Supplementary Information

Future Suitable Habitat Reductions of Key Tree Species Result in Declining Boreal Forest Aboveground Biomass Carbon in China

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Temperature and precipitation were crucial climate factors that influence vegetation growth and served as important data inputs for driving the LPJ model. Evaluating the applicability of simulated temperature and precipitation in global climate models was the foundation for vegetation dynamic modeling using this data. The Equidistant Cumulative Distribution Functions (EDCDF) was used to correct the bias of the original CMIP6 data [1,2]. This method was mainly based on the deviation between the simulated values and the observed at each percentile, and its accuracy has been demonstrated in our previous studies. By comparing the spatial distribution of temperature and precipitation in China, it was evident that the spatial distribution simulated by CMIP6 models closely matches the observations. It exhibited a gradual increase in temperature and precipitation from the northwest, where temperature was below -5°C and precipitation was below 200mm, to the southeast, where temperature exceeded 25°C and precipitation exceeded 1000mm, indicating a pattern of increasing warmth and moisture (Figure S1a, b, d, e). The temperature and precipitation data of CMIP6 were in good agreement with the those of the seven geographical subdivisions. Taylor diagrams provided a means to assess the agreement between simulated and observed values of temperature and precipitation using metrics such as correlation coefficients, root mean square errors, and standard deviations. The results of this study demonstrated that for the period 1982-2014, multiple climate models exhibited high correlation coefficients (above 0.95) and low root mean square errors (below 1) for temperature simulations compared to observations. Similarly, precipitation simulations showed correlation coefficients above 0.9 and root mean square errors below 15 when compared to observations. Additionally, the ensemble of multiple climate models performed best in simulating both temperature and precipitation (Figure S1).

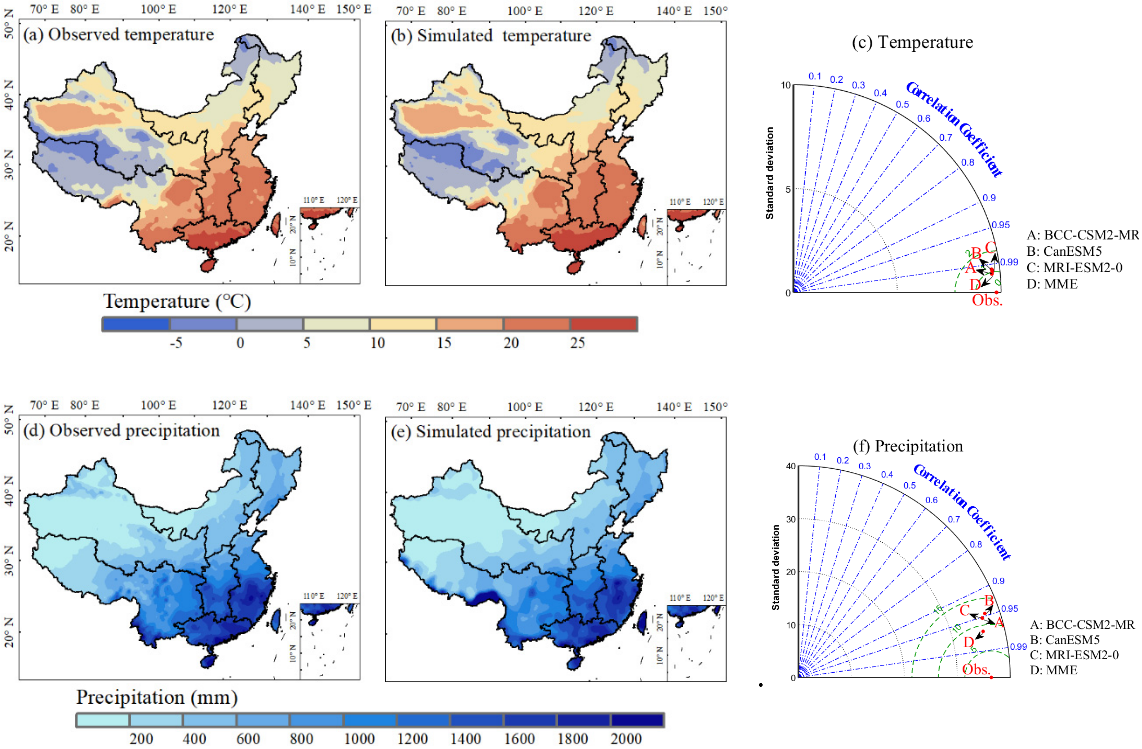

Figure S1. Spatial distribution map and Taylor chart of observed annual mean temperature/precipitation and simulated values (MME) in China during 1982-2014.

Supplemental Figure S2 illustrated the percentage difference in mean temperature and precipitation from 1982-2060 compared to the reference period of 1982-2014. The results indicated that the percentage differences between observed and modeled data follow a consistent pattern during the historical period, exhibiting fluctuating upward trends. Under different SSP scenarios, the temperature showed a significant upward trend from 2015 to 2060 in China. In the SSP5-8.5 scenario, the projected temperature increase reached approximately 60% by around 2060. On the other hand, precipitation exhibited a gradual increase trend, with the percentage increase in precipitation under different SSP scenarios remaining below 40%.

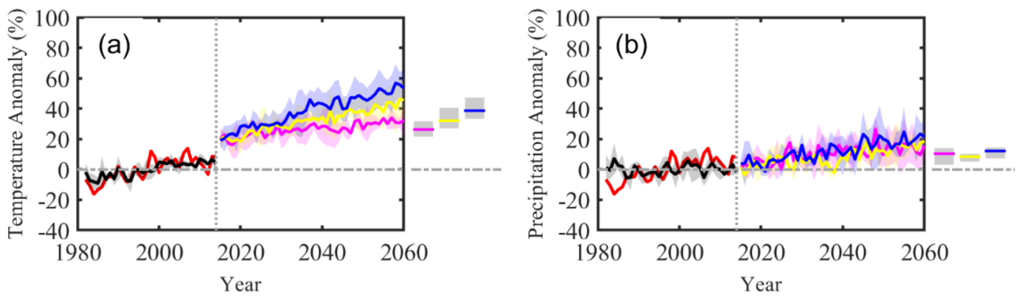

Figure S2. Annual mean temperature and precipitation anomalies in China from 1982 to 2060. Shaded areas and grey bars represent the mean ± 1 standard deviation ranges for the three CMIP6 models.

According to the AUC results generated from the MaxEnt model, the average AUC values for 10 repetitions for *Larix gmelinii* and *Schima superba Gardner & Champ* and *Camphora officinarum* were 0.819, 0.928 and 0.914, respectively, indicating that the model yielded highly reliable results in predicting the potential distribution (Figure S3).

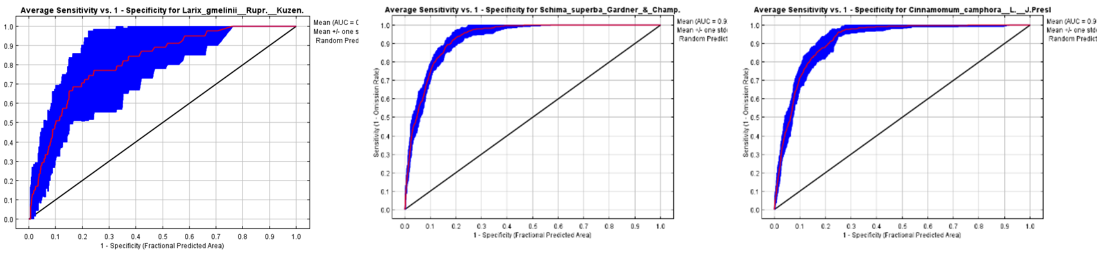

Figure S3. Reliability test of the MaxEnt model created for: (a) *Larix gmelinii*; *Schima superba Gardner & Champ* and (c) *Camphora officinarum*.

References

1. Tian, J.; Zhang, Z.; Ahmed, Z.; Zhang, L.; Su, B.; Tao, H.; Jiang, T. Projections of Precipitation over China Based on CMIP6 Models. *Stoch. Env. Res. Risk A.* **2021**, *35*, 831–848, doi:10.1007/s00477-020-01948-0.
2. Kong, R.; Zhang, Z.; Huang, R.; Tian, J.; Feng, R.; Chen, X. Projected Global Warming-Induced Terrestrial Ecosystem Carbon across China under SSP Scenarios. *Ecol. Indic.* **2022**, *139*, 108963, doi:10.1016/j.ecolind.2022.108963.