Spatially adaptive estimation of multi-layer soil temperature at a daily time-step across China during 2010-2020

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Figure S1. Variance Inflation Factor (VIF) of predictor variables



Figure S2. Quadtree spatial index principle. (Northwest (NW), Northeast (NE),
Southwest (SW), Southeast (SE) refer to the four quadrants into which the quadtree divides the two-dimensional space.)

| hyperparameters | candidate value | | |
|-----------------|-----------------|-----|------|
| | Start | End | Step |
| n_estimators | 50 | 100 | 10 |
| max_depth | 5 | 15 | 1 |
| learning rate | 0.1 | 1 | 0.1 |

Table.S1 Candidate values of hyperparameters in XGBoost.

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Figure S3. Scatter density plot comparing the accuracy of different products (e.g., 0, 10, and 40 cm)

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Figure S4. The difference in spatial performance after modeling different rotations separately (Rotation1-Rotation 6) and the average value of all different rotations (Estimated_ T_s) within the same sub-region (29°N–35°N, 98°E–106°E)



Figure S5. Inversion results for different feature combinations (a, b) using all feature variables; (c, d) excluding the Daily_mean_LST variable.)