

Figure S1. Variation of (a) *MBE*, (b) *Corr*, (c) *RMSE*, (d) *POD*, (e) *FAR*, and (f) *ETS* across different seasons at daily scale.

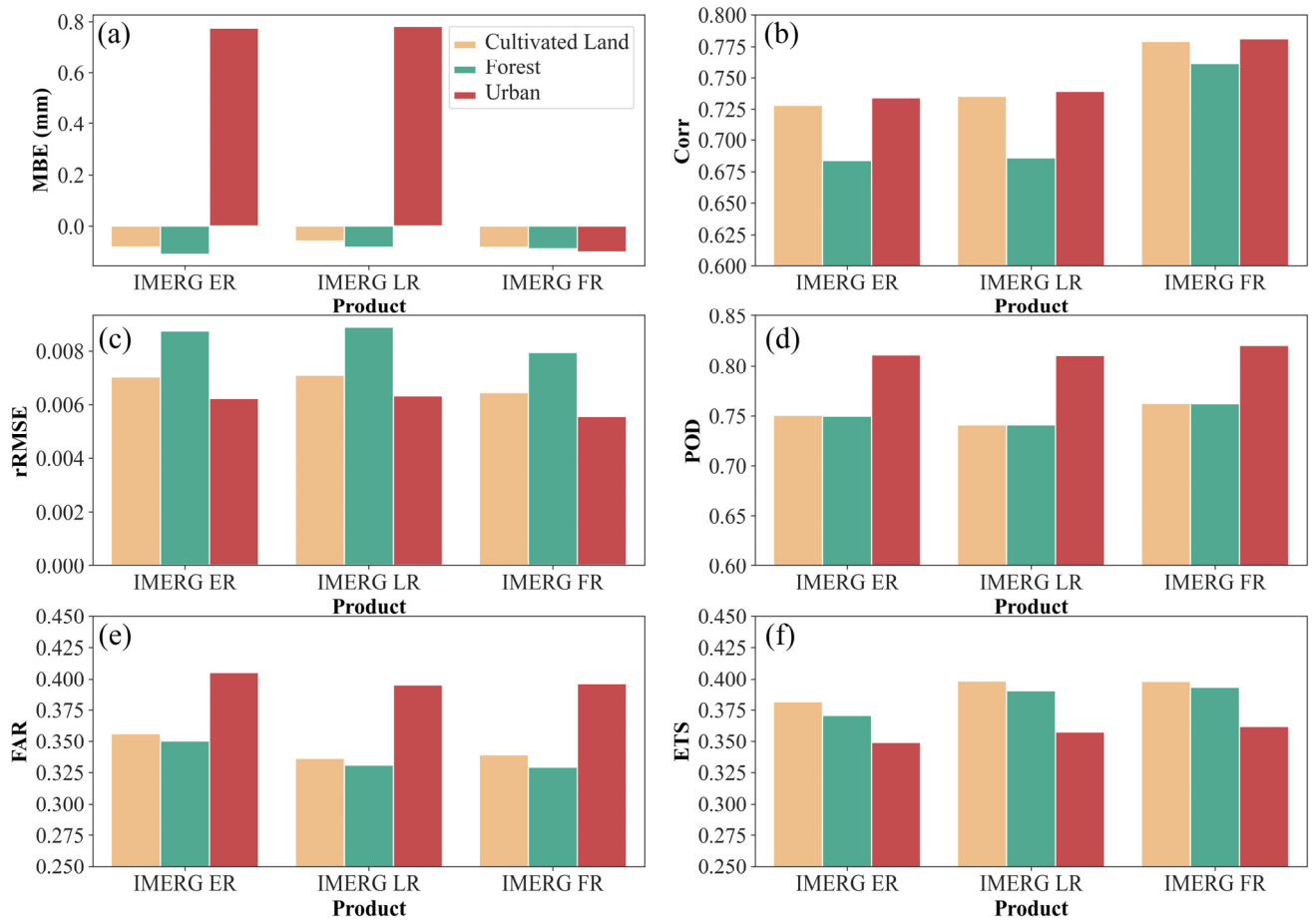


Figure S2. Differences of (a) *MBE*, (b) *Corr*, (c) *rRMSE*, (d) *POD*, (e) *FAR*, and (f) *ETS* on cultivated lands, forests, and urban areas at daily scale.

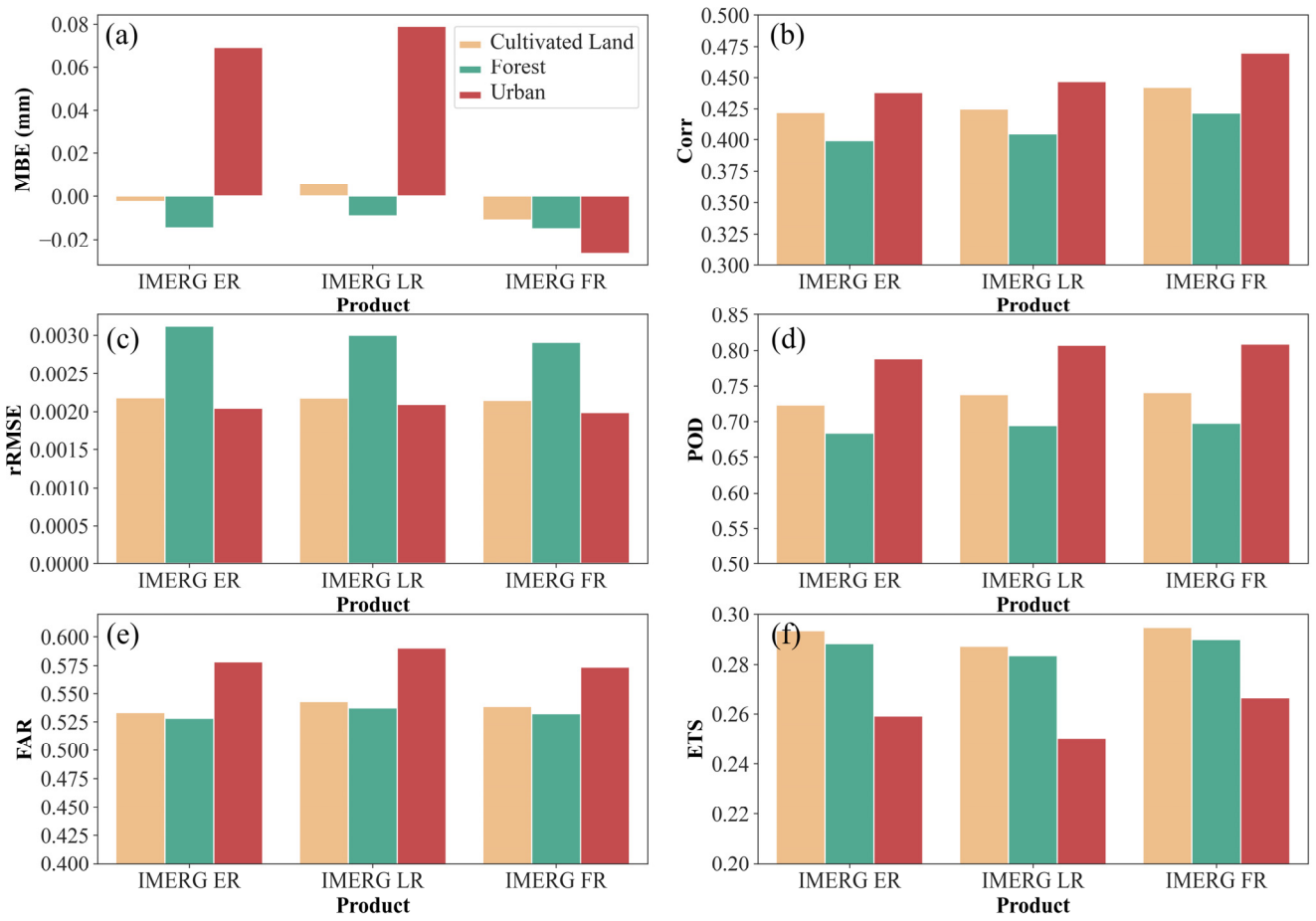


Figure S3. Differences of (a) *MBE*, (b) *Corr*, (c) *rRMSE*, (d) *POD*, (e) *FAR*, and (f) *ETS* on cultivated lands, forests, and urban areas in the summer at hourly scale.

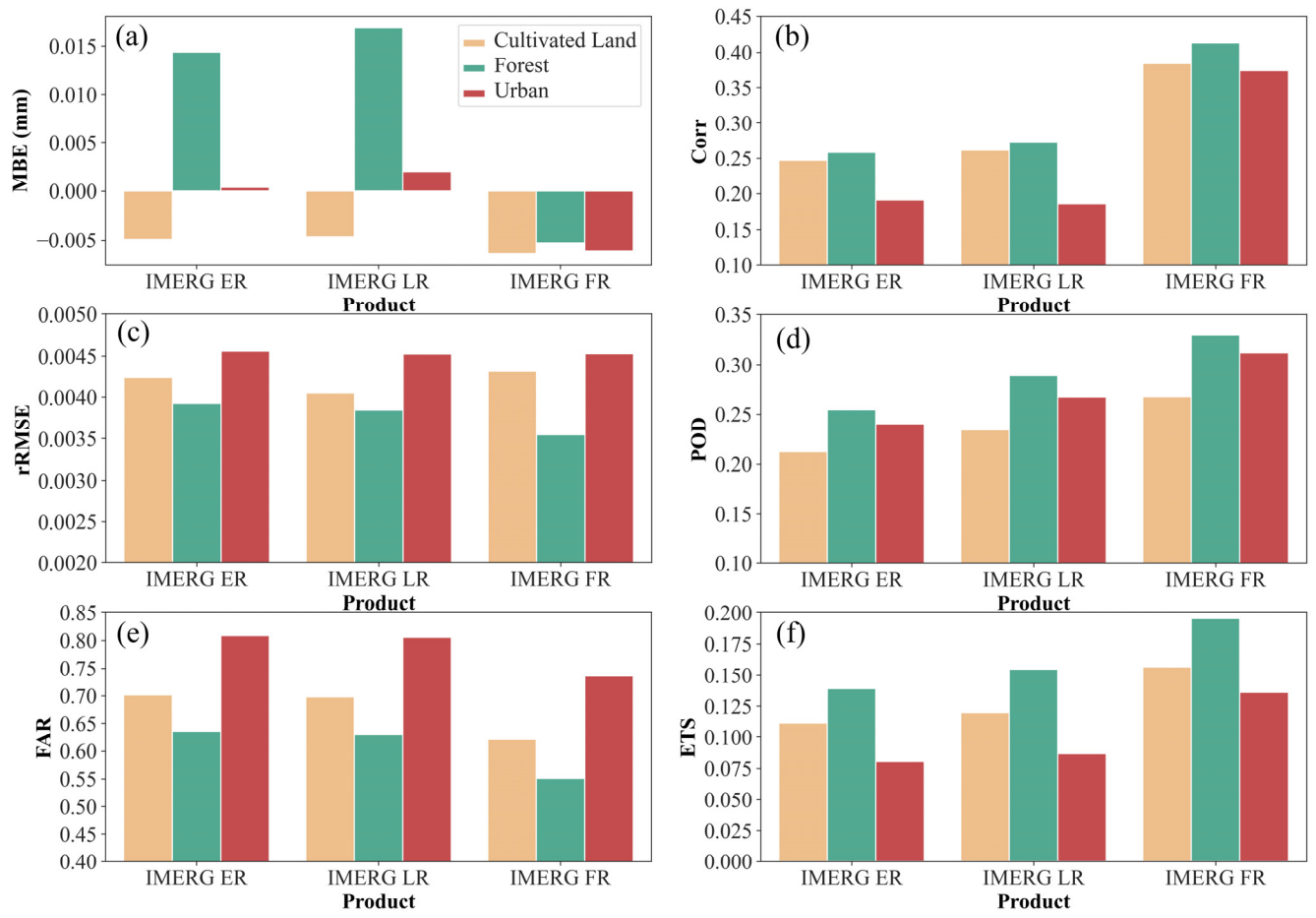


Figure S4. Differences of (a) *MBE*, (b) *Corr*, (c) *rRMSE*, (d) *POD*, (e) *FAR*, and (f) *ETS* on cultivated lands, forests, and urban areas in the winter at hourly scale.

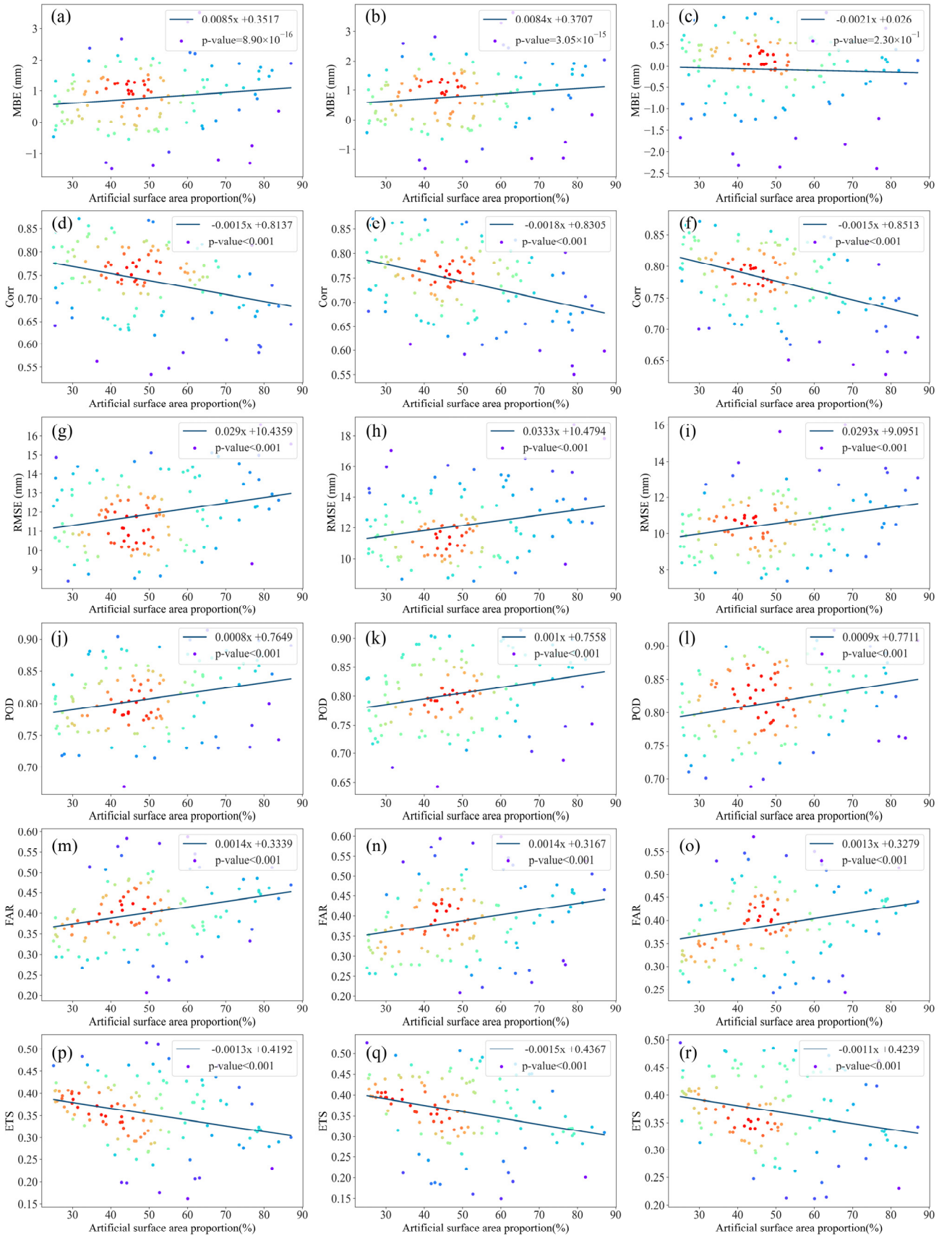


Figure S5. MBE (for IMERG (a) ER, (b) LR, (c) FR), Corr (for IMERG (d) ER, (e) LR, (f) FR), RMSE (for IMERG (g) ER, (h) LR, (i) FR), POD (for IMERG (j) ER, (k) LR, (l) FR), FAR (for IMERG (m) ER, (n) LR, (o) FR), and ETS (for IMERG (p) ER, (q) LR, (r) FR) of urban grids along with artificial surface area proportion at daily scale.

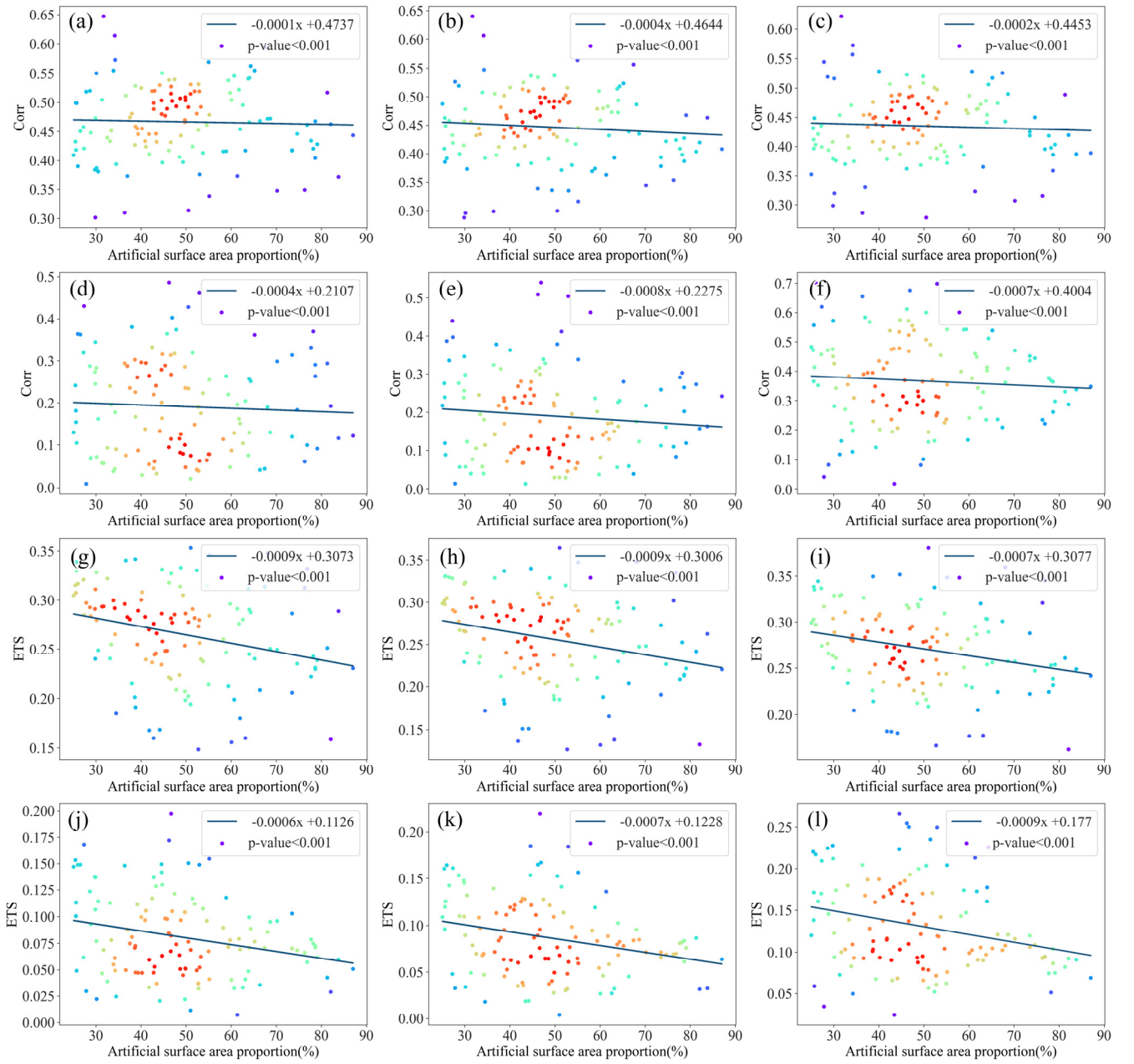


Figure S6. Summer *Corr* (for IMERG (a) ER, (b) LR, (c) FR), winter *Corr* (for IMERG (d) ER, (e) LR, (f) FR), summer *ETS* (for IMERG (g) ER, (h) LR, (i) FR), and winter *ETS* (for IMERG (j) ER, (k) LR, (l) FR) of urban grids along with artificial surface area proportion at hourly scale.

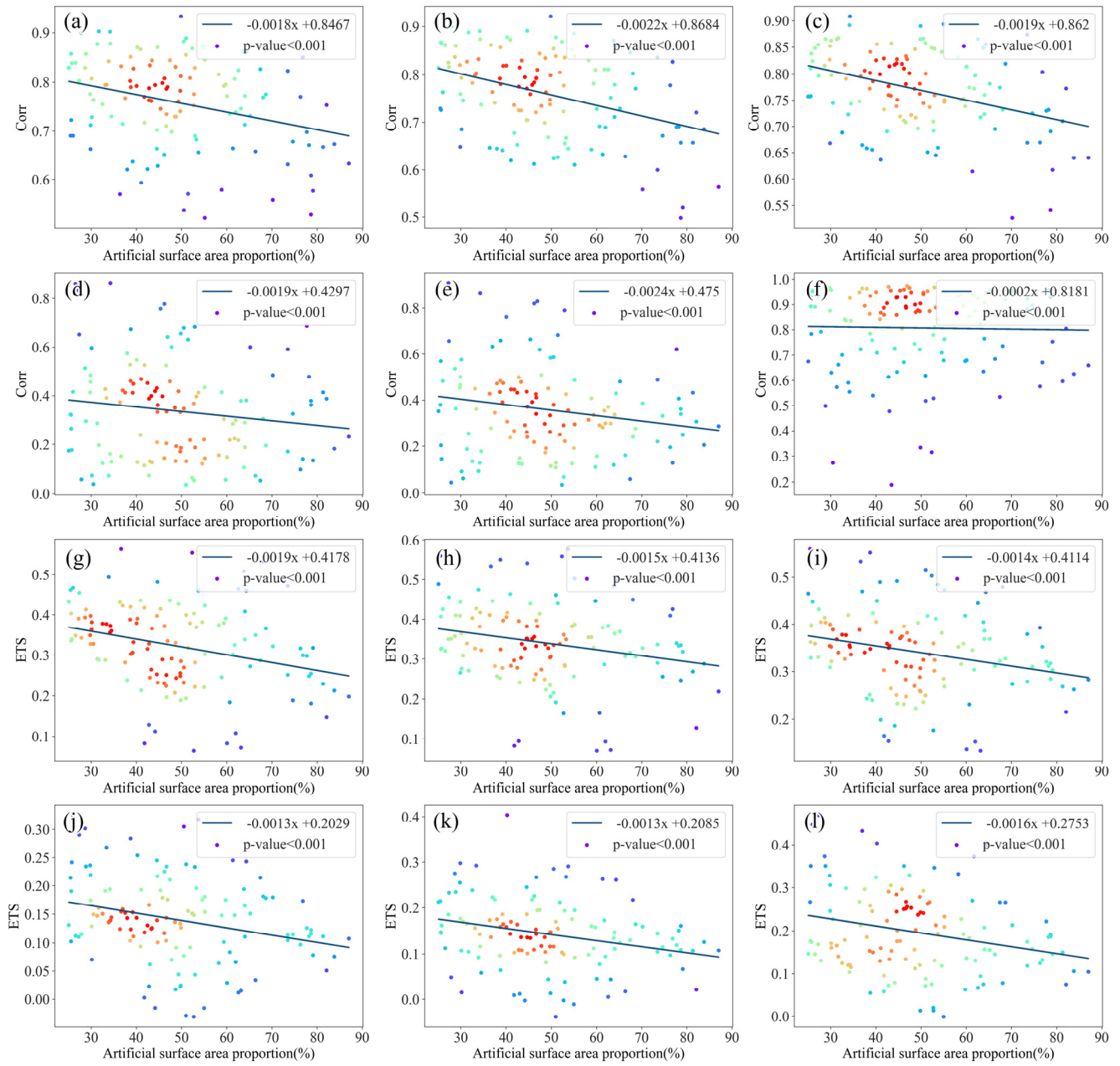


Figure S7. Summer *Corr* (for IMERG (a) ER, (b) LR, (c) FR), winter *Corr* (for IMERG (d) ER, (e) LR, (f) FR), summer *ETS* (for IMERG (g) ER, (h) LR, (i) FR), and winter *ETS* (for IMERG (j) ER, (k) LR, (l) FR) of urban grids along with artificial surface area proportion at daily scale.

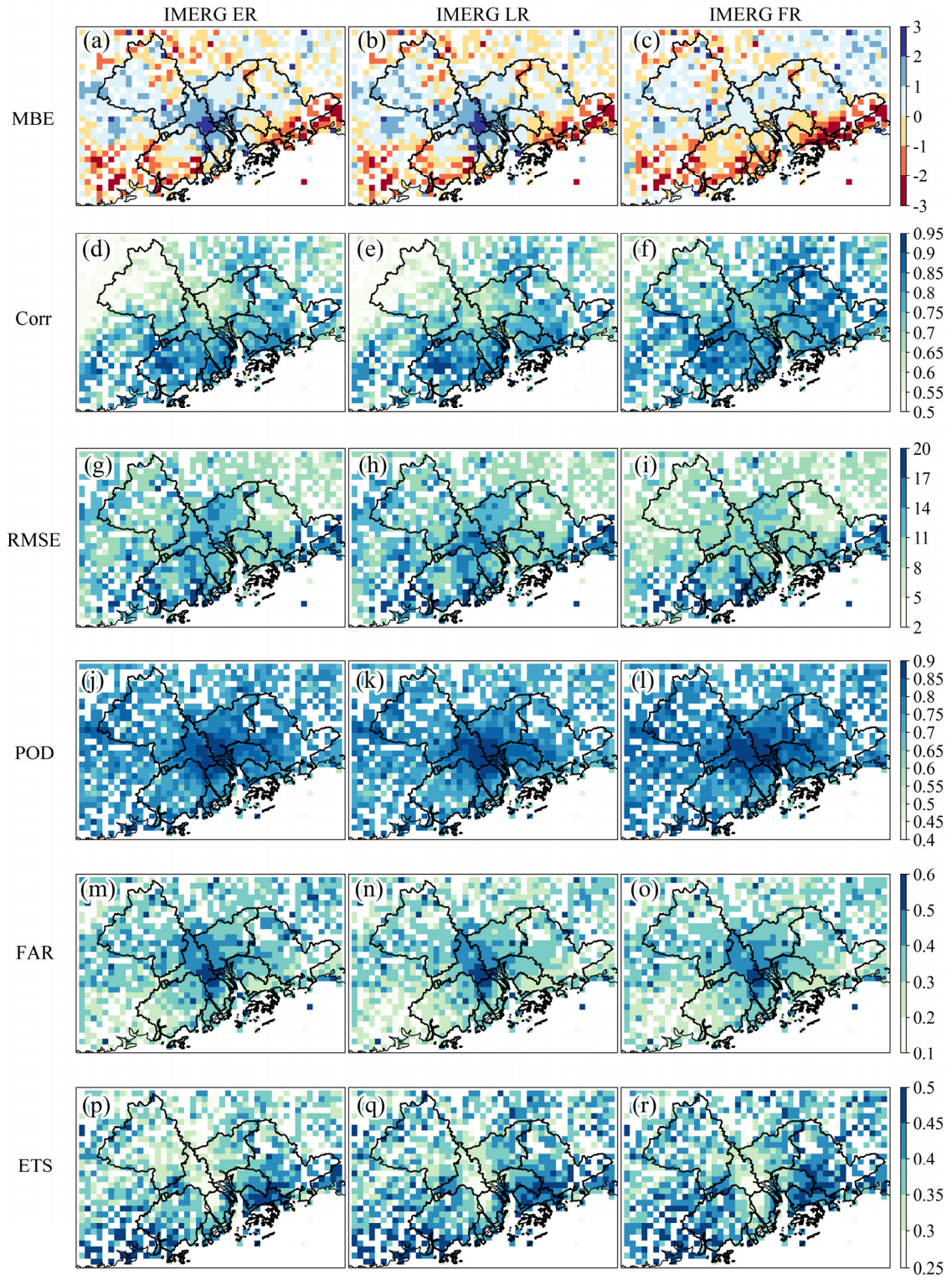


Figure S8. Spatial distribution of evaluation metrics for IMERG ER ((a) *MBE*, (d) *Corr*, (g) *RMSE*, (j) *POD*, (m) *FAR* (p) *ETS*), IMERG LR ((b) *MBE*, (e) *Corr*, (h) *RMSE*, (k) *POD*, (n) *FAR* (q) *ETS*), and IMERG FR ((c) *MBE*, (f) *Corr*, (i) *RMSE*, (l) *POD*, (o) *FAR* (r) *ETS*) at daily scale.

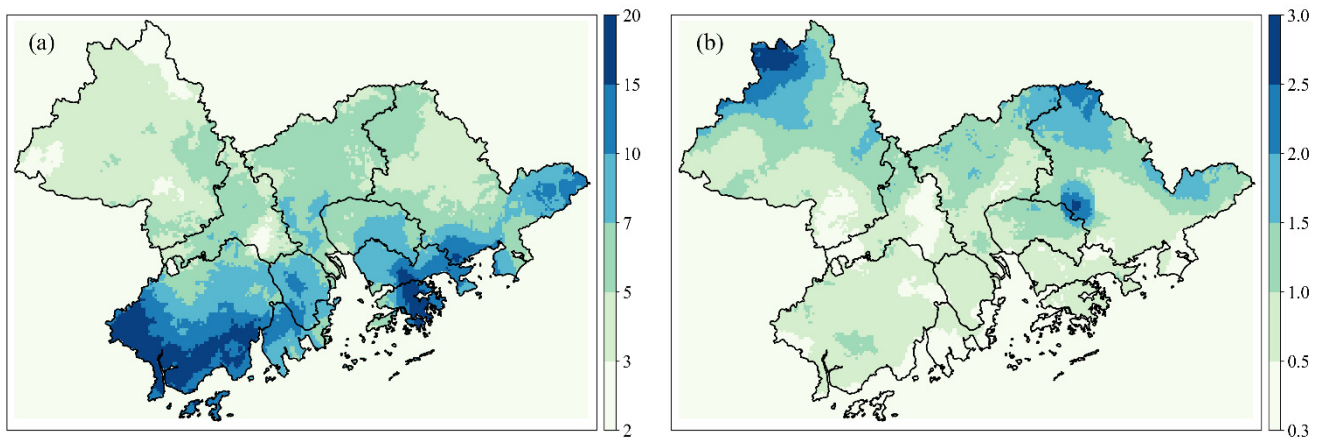


Figure S9. Spatial distribution of average daily precipitation in (a) summer and (b) winter in the study area. The distributions are obtained by ordinary kriging interpolation based on rain gauge observations.

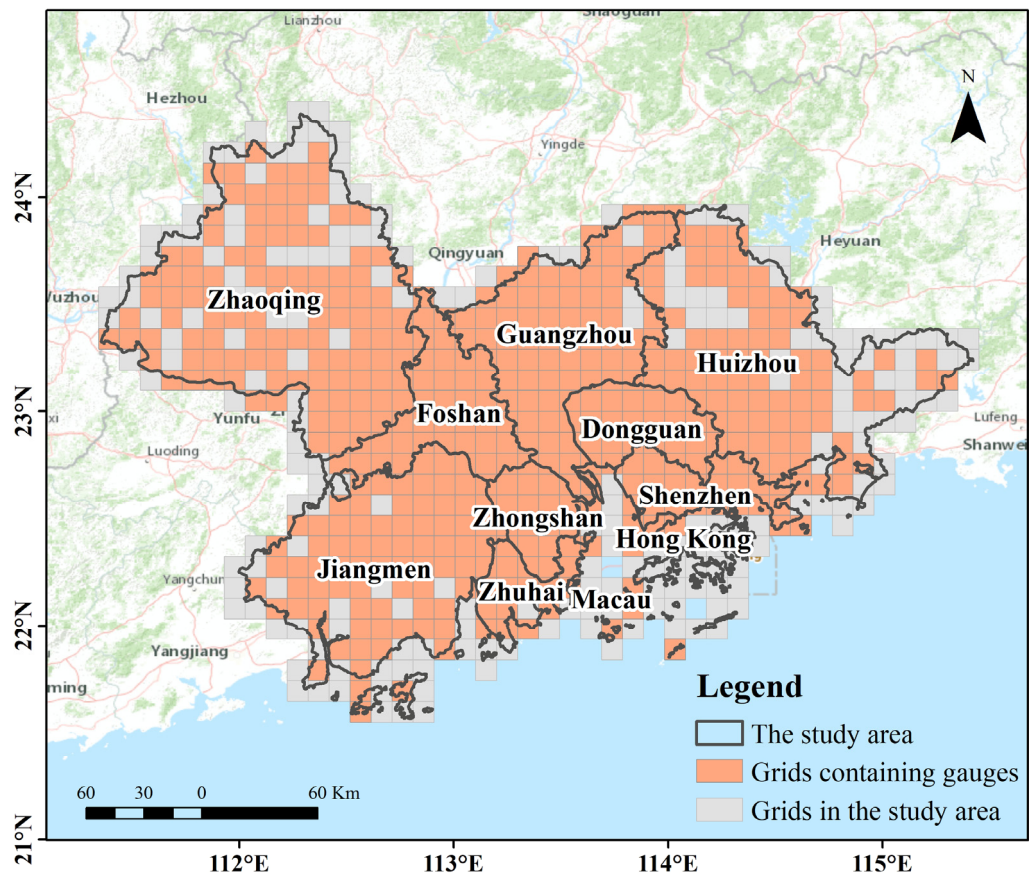


Figure S10. Spatial distribution of IMERG grids containing at least one gauge station in the study area.

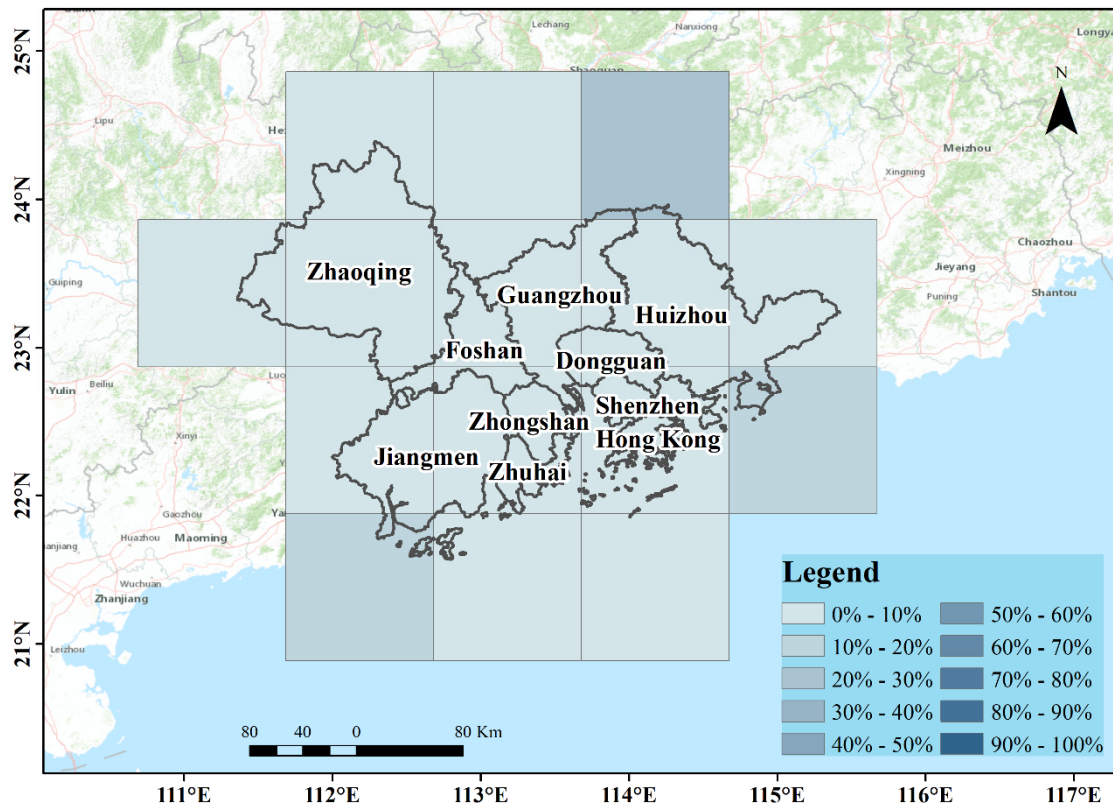


Figure S11. Proportion of the number of GPCC stations to the number of local gauge stations in the 1° grid for the study area.

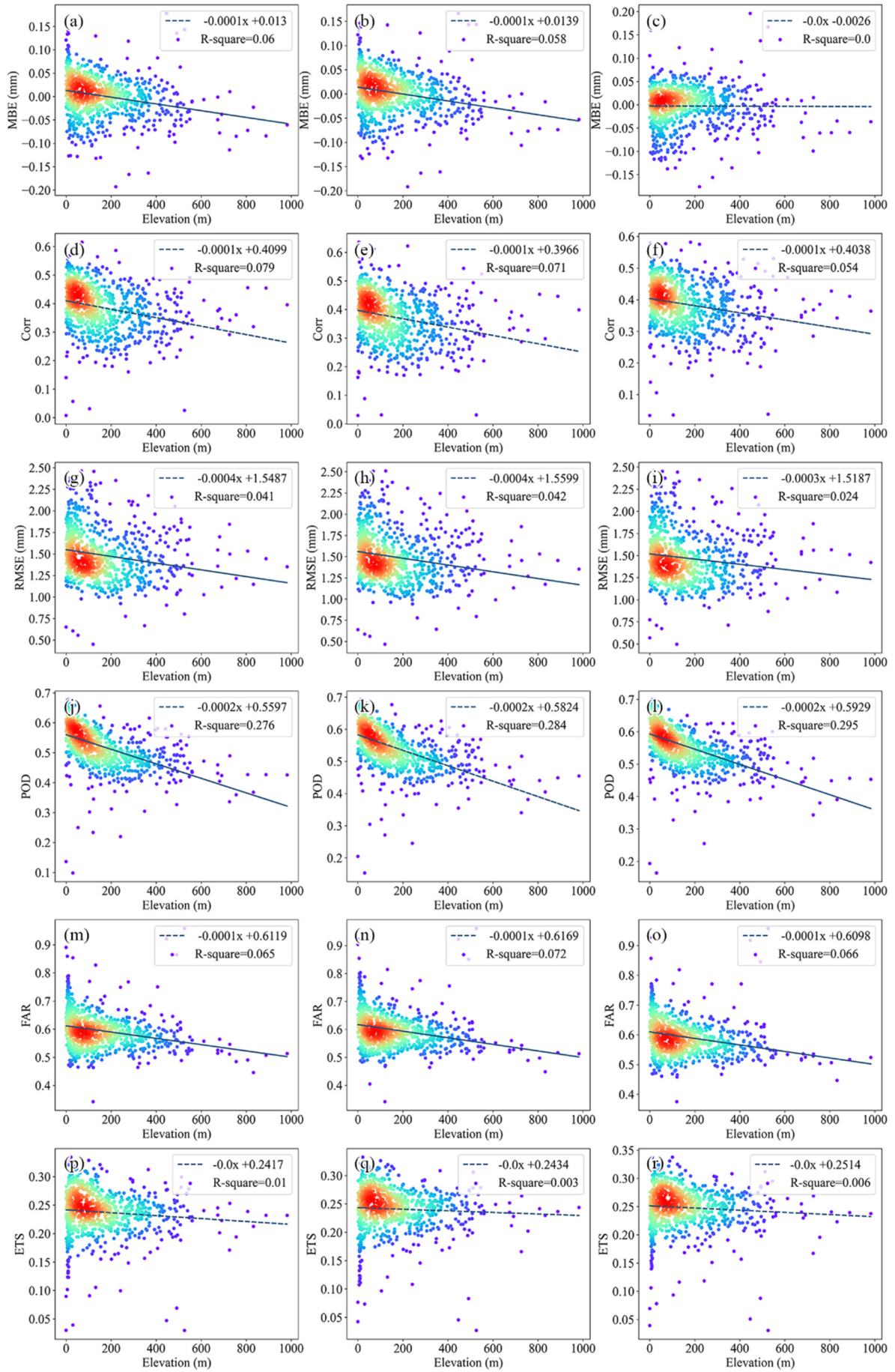


Figure S12. Evaluation metrics for IMERG ER ((a) MBE, (d) Corr, (g) RMSE, (j) POD, (m) FAR (p) ETS), IMERG LR ((b) MBE, (e) Corr, (h) RMSE, (k) POD, (n) FAR (q) ETS), and IMERG FR ((c) MBE, (f) Corr, (i) RMSE, (l) POD, (o) FAR (r) ETS) along with elevations at hourly scale.

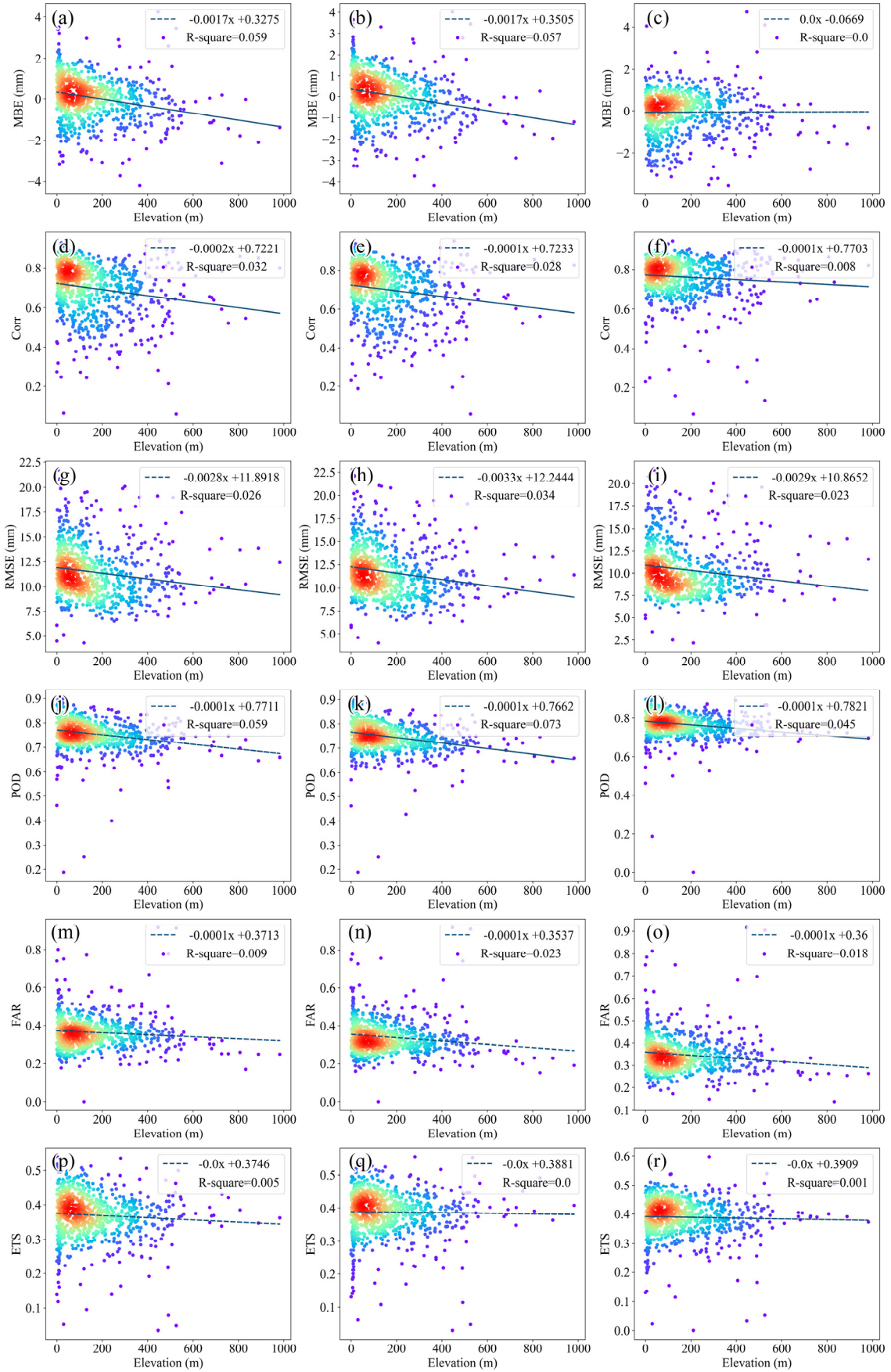


Figure S13. Evaluation metrics for IMERG ER ((a) MBE, (d) Corr, (g) RMSE, (j) POD, (m) FAR (p) ETS), IMERG LR ((b) MBE, (e) Corr, (h) RMSE, (k) POD, (n) FAR (q) ETS), and IMERG FR ((c) MBE, (f) Corr, (i) RMSE, (l) POD, (o) FAR (r) ETS) along with elevations at daily scale.

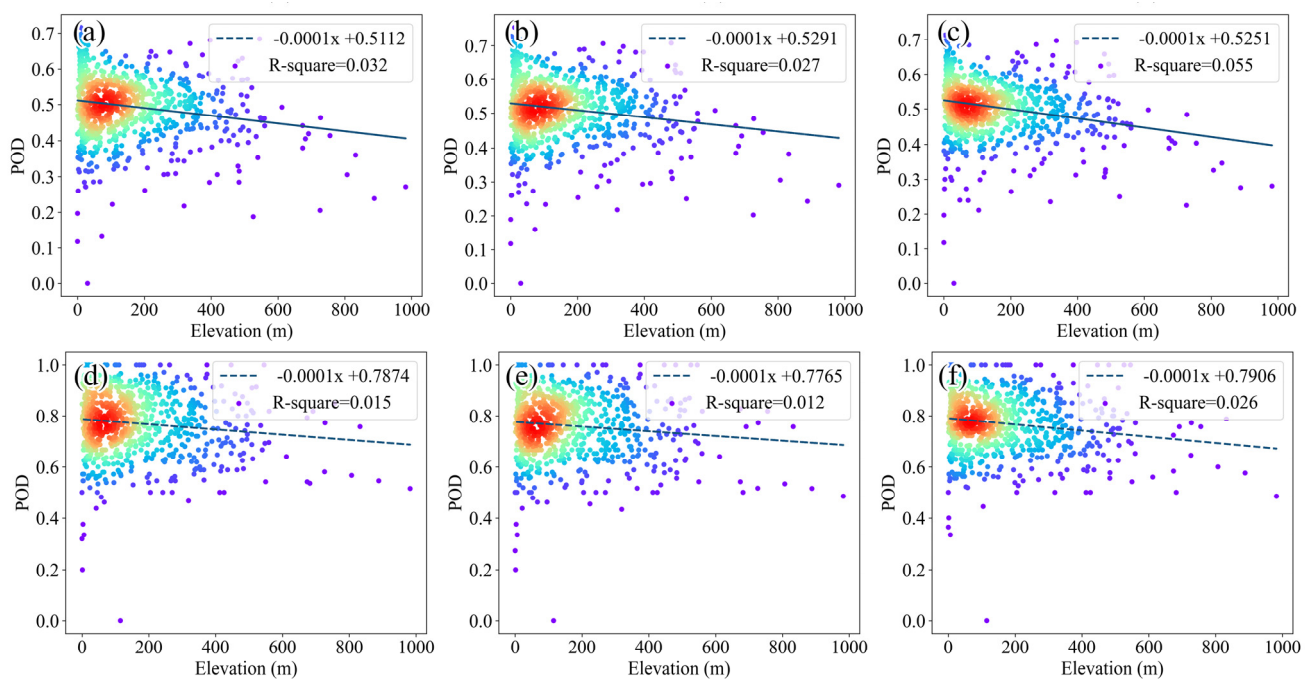


Figure S14. Spring *POD* for IMERG ER (at (a) hourly and (d) daily scales), IMERG LR (at (b) hourly and (e) daily scales), and IMERG FR (at (c) hourly and (f) daily scales) along with elevations.

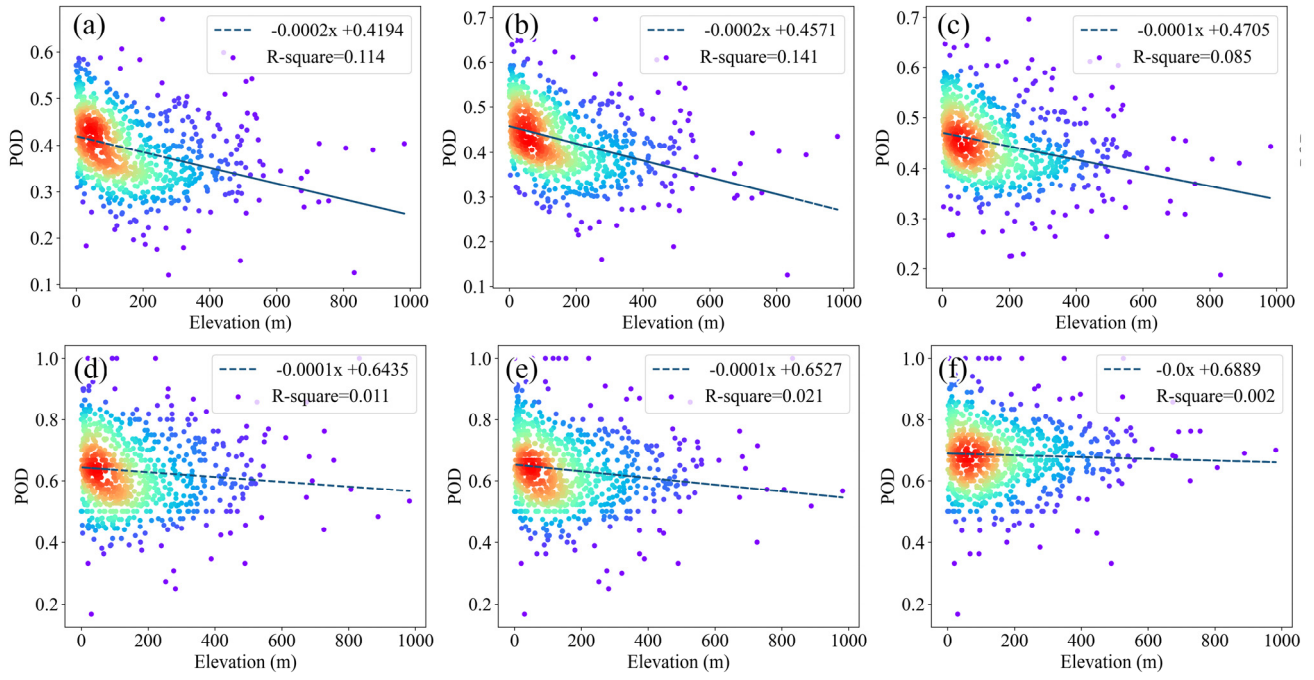


Figure S15. Autumn *POD* for IMERG ER (at (a) hourly and (d) daily scales), IMERG LR (at (b) hourly and (e) daily scales), and IMERG FR (at (c) hourly and (f) daily scales) along with elevations.

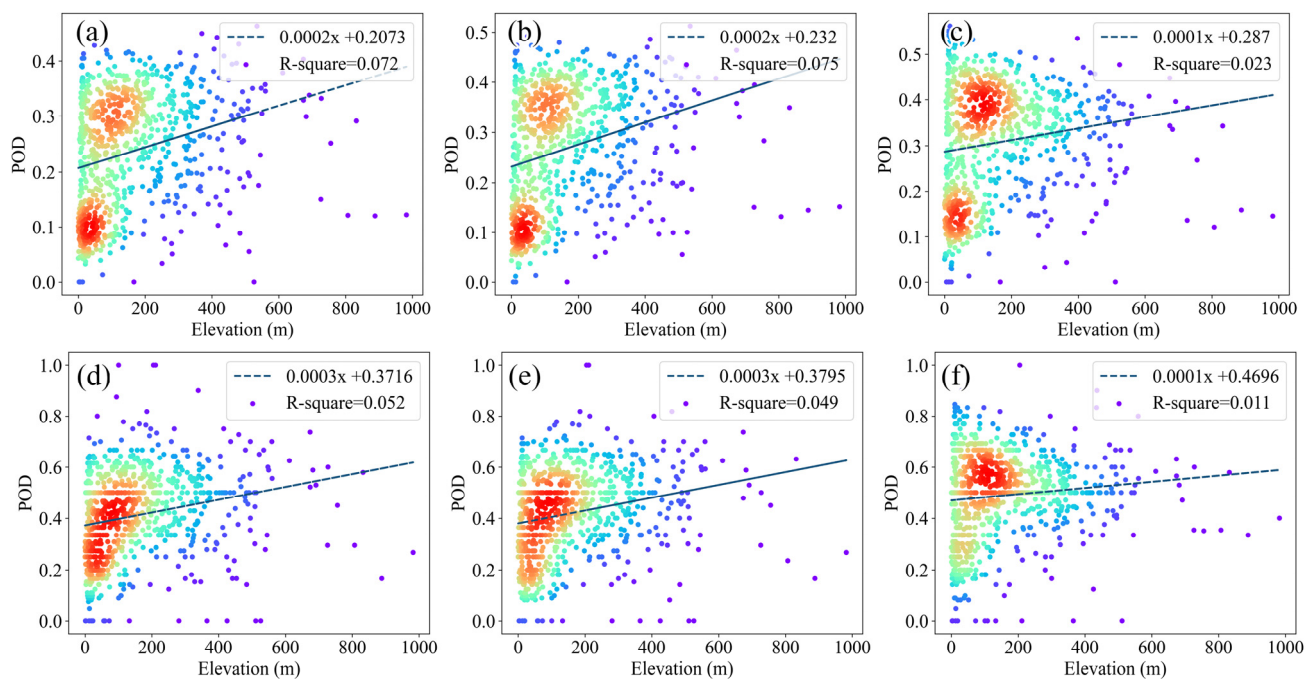


Figure S16. Winter *POD* for IMERG ER (at (a) hourly and (d) daily scales), IMERG LR (at (b) hourly and (e) daily scales), and IMERG FR (at (c) hourly and (f) daily scales) along with elevations.