Ranked Probability Skill Score (RPSS)

The ranked probability skill score (RPSS) is based on the comparison of the cumulative squared probability and the reference cumulative probability, and it is calculated as follow;

$$\mathrm{RPSS} = 1 - \frac{\mathrm{RPSforecast}}{\mathrm{RPSreforecast}}$$

where RPS is the sum of the squared difference between cumulative forecast and reference probabilities. The value of RPSS varies between negative infinity and one. Negative values indicates that the climatology forecast outperforms the model forecast, while positive values of RPSS indicates model forecasts that are better than climatology and potentially useful.

Table S1 Displays the ten streamflow gauging stations locations from the Royal Irrigation Department (RID), Thailand.

Station Name	River	Latitude	Longitude
C.2	Chao Phraya	15.67	100.11
E.20A	Chi	15.52	104.25
KGT.3	Prachin Buri	13.99	101.71
M.7	Mun	15.22	104.86
N.1	Nan	18.77	100.78
P.1	Ping	18.79	99.00
W.4A	Wang	17.20	99.10
X.90	Thale Sap Songkhla	6.93	100.44
Y.1C	Yom	18.13	100.12
Z.18	East-Coast Gulf	12.96	101.67

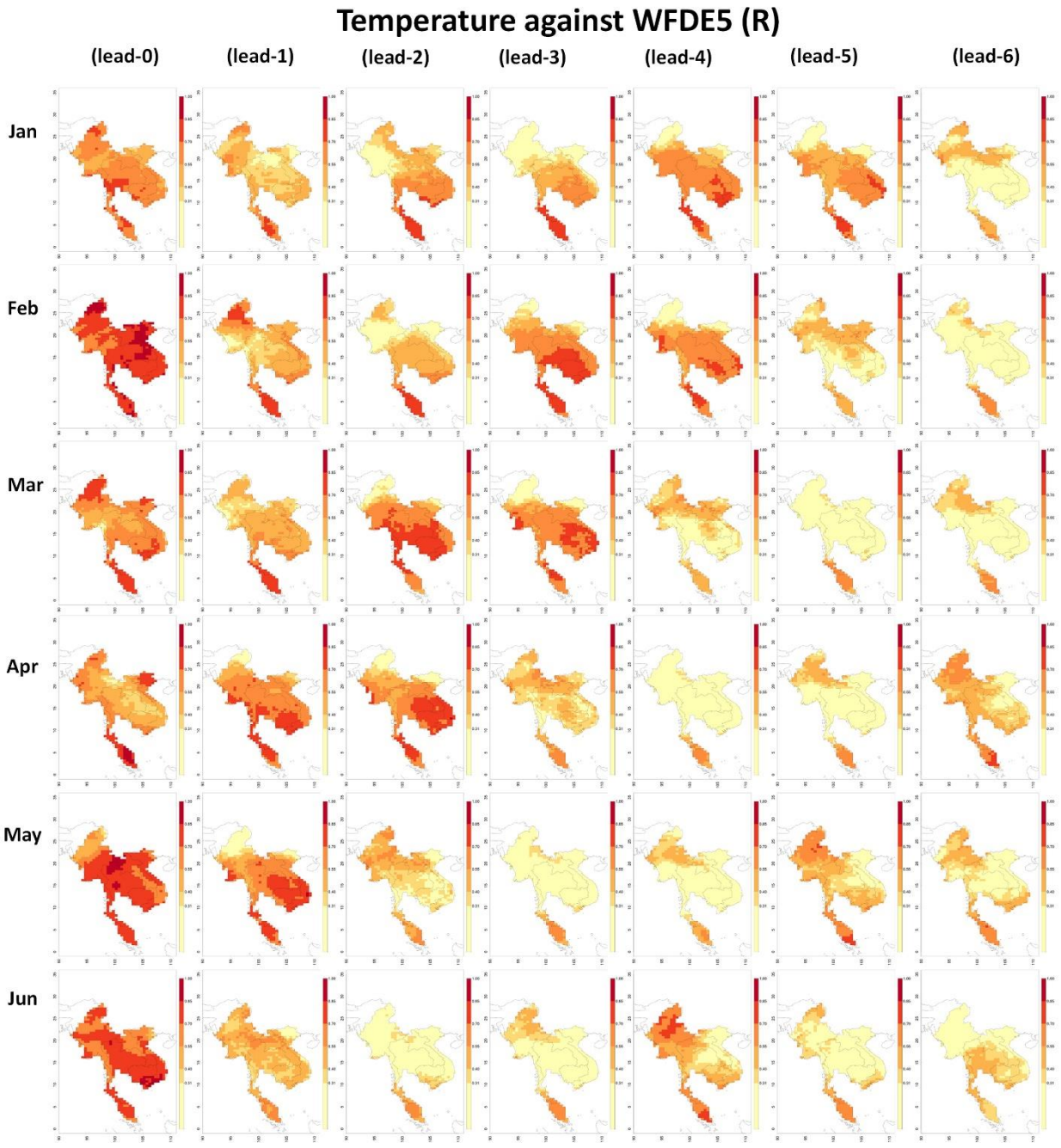

Figure S1 Spatially distributed correlation coefficient R ($p<0.05$) for temperature of SEAS5 hindcast against WFDE5 reanalysis for 1985-2014 over Mainland Southeast Asia from January to June for seven lead times.

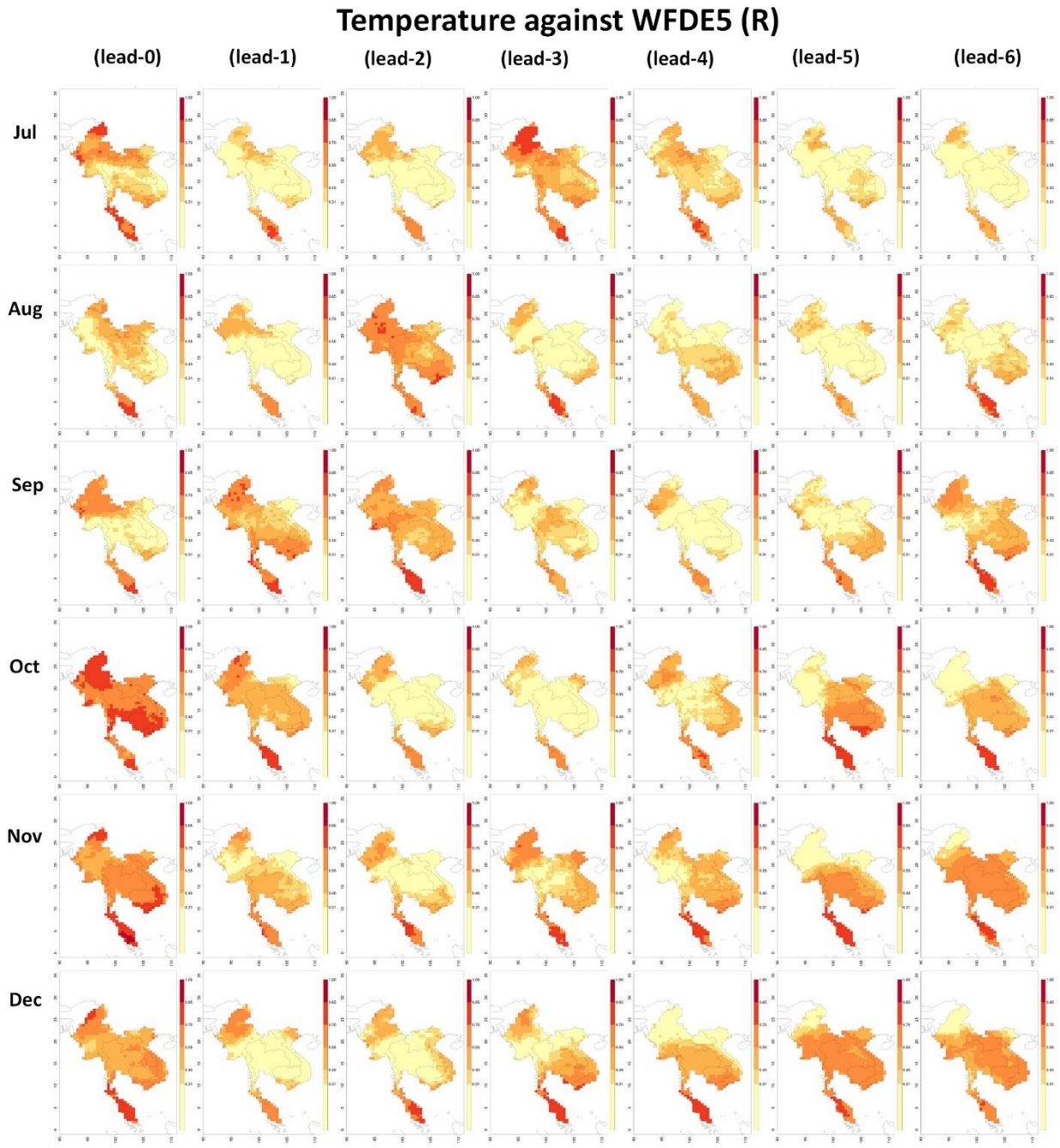

Figure S2 Spatially distributed correlation coefficient R ($p<0.05$) for temperature of SEAS5 hindcast against WFDE5 reanalysis for 1985-2014 over Mainland Southeast Asia from July to December for seven lead times.

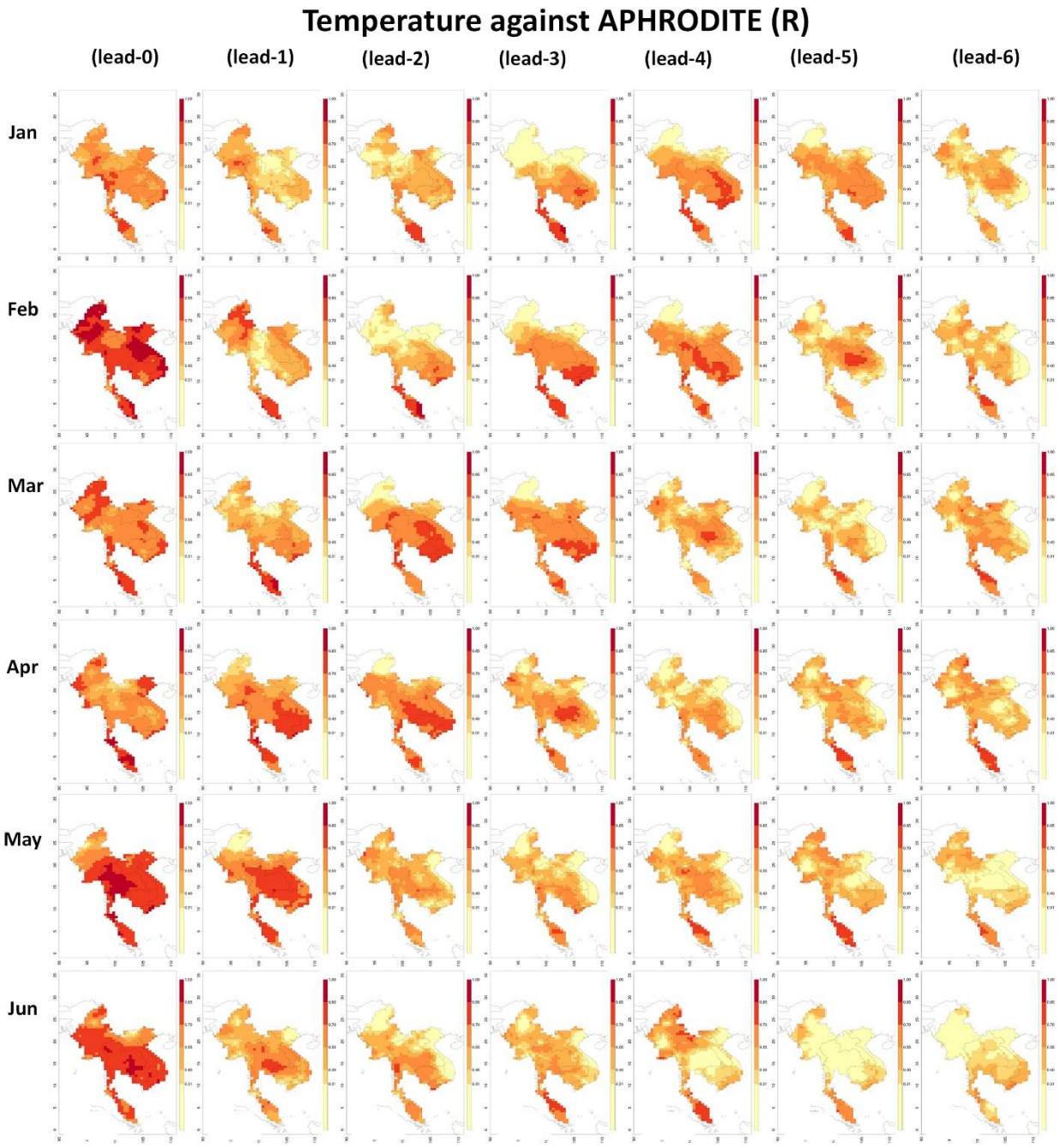

Figure S3 Spatially distributed correlation coefficient R ($p<0.05$) for temperature of SEAS5 hindcast against APHRODITE reanalysis for 1985-2014 over Mainland Southeast Asia from January to June for seven lead times.

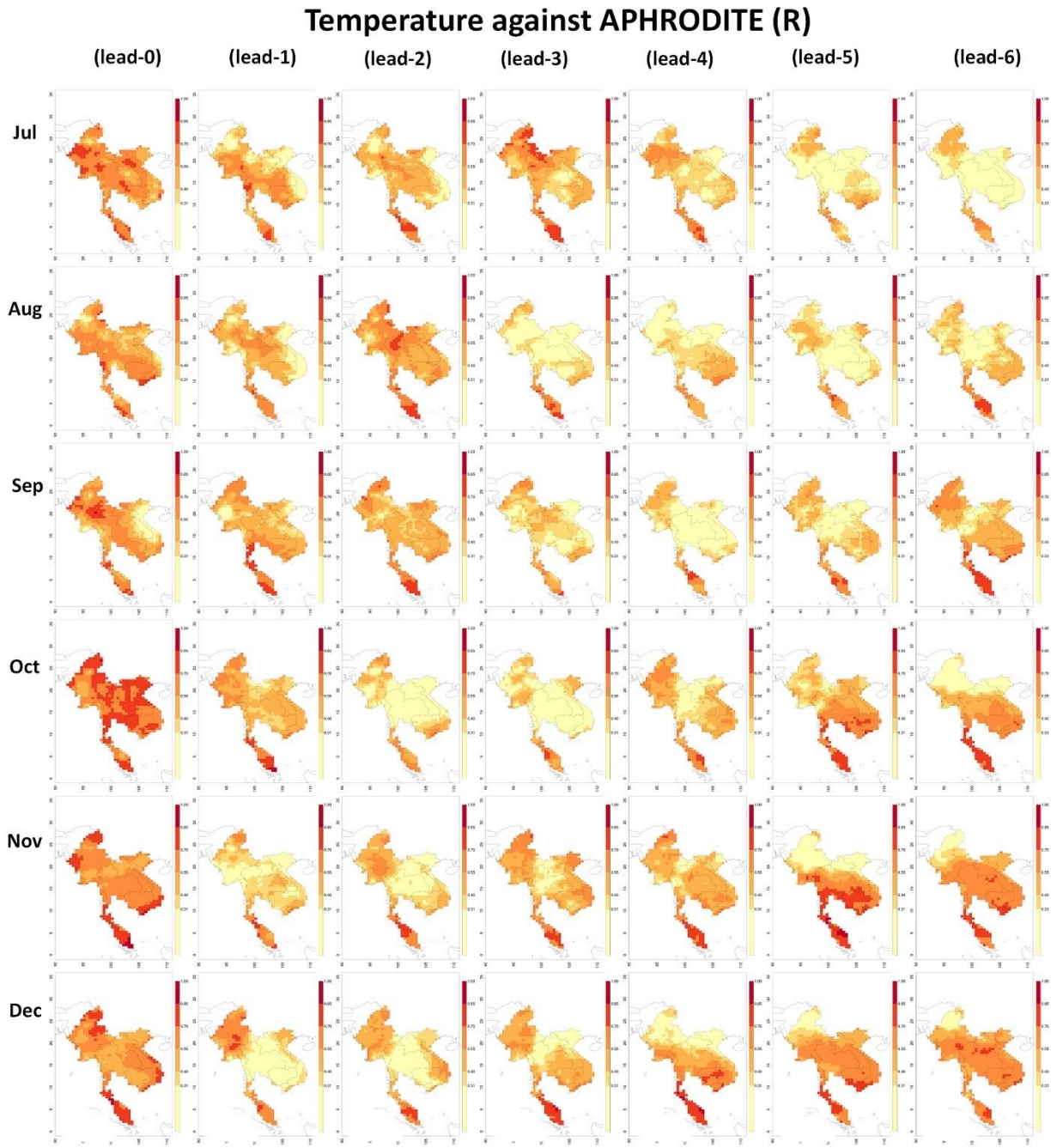

Figure S4 Spatially distributed correlation coefficient R ($p<0.05$) for temperature of SEAS5 hindcast against APHRODITE reanalysis for 1985-2014 over Mainland Southeast Asia from July to December for seven lead times.

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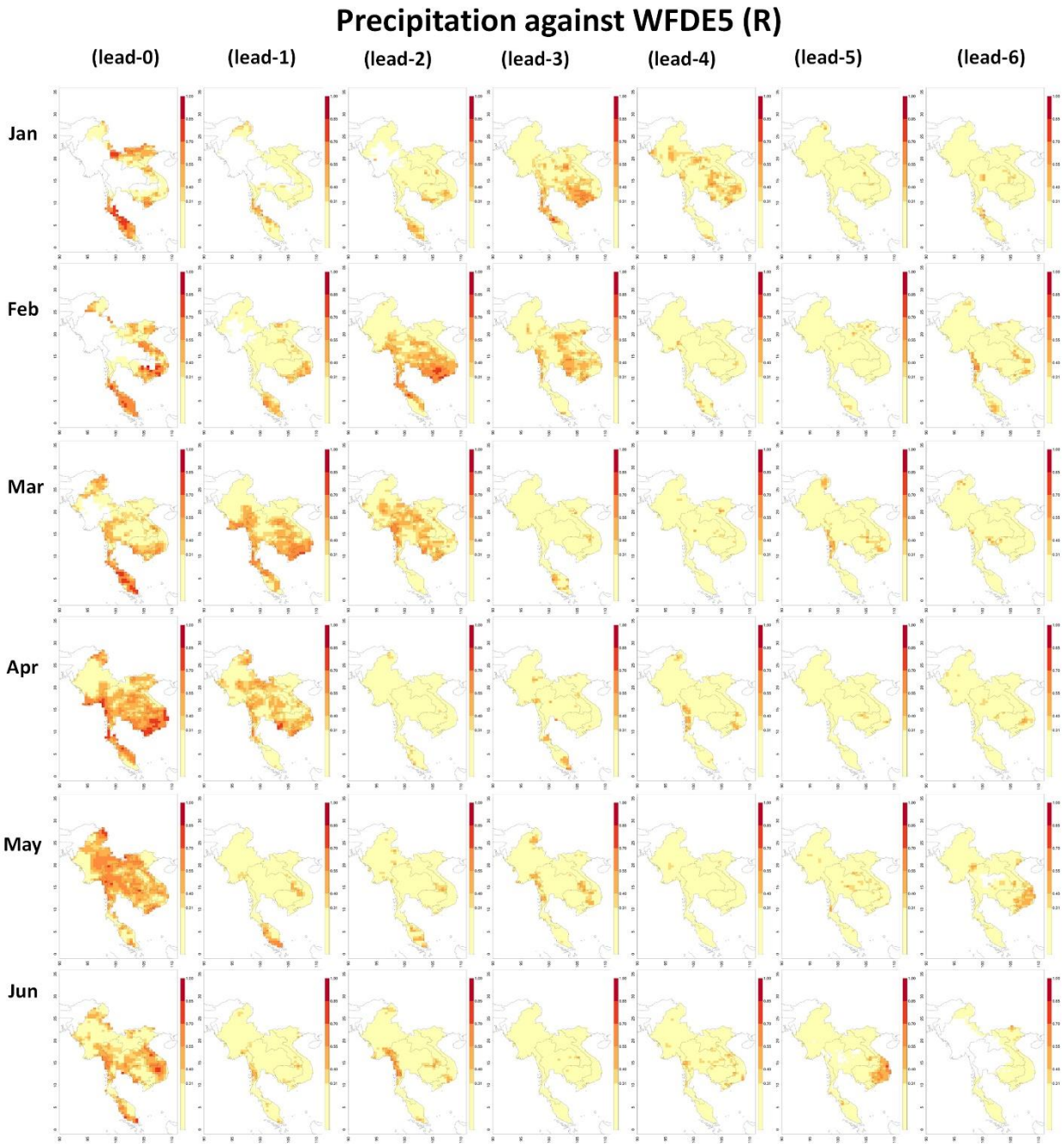

Figure S5 Spatially distributed correlation coefficient R ($p<0.05$) for precipitation of SEAS5 hindcast against WFDE5 reanalysis for 1985-2014 over Mainland Southeast Asia from January to June for seven lead times.

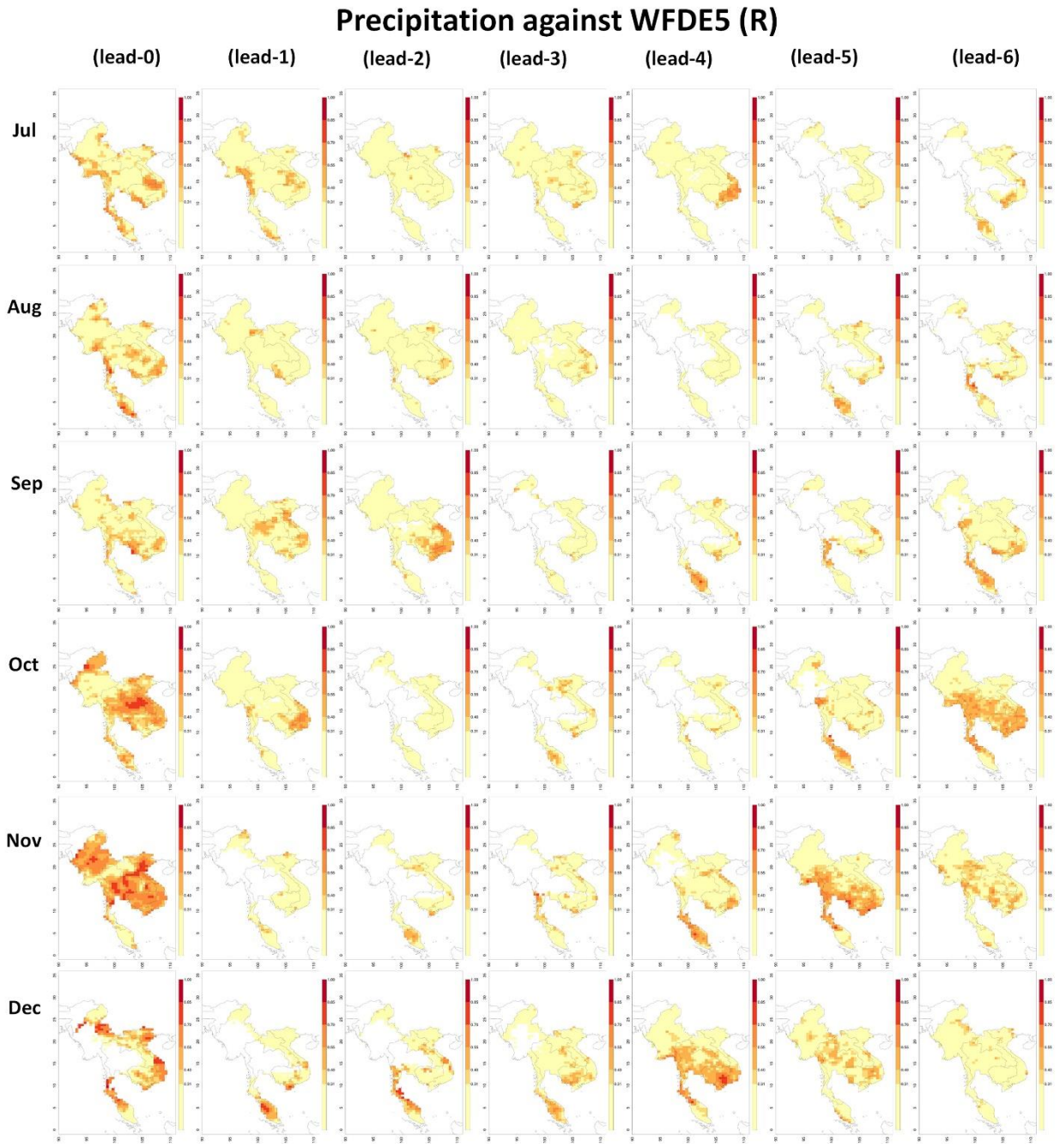

Figure S6 Spatially distributed correlation coefficient R ($p<0.05$) for precipitation of SEAS5 hindcast against WFDE5 reanalysis for 1985-2014 over Mainland Southeast Asia from July to December for seven lead times.

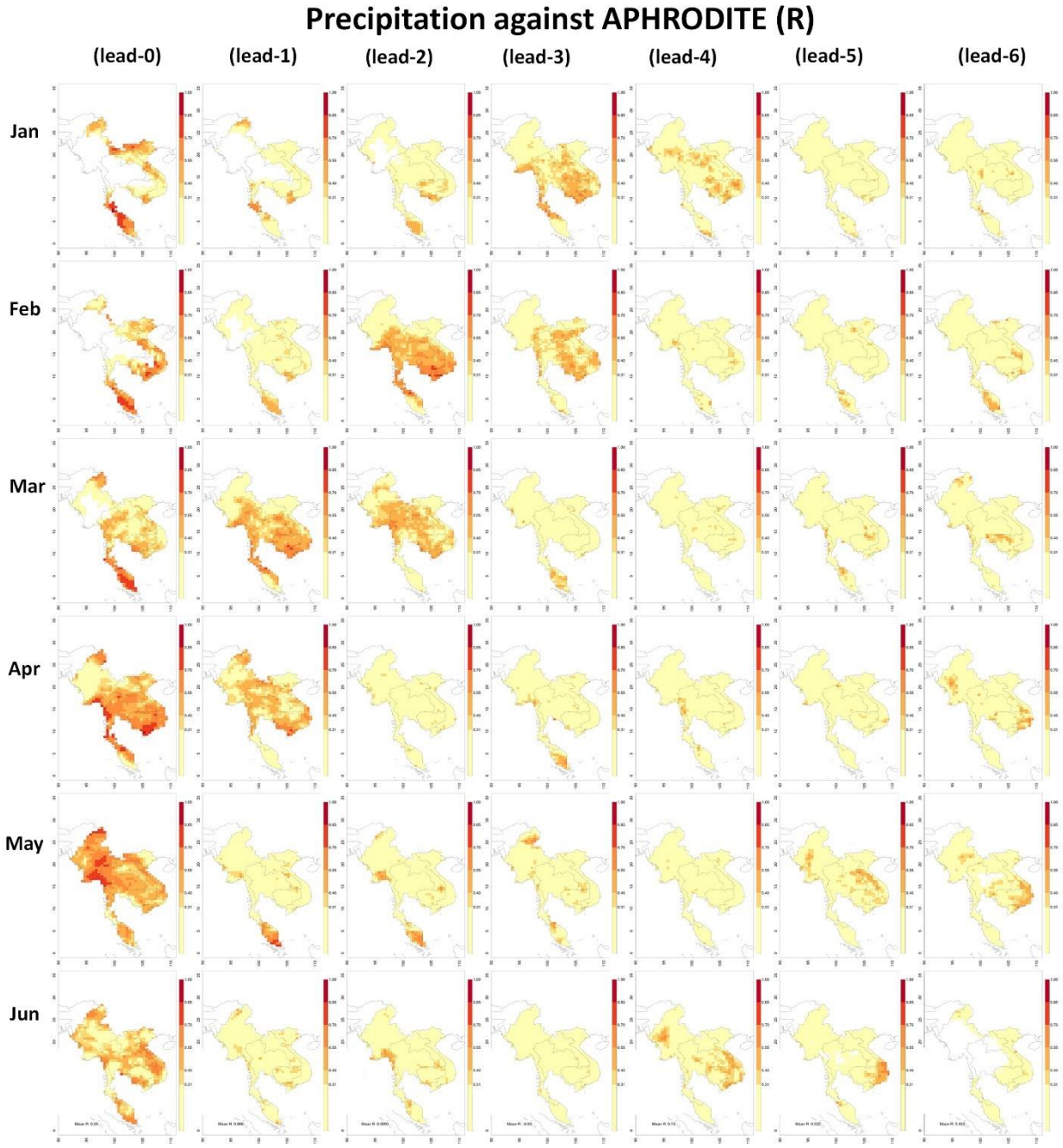

Figure S7 Spatially distributed correlation coefficient R ($p<0.05$) for precipitation of SEAS5 hindcast against APHRODITE reanalysis for 1985-2014 over Mainland Southeast Asia from January to June for seven lead times.

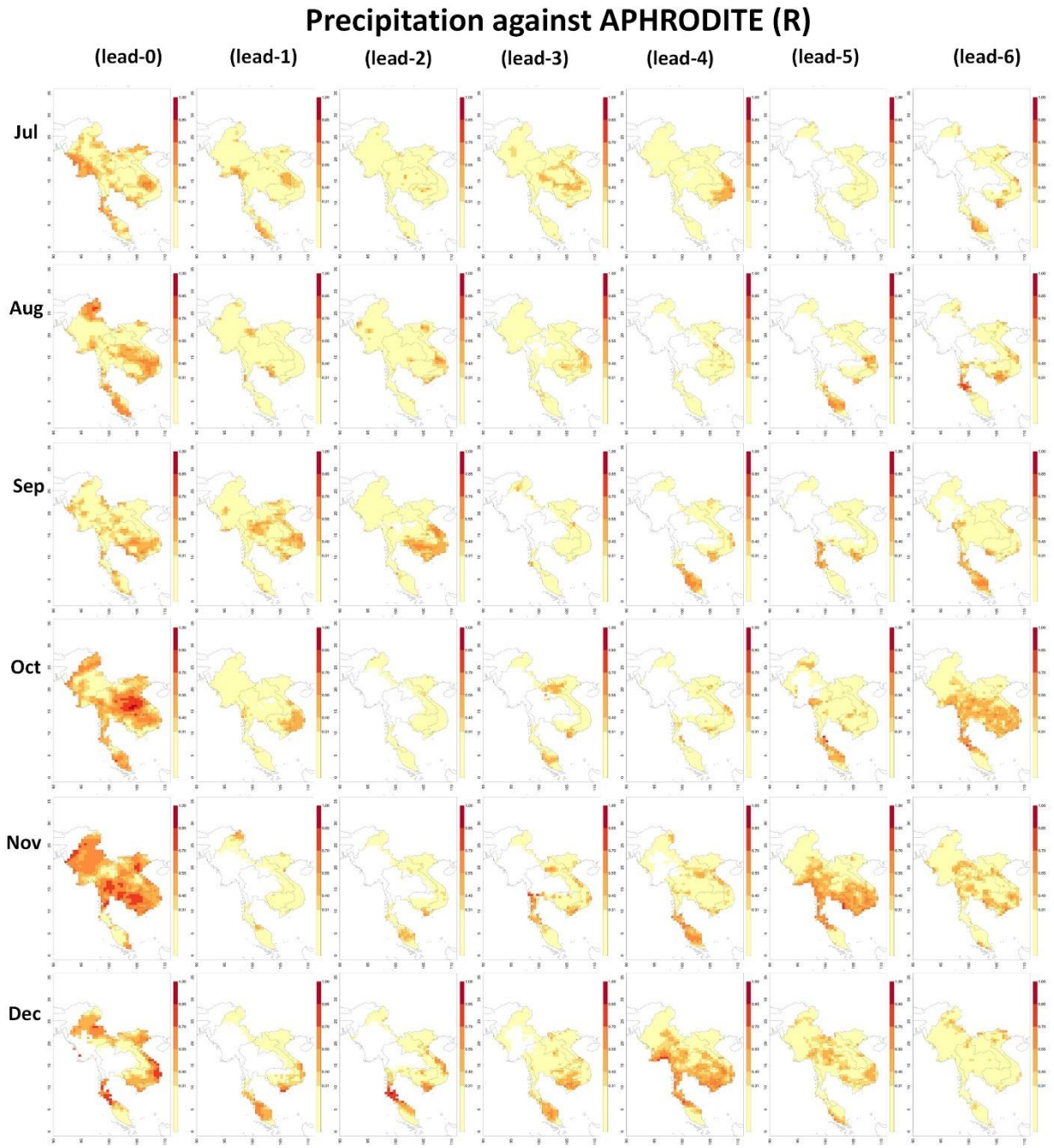

Figure S8 Spatially distributed correlation coefficient R ($p<0.05$) for precipitation of SEAS5 hindcast against APHRODITE reanalysis for 1985-2014 over Mainland Southeast Asia from July to December for seven lead times.

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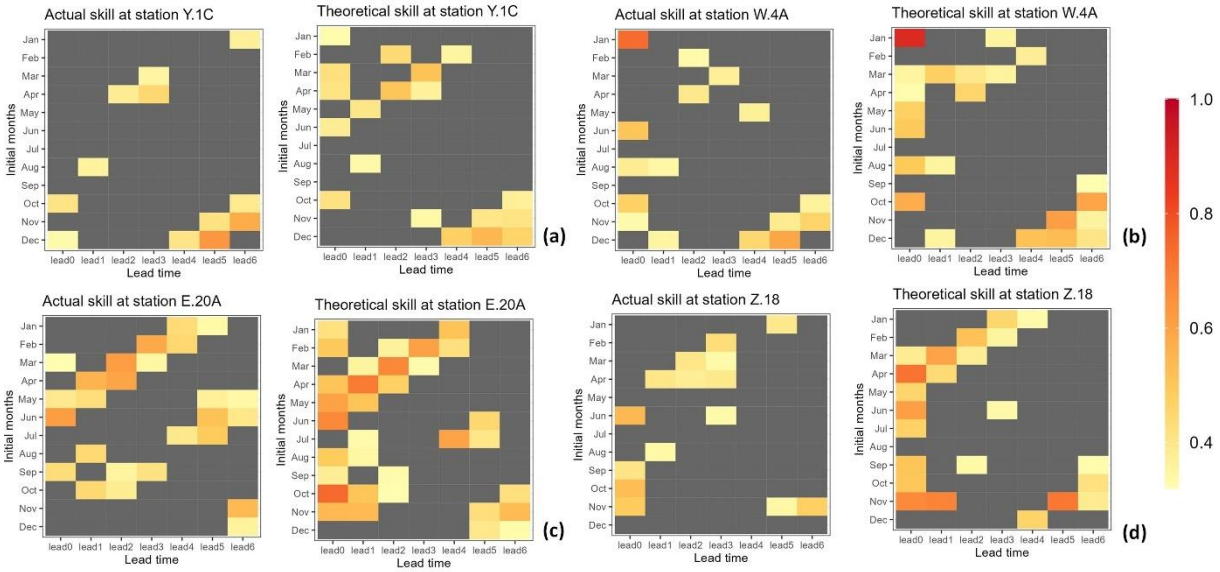

50 **Figure S9 Comparison between river discharge from gauging stations, known as actual skill (left column), and river discharge generated from the VIC model driven by SEAS5 hindcast, known as theoretical skill (right column), using the correlation coefficient R ($p<0.05$). (a) station Y.1C; (b) station W.4A; (c) station E.20A; and (d) station Z.18.**