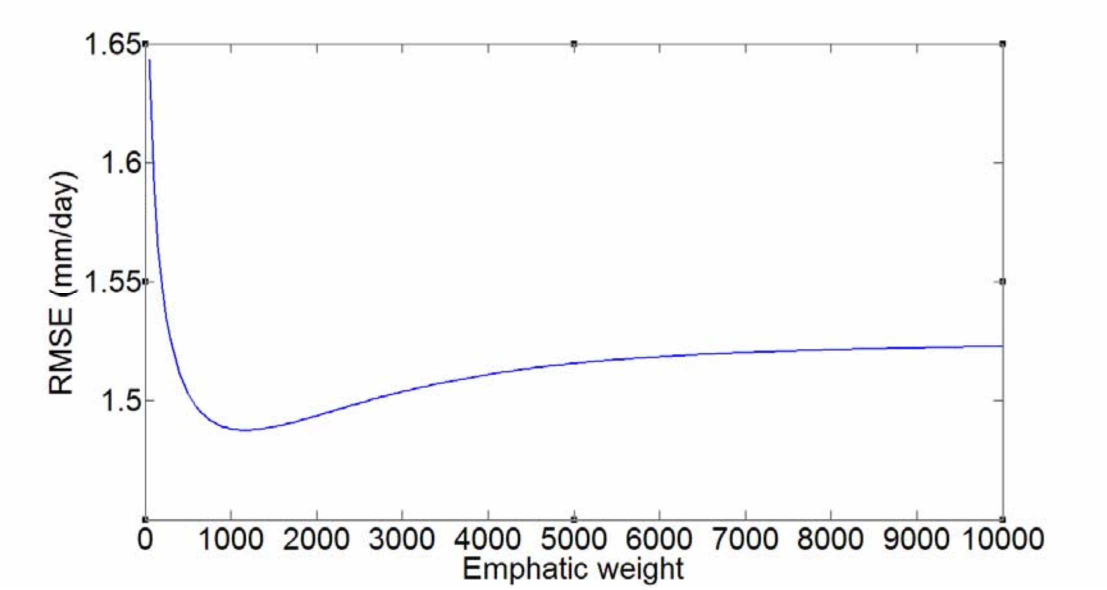


Figure Trend of RMSE vs. emphatic weight

Reference: Hutchinson, M. F.: Interpolating mean rainfall using thin plate smoothing splines, Int. J. Geogr. Inf. Syst., 9, 385 – 403, 1995.

*(3) Page 9681 Lines 22-25. The estimated evaporation should be clearly defined.*

**Reply:** OK! (Page 9680 Lines 5-10).

The evaporation $E'$ is calculated at every grid cell of the ungauged site based on the data from *n* gauged sites (*n*=16 in this case) by using ANFIS output $E$ instead of measurements. The estimated evaporation $E'$ is defined in Equation (4).

$$E_i' = \sum_{i=1}^{n} w_i E_i \quad \text{---------} \ (4)$$

*(4) Page, 9682, L 14-19. How to determine three subsets from 19 stations to develop ANFIS models?*

**Reply:** We intend to estimate the evaporation at ungauged sites and demonstrate the reliability of the proposed method. To achieve this goal, data of station Nos.17-19 were selected to form the test subset and station Nos.17-19 were assumed as ungauged sites which means that these three stations were not used when determining the optimal ANFIS structure or calibrating the model parameters. The determination of the test subset is dependent on the spatial criterion (different stations), that is, "(1) these three stations are separately located in northern, central and southern Taiwan; and (2) these three sites have relatively few meteorological stations around them as compared with the other sites."

"Being different from that of the test subset, the determination of the training and validation subsets is dependent on the temporal criterion due to the optimization of parameters. In other words, training data should cover as much variability as possible. This is why the training and validation subsets consisted of data from station Nos. 1-16 and the ratio of the number of months in the training subset to the number of months in the validation subset is approximately 3:1" (data from 2007-2008 were for the training subset, and data from January-August 2009 were for the validation subset).

*(5) In the Conclusions Section, the authors claim that the AK model can estimate evaporation at ungauged sites without using meteorological variables. The roles of ANFIS and kriging in the AK model should be explained in more detail.*

**Reply:** Thanks for the referee's constructive comment! To enhance our statements concerning the proposed model, we would revise the manuscript and added detailed description of the roles of ANFIS and kriging in the AK model in the Conclusions Section shown as follows.

"The role of ANFIS in the AK model is to estimate evaporation at gauged sites and extend its estimations to ungauged sites through the spatial weight method; whereas the use of kriging is to adjust the spatial error of ANFIS outputs. Once the AK model is well developed and trained, the operation of the AK model merely requires coordinates and elevation data at ungauged sites and coordinates, elevation data and the meterological variables at gauged sites in practice."

*(6) Tables*

*(a) The unit of daily evaporation in Table 2 should be changed. (mm/day)*

*(b) Tables 3 & 4: The unit of RMSE should be addressed.*

**Reply:** OK. The unit of daily evaporation in Table 2 has been changed, and the unit of RMSE has been added in both Tables 3 and 4 as follows.

**Table 2.** Statistics of evaporation in training, validation and test subsets.

| Evaporation **(mm day $^{-1}$)** | Mean | Standard deviation | Max. | Min. |
|---|---|---|---|---|
| Training | 3.04 | 1.90 | 11.4 | 0 |
| Validation | 3.39 | 1.98 | 16.0 | 0 |
| Testing | 3.15 | 1.80 | 9.8 | 0.1 |

**Table 3.** Performance of the AK and PM models at individual meteorological station.

| | RMSE **(mm day $^{-1}$)** | | | CE | | |
|---|---|---|---|---|---|---|
| | No.17 | No.18 | No.19 | No.17 | No.18 | No.19 |
| AK | 1.17 | 1.02 | 1.08 | 0.64 | 0.12 | 0.59 |
| PM | 1.59 | 1.25 | 1.14 | 0.35 | -0.32 | 0.54 |

**Table 4.** Test performance of the AK and PM models in daily, monthly and seasonal scales.

| | RMSE **(mm day $^{-1}$)** | | | CE | | |
|---|---|---|---|---|---|---|
| | Day | Month | Season | Day | Month | Season |
| AK | 1.09 | 9.55 | 24.12 | 0.62 | 0.89 | 0.87 |
| PM | 1.34 | 22.27 | 61.39 | 0.44 | 0.40 | 0.17 |