SUPPORTING INFORMATION

SI text

1. Algorithm of random sample method

We randomly sampled one thousand 40 km × 40 km grid cells that have at least 10% fractional cover of planted forests by the following algorithm.

Step 1, a point (latitude and longitude values) is randomly generated within China as the center of a 40 km × 40 km grid cell.

Step 2, if there are more than 10% planted forest pixels in the 40 km × 40 km grid cell sampled by Step 1, this grid cell is selected and the number of total sample grid cells plus one. Otherwise, this random sample grid cell is discarded and the number of total sample grid cells is unchanged.

Step 3, if the number of total sample grid cells is smaller than 1000, then go to Step 1. Otherwise stop and finish.

2. Regular grid sample method

We aggregated the MODIS 1km land cover map and plantation map of China into grids of 40 km by 40 km (sample every 40 km from 55°N to 15°N and every 40 km from 70°E to 140°E). There are total 594 grid cells that have at least 10% fractional cover of planted forests. To minimize the effect of elevation on ΔLST, we only selected grid cells in which elevation difference in the range of -100~100 m between PF and NF, GR and CR for further analysis. This resulted in 480, 94 and 97 sample grid cells for comparison between PF and NF, GR and CR, respectively (Fig. S23). The spatial distributions of the sampled grid cells by regular grid sample method are similar with that by random sample method (Fig. S1 and S23). The results of sampled grid cells by regular grid sample method are similar as that shown in the main text (Fig. S24).

Figure S1. The spatial distributions of the sampled grid cells by random sample method. (**A**) 787 sample grid cells for comparison between planted forests (PF) and nature forests (NF). (**B**) 163 sample grid cells for comparison between planted forests (PF) and grasslands (GR). (**C**) 155 sample grid cells for comparison between planted forests (PF) and croplands (CR). The red dots are the locations of the sample grid cells center.

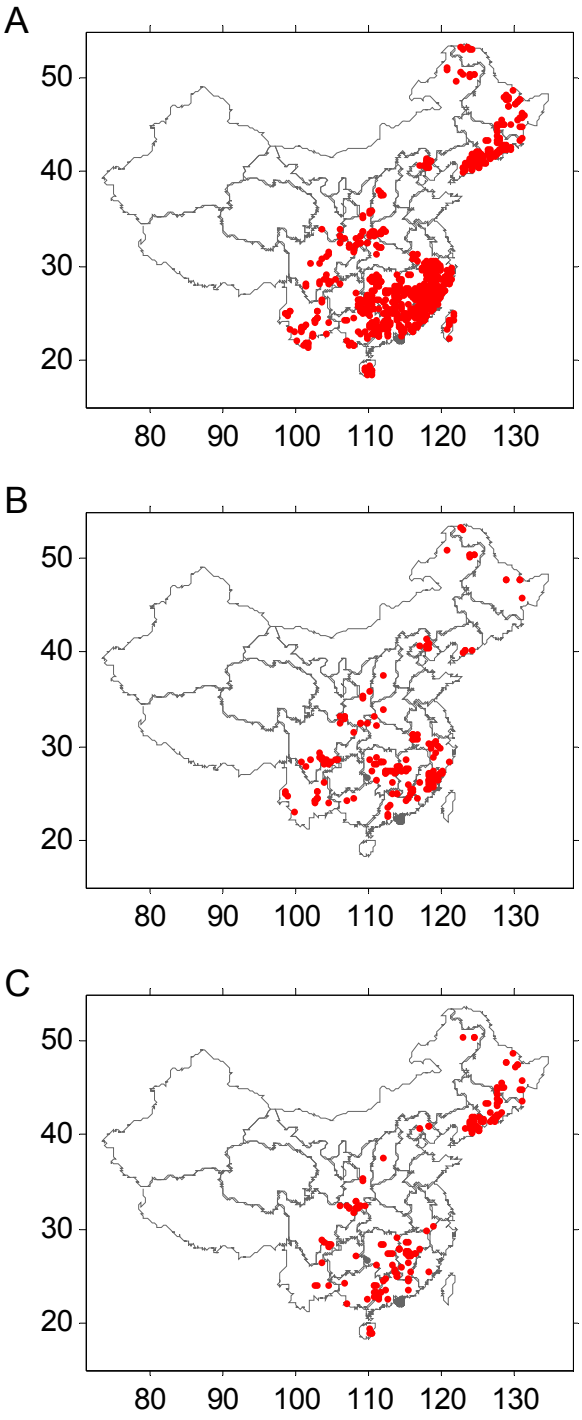

Figure S2. The spatial distributions of annual daytime ΔLST. (**A**) Daytime ΔLST between planted forests (PF) and nature forests (NF). (**B**) Daytime ΔLST between planted forests (PF) and grasslands (GR). (**C**) Daytime ΔLST between planted forests (PF) and croplands (CR). The right panels of **A**, **B** and **C** show the frequency distributions of corresponding daytime ΔLST.

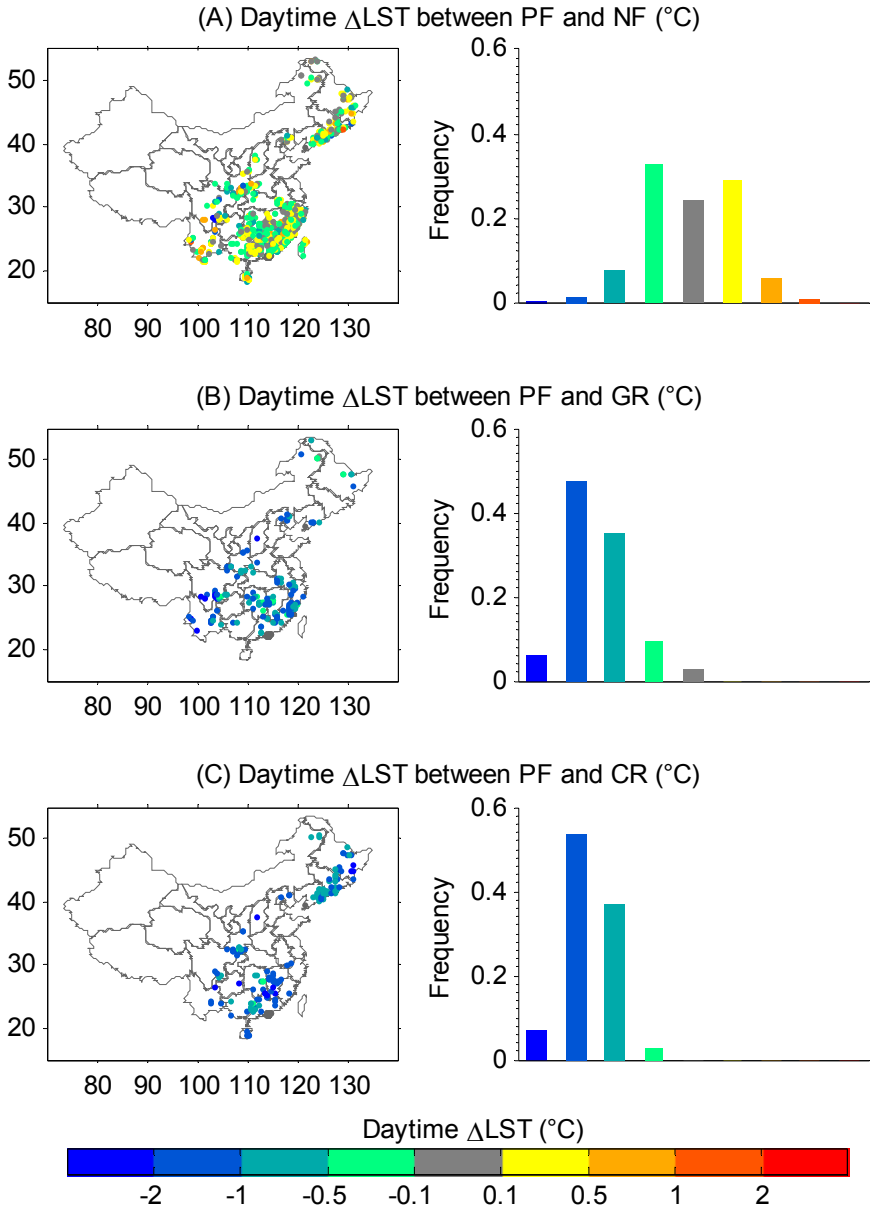

Figure S3. The spatial distributions of annual nighttime ΔLST. (**A**) Nighttime ΔLST between planted forests (PF) and nature forests (NF). (**B**) Nighttime ΔLST between planted forests (PF) and grasslands (GR). (**C**) Nighttime ΔLST between planted forests (PF) and croplands (CR). The right panels of **A**, **B** and **C** show the frequency distributions of corresponding nighttime ΔLST.

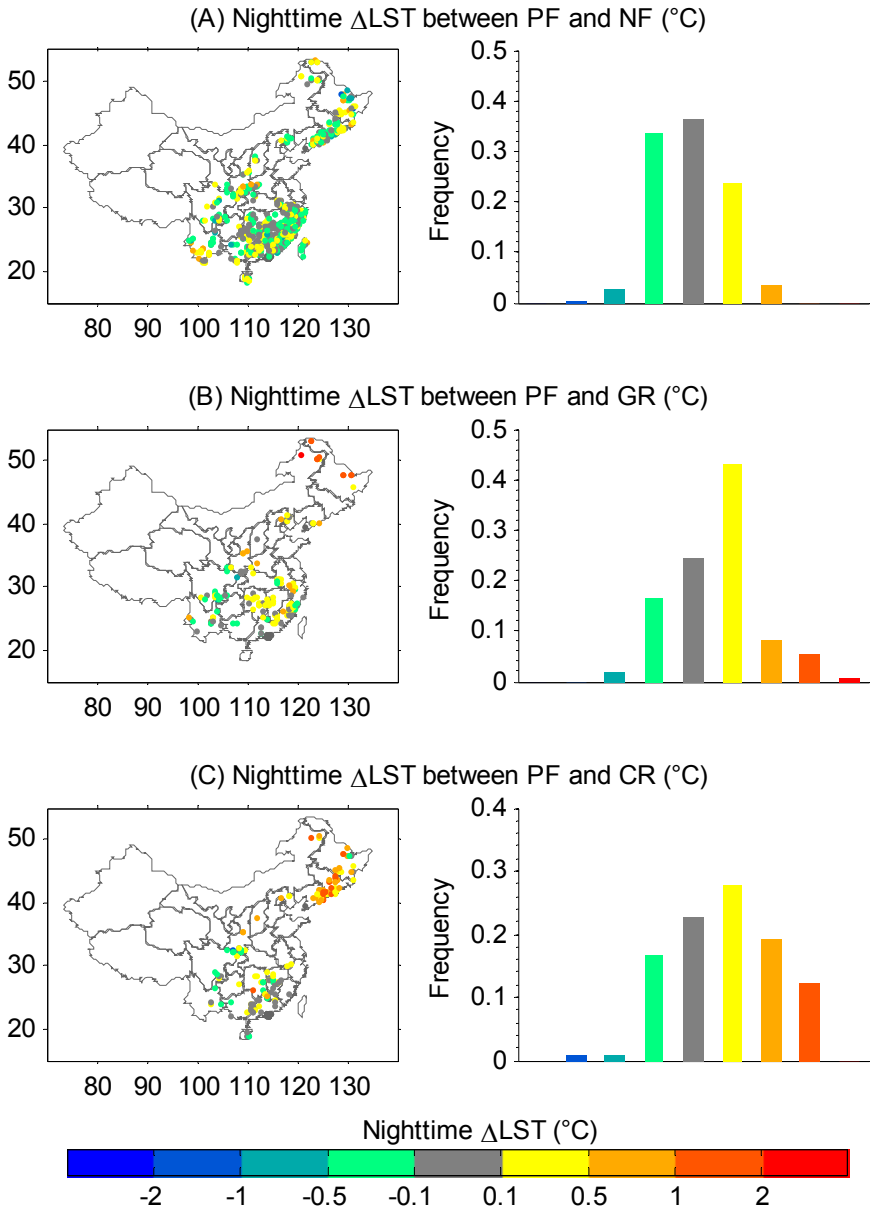

Figure S4. The spatial distributions of annual ΔAlbedo. (**A**) ΔAlbedo between planted forests (PF) and nature forests (NF). (**B**) ΔAlbedo between planted forests (PF) and grasslands (GR). (**C**) ΔAlbedo between planted forests (PF) and croplands (CR). The right panels of **A**, **B** and **C** show the frequency distributions of corresponding ΔAlbedo.

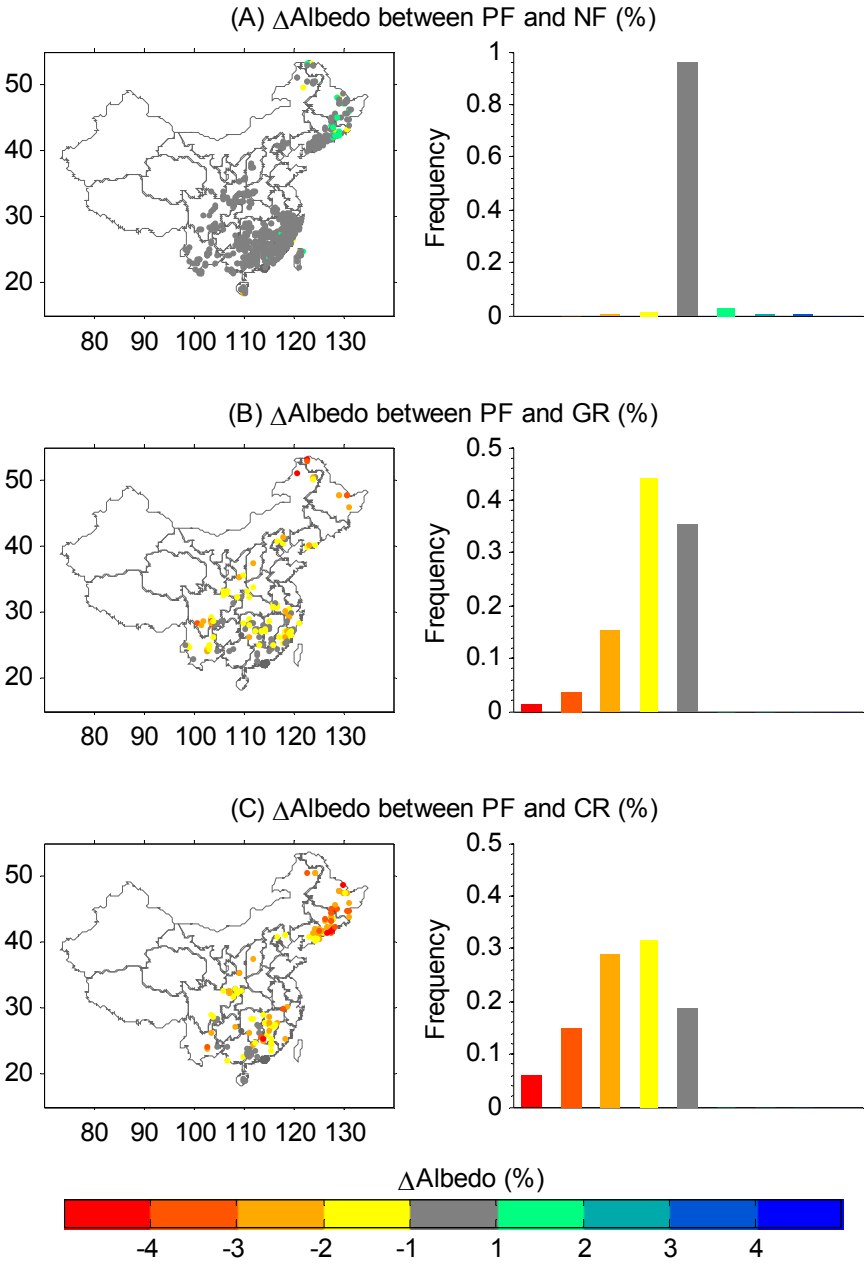

Figure S5. The spatial distributions of annual ΔET. (**A**) ΔET between planted forests (PF) and natural forests (NF). (**B**) ΔET between planted forests (PF) and grasslands (GR). (**C**) ΔET between planted forests (PF) and croplands (CR). The right panels of **A**, **B** and **C** show the frequency distributions of corresponding ΔET.

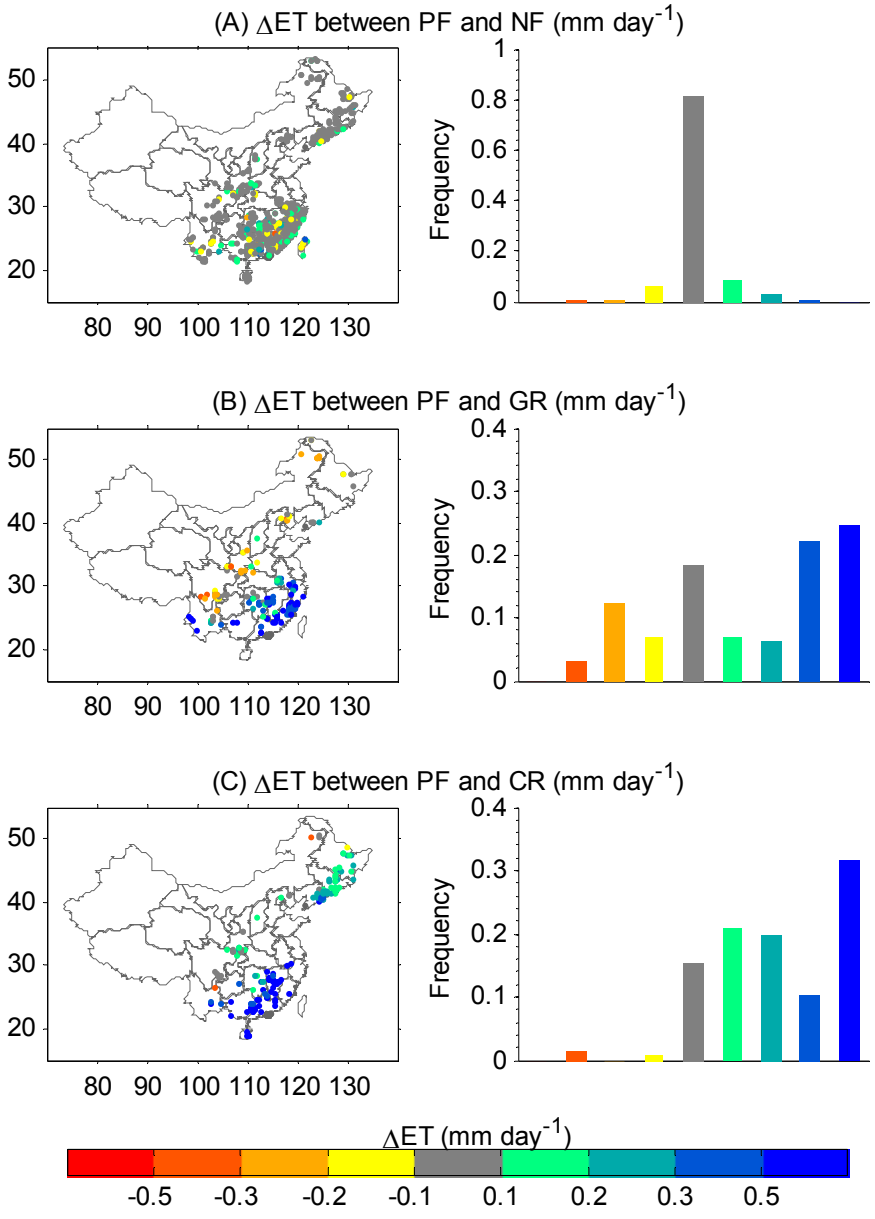

Figure S6. The average of annual daytime and nighttime ΔLST between planted forests and grasslands is shown for different ΔET (mm day^{-1}) and ΔAlbedo (%) bins. The insets show the correlation between annual daytime and nighttime ΔLST and ΔET and ΔAlbedo. Average annual daytime (**A**) and nighttime (**B**) ΔLST for different ΔET binned into 0.5 mm day^{-1} intervals. Average annual daytime (**C**) and nighttime (**D**) ΔLST for different ΔAlbedo binned into 1% intervals.

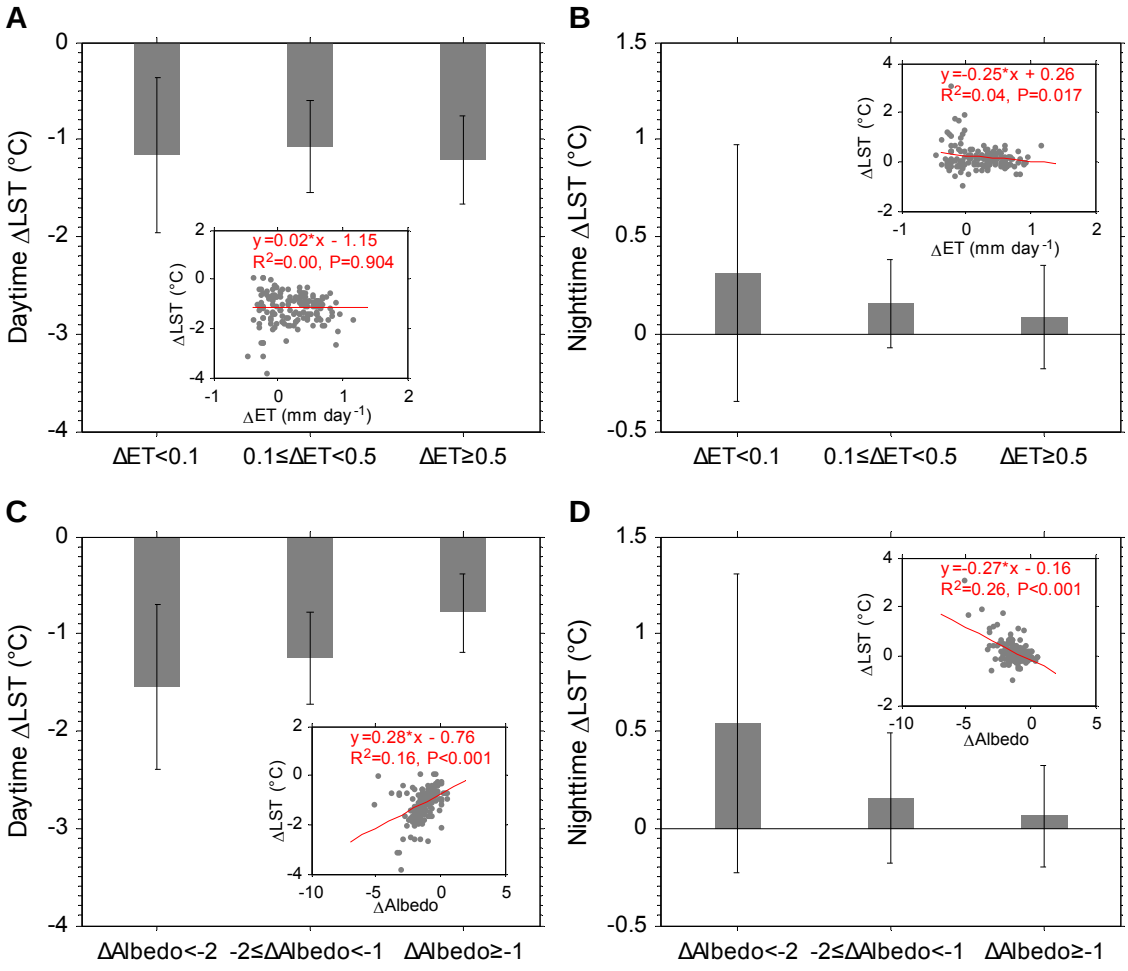

Figure S7. The average of annual daytime and nighttime ΔLST between planted forests and croplands is shown for different ΔET (mm day^{-1}) and ΔAlbedo (%) bins. The insets show the correlation between annual daytime and nighttime ΔLST and ΔET and ΔAlbedo. Average annual daytime (**A**) and nighttime (**B**) ΔLST for different ΔET binned into 0.5 mm day^{-1} intervals. Average annual daytime (**C**) and nighttime (**D**) ΔLST for different ΔAlbedo binned into 1% intervals.

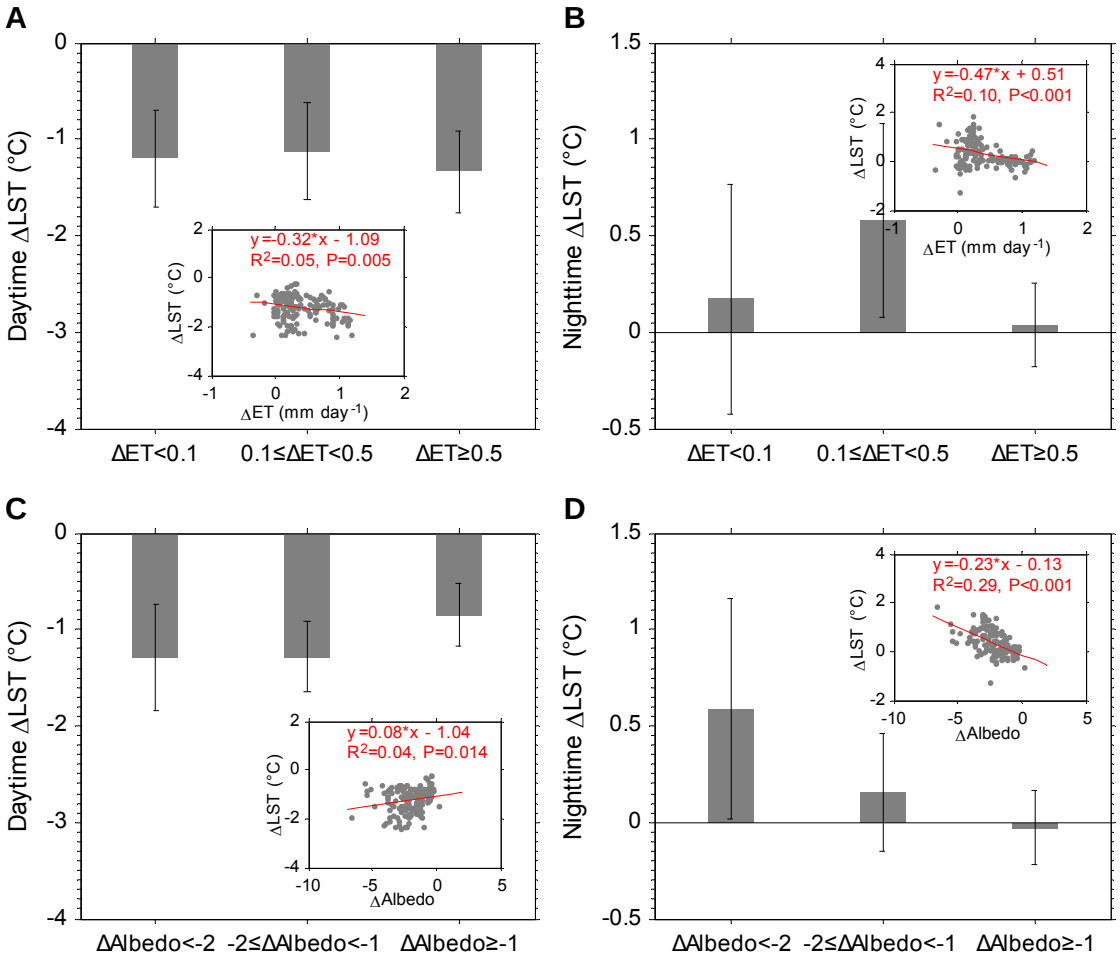

Figure S8. The relationships between annual daytime ΔLST and ΔET are shown for different ΔAlbedo bins. (**A**) ΔAlbedo<-2%, (**B**) -2%≤ΔAlbedo<-1% and (**C**) ΔAlbedo≥-1% between planted forests and grasslands; (**D**) ΔAlbedo<-2%, (**E**) -2%≤ΔAlbedo<-1% and (**F**) ΔAlbedo≥-1% between planted forests and croplands. The red line is the linear regressed line.

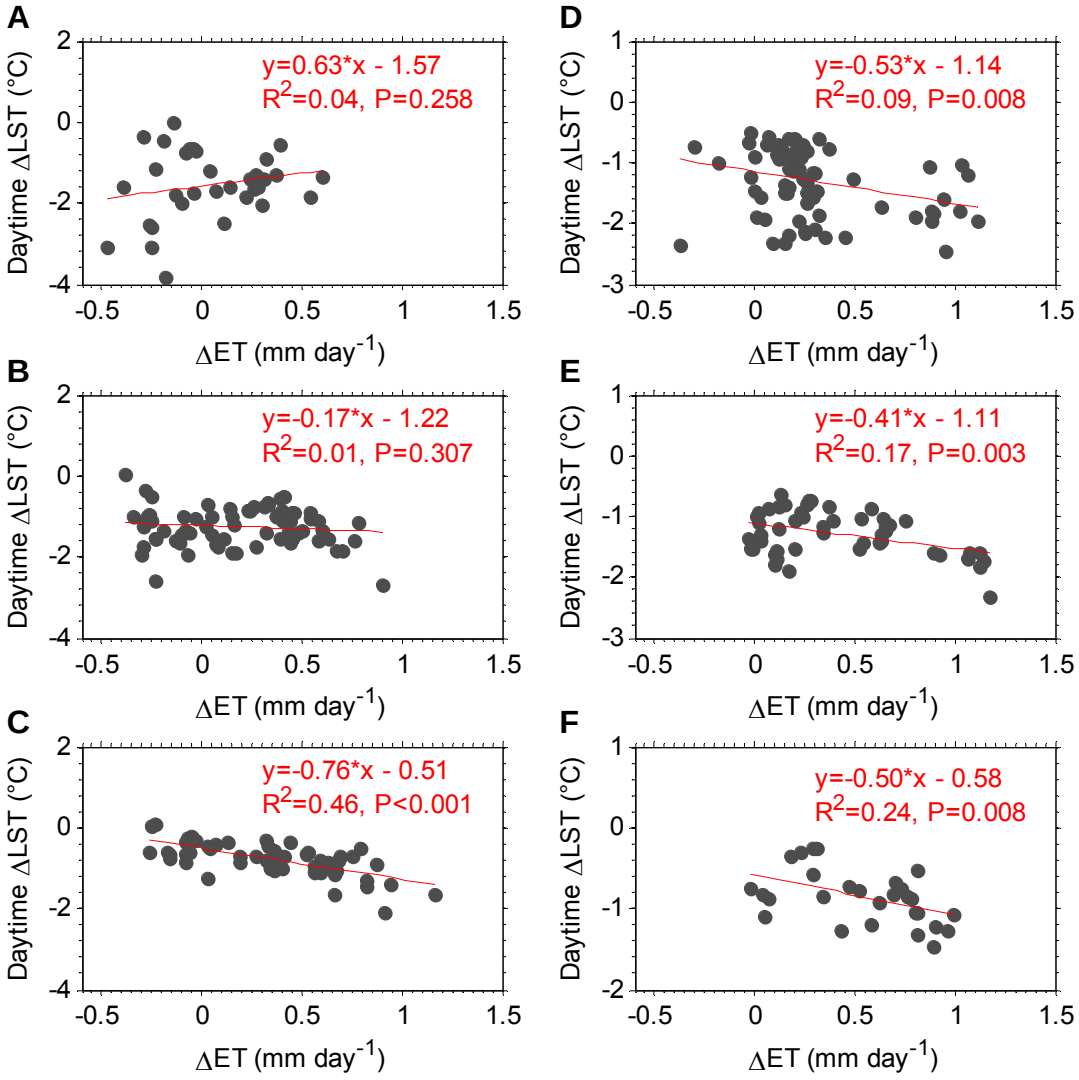

Figure S9. Box and whisker plots for annual (**A**) daytime (blue) and nighttime (red) ΔLST, (**B**) ΔAlbedo and (**C**) ΔET between planted forests and grasslands for different mean annual precipitation bins. The outliers (> 2 SD) are shown as empty circle.

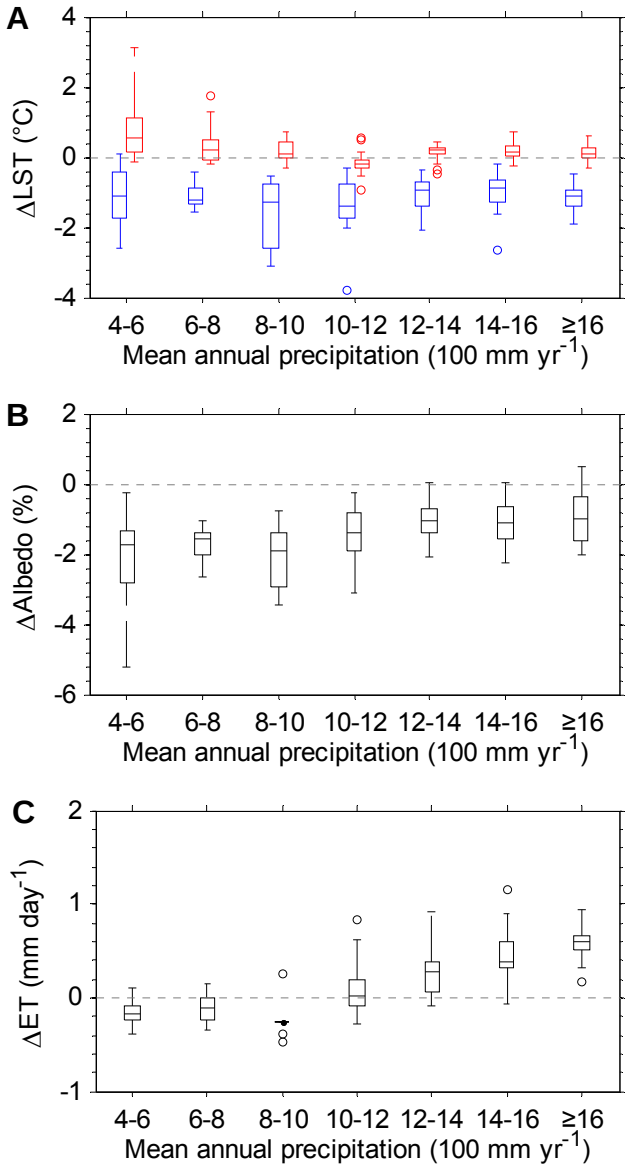

Figure S10. Box and whisker plots for annual (**A**) daytime (blue) and nighttime (red) ΔLST, (**B**) ΔAlbedo and (**C**) ΔET between planted forests and croplands for different mean annual precipitation bins. The outliers (> 2 SD) are shown as empty circle.

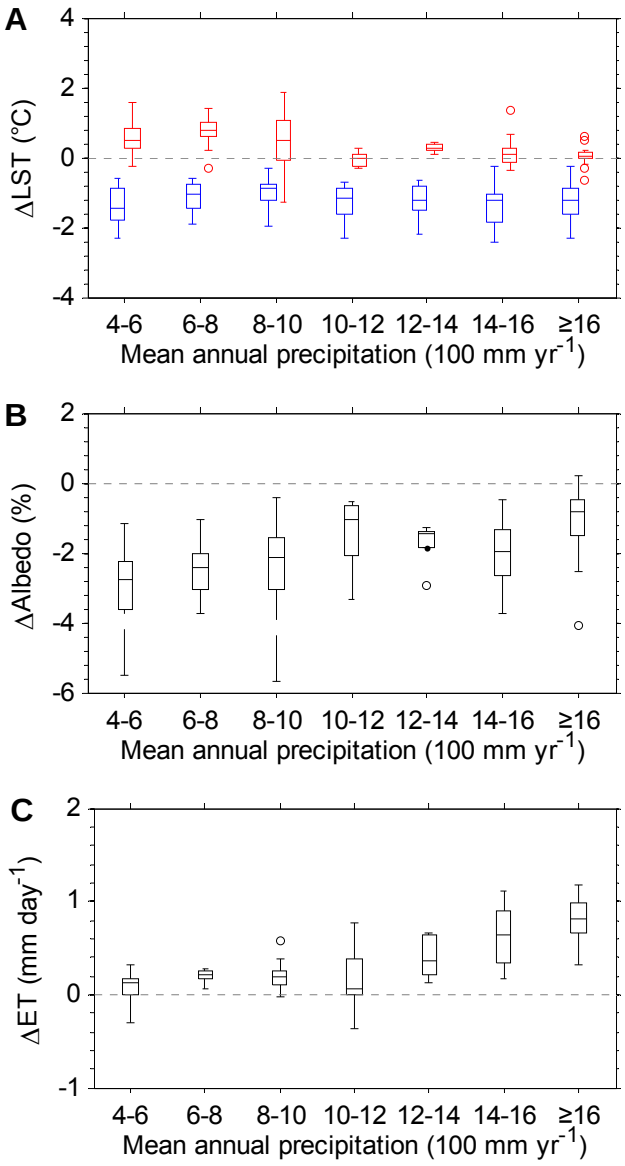

Figure S11. Fraction of sample grid cells with daily mean ΔLST > 0 °C (i.e. nighttime warming effect surpasses daytime cooling) between planted forests and (**A**) grasslands and (**B**) croplands for different mean annual precipitation bins. The number of sample grid cells (N) is also marked for each mean annual precipitation bin.

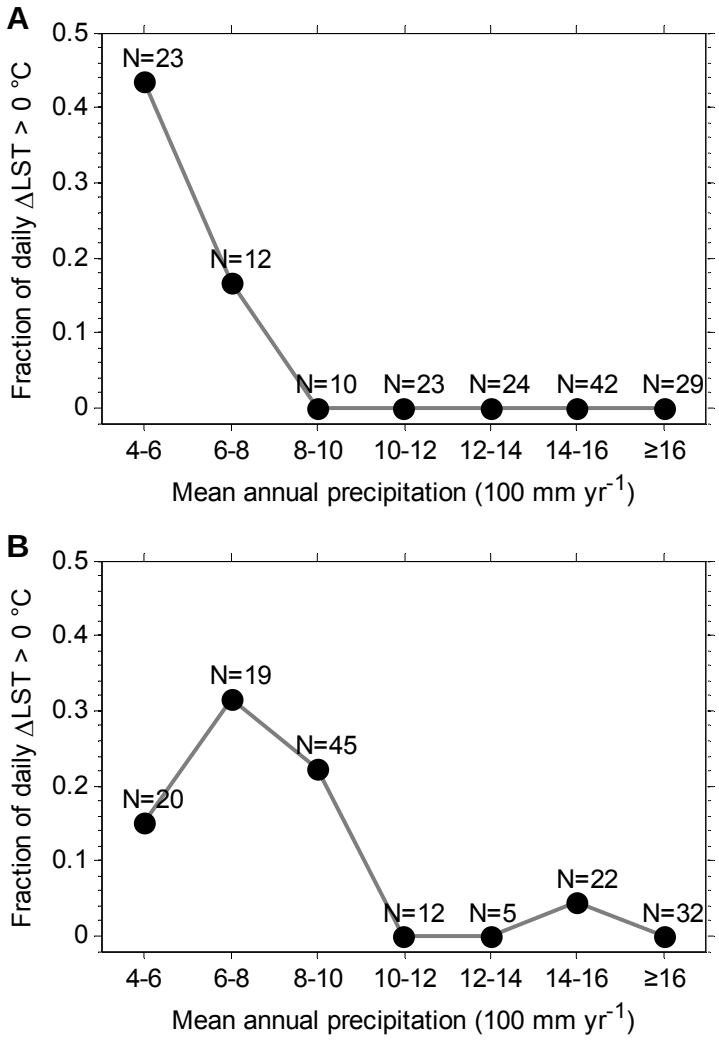

Figure S12. Box and whisker plots for annual (**A**) daytime (blue) and nighttime (red) ΔLST, (**B**) ΔAlbedo and (**C**) ΔET between planted forests and grasslands for different latitude bins. The outliers (> 2 SD) are shown as empty circle.

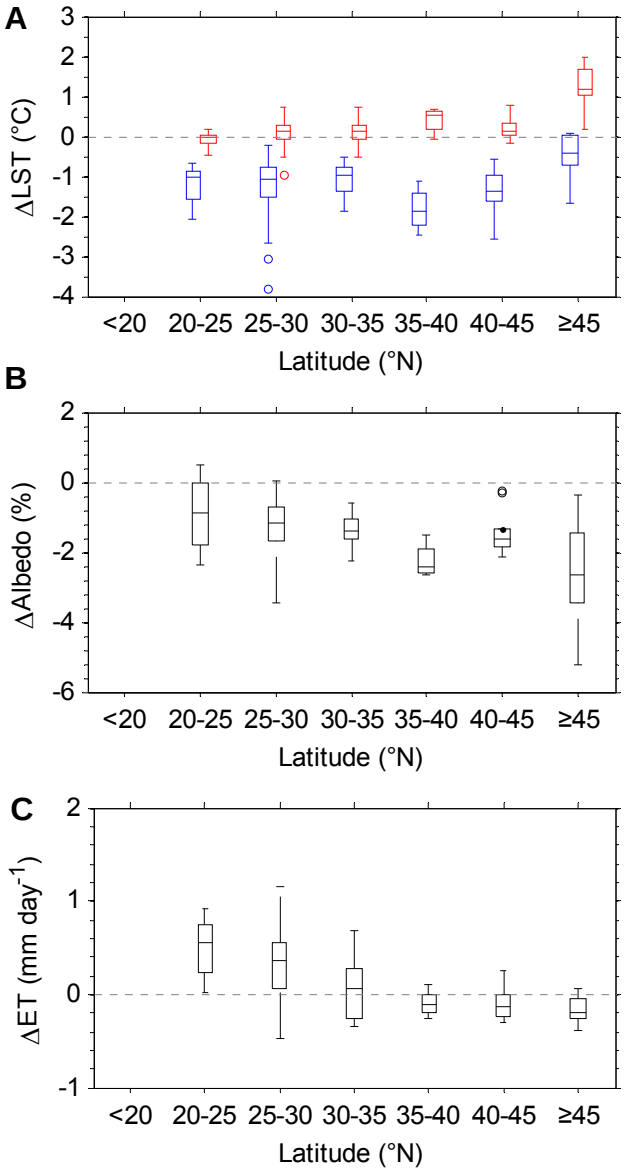

Figure S13. Box and whisker plots for annual (**a**) daytime (blue) and nighttime (red) ΔLST, (**b**) ΔAlbedo and (**c**) ΔET between planted forests and croplands for different latitude bins. The outliers (> 2 SD) are shown as empty circle.

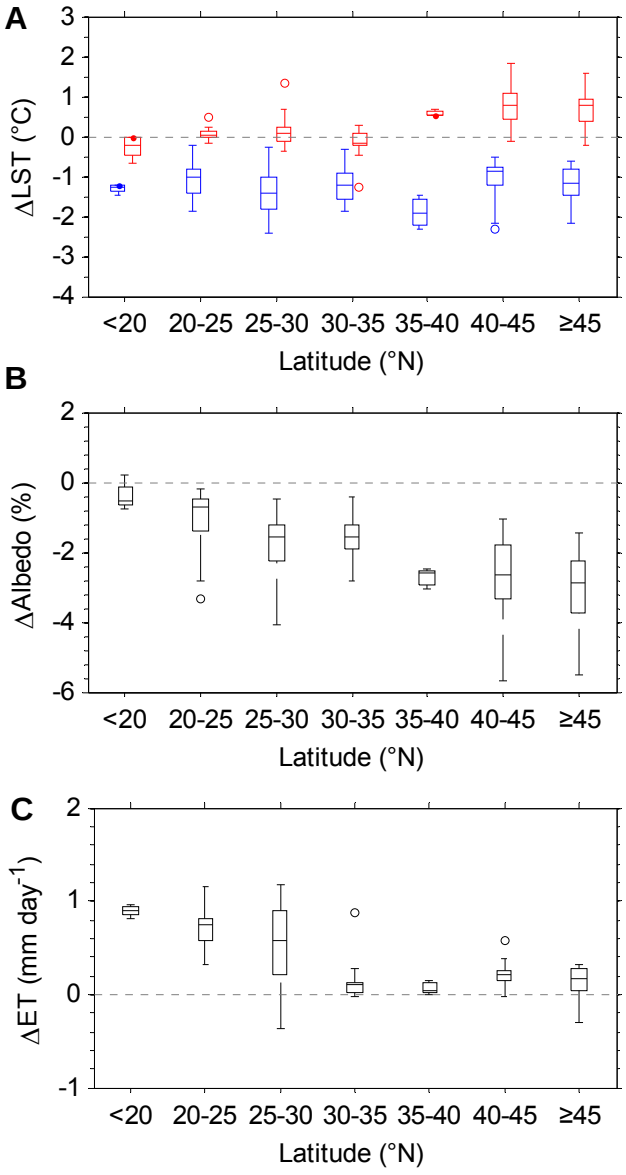

Figure S14. Box and whisker plots for (a) Spring, (b) summer, (c) autumn, (d) winter and (e) annual difference in absorbed solar radiation (ΔRn = -1*ΔAlbedo* incoming solar radiation) and ΔET between planted forests and grasslands for different latitude bins. Red and blue boxes indicate ΔRn and ΔET, respectively. Red and blue lines are the linear regressed line for ΔRn and ΔET along latitude, respectively. The outliers (> 2 SD) are shown as empty circle.

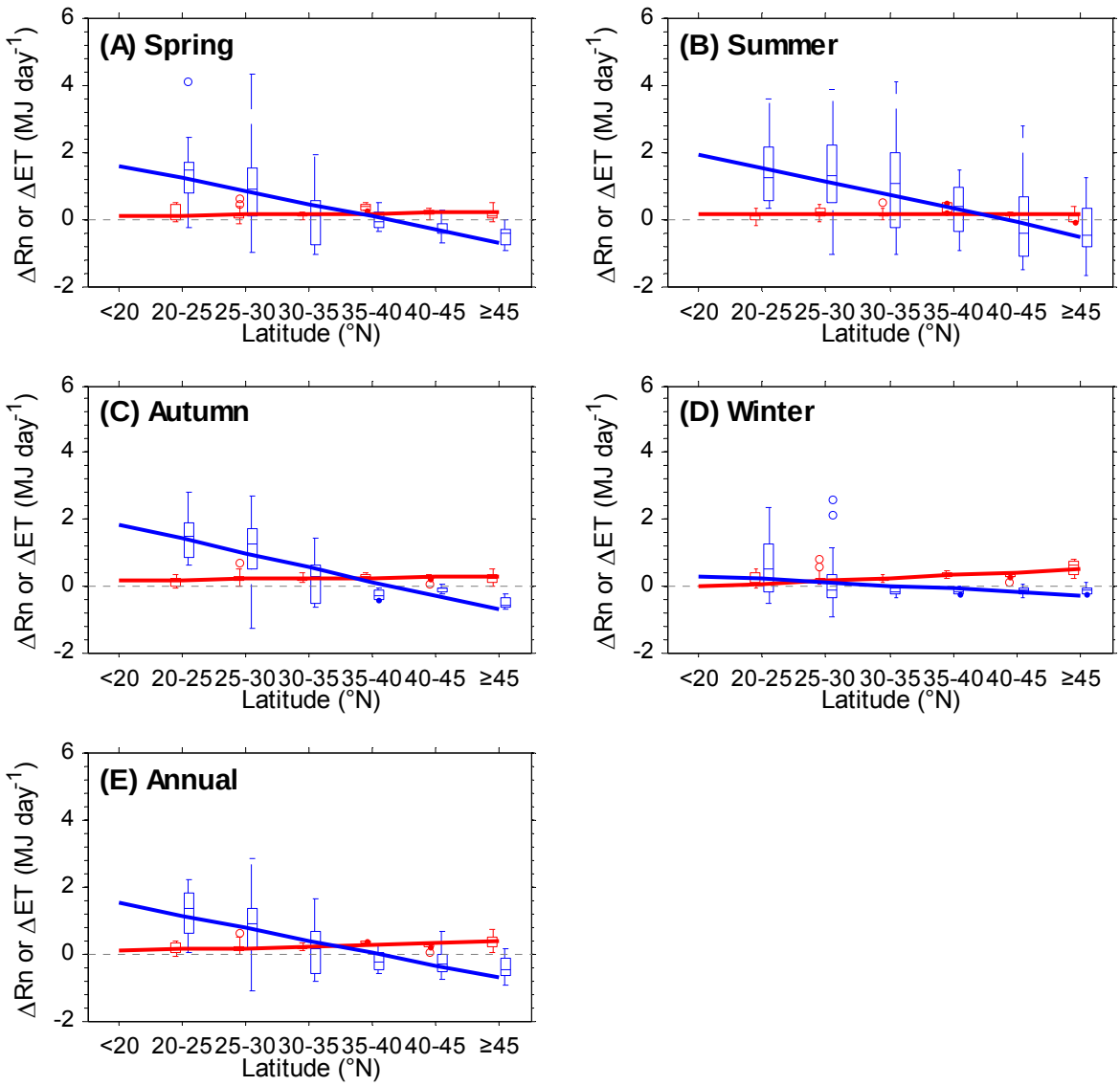

Figure S15. Box and whisker plots for (a) Spring, (b) summer, (c) autumn, (d) winter and (e) annual difference in absorbed solar radiation (ΔRn = -1*ΔAlbedo* incoming solar radiation) and ΔET between planted forests and croplands for different latitude bins. Red and blue boxes indicate ΔRn and ΔET, respectively. Red and blue lines are the linear regressed line for ΔRn and ΔET along latitude, respectively. The outliers (> 2 SD) are shown as empty circle.

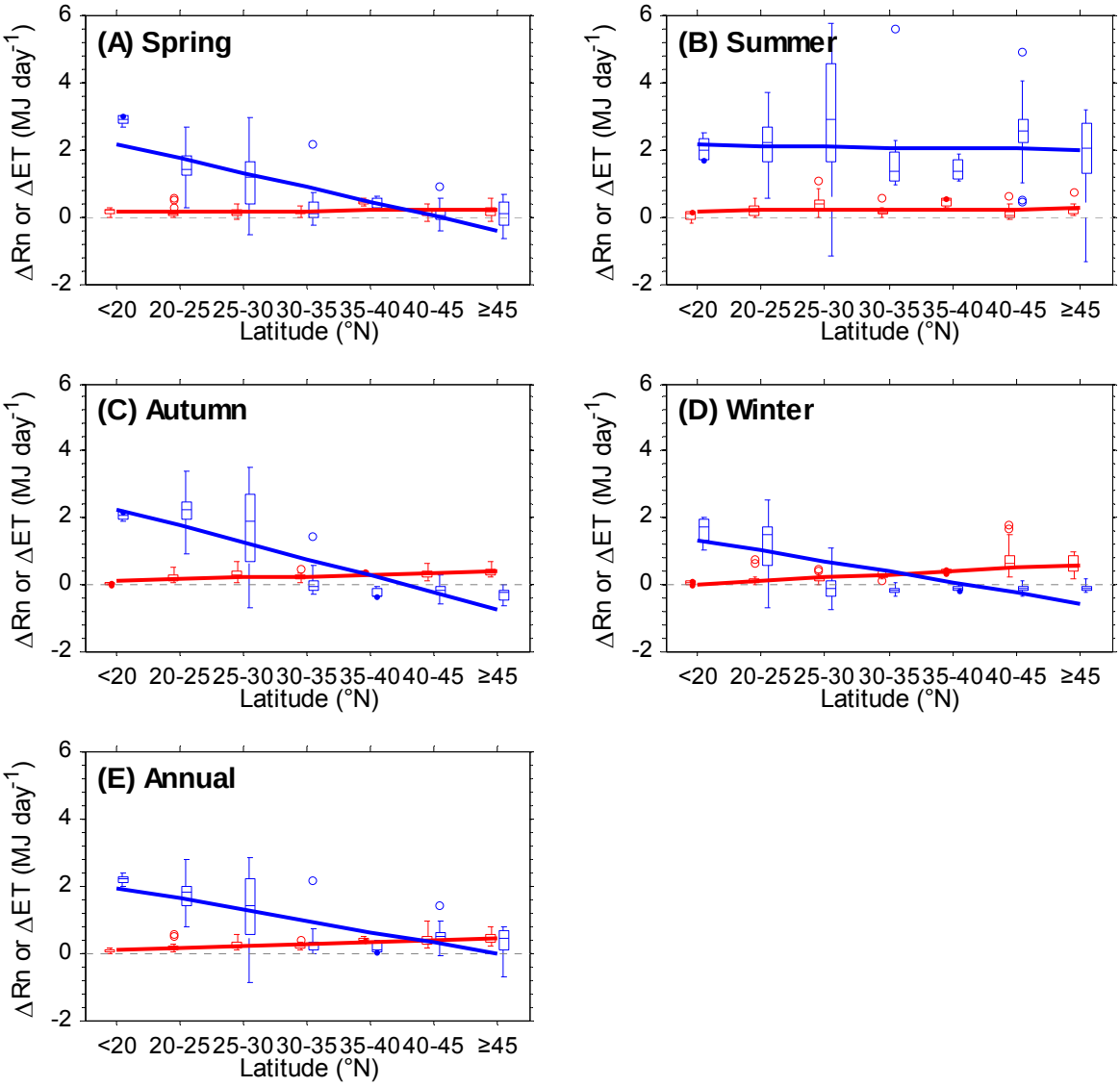

Figure S16. Box and whisker plots for winter (**A**) daytime (blue) and nighttime (red) ΔLST, (**B**) ΔAlbedo and (**C**) ΔET between planted forests and grasslands for different latitude bins. The outliers (> 2 SD) are shown as empty circle.

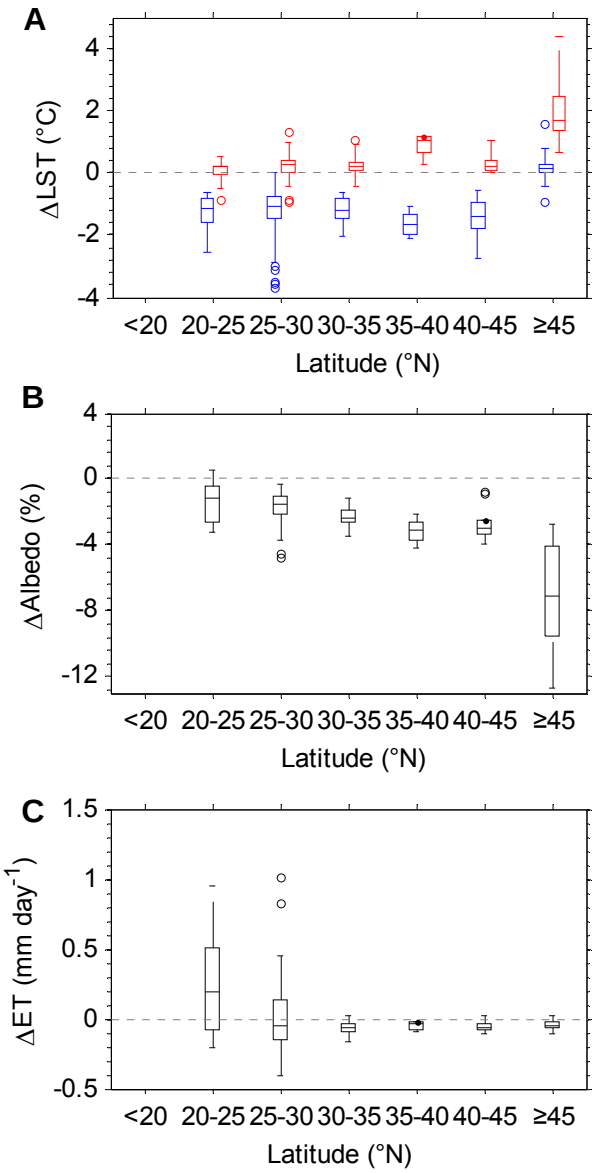

Figure S17. Box and whisker plots for winter (**A**) daytime (blue) and nighttime (red) ΔLST, (**B**) ΔAlbedo and (**C**) ΔET between planted forests and croplands for different latitude bins. The outliers (> 2 SD) are shown as empty circle.

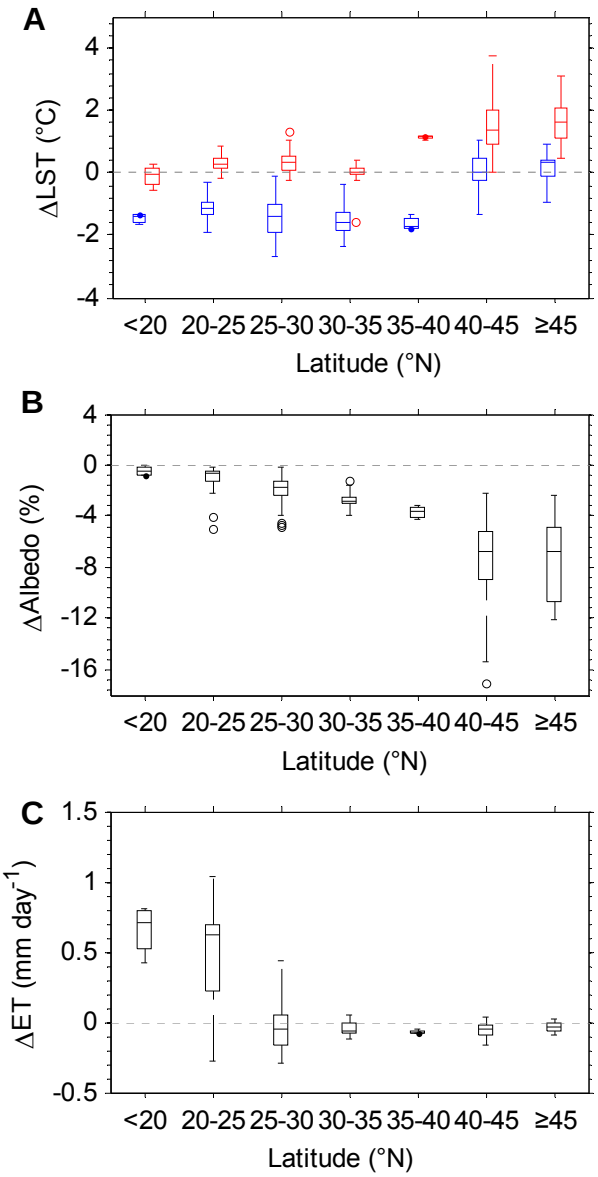

Figure S18. The mean seasonal cycle of differences in (**A**) daytime and (**B**) nighttime land surface temperature (ΔLST), (**C**) albedo (ΔAlbedo, %) and (**D**) evapotranspiration (ΔET, mm day^{-1}) between planted forests (PF) and the surrounding grasslands (GR) and croplands (CR) in southern China (south of 35°N) during the period 2003-2010. The colorful lines and lighted shaded areas represent the mean and standard deviation of all sample grid cells south of 35°N, respectively.

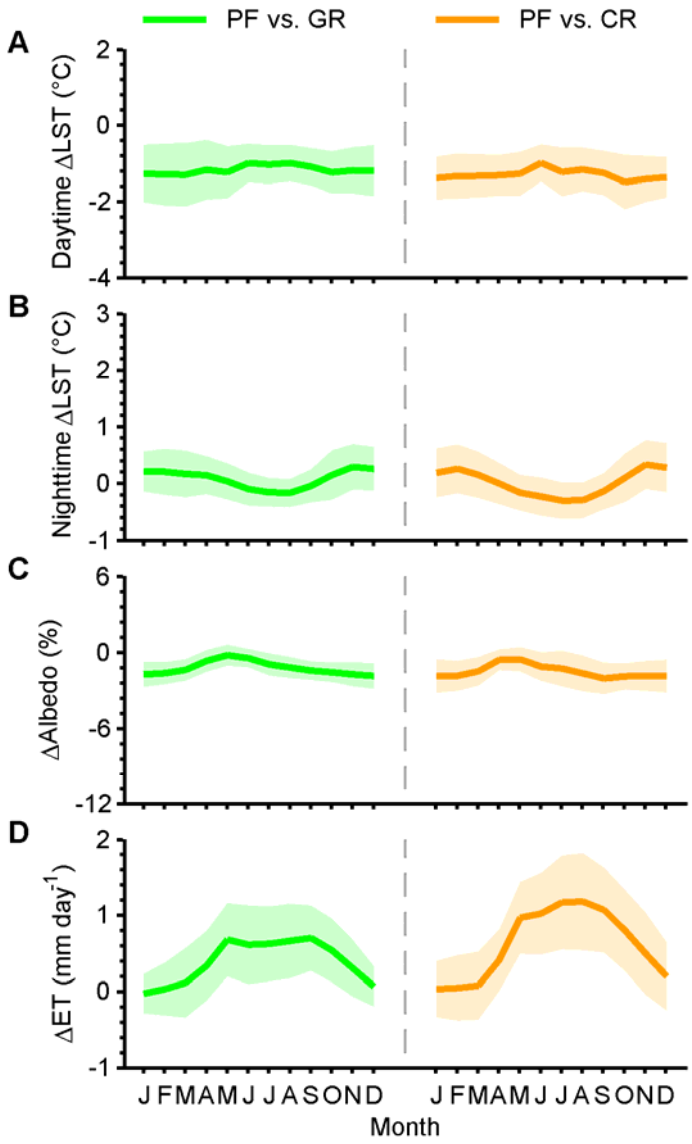

Figure S19. Relationships between fraction of planted forests (PF) pixels in the sample grid cells and annual daytime and nighttime ΔLST between planted forests and grasslands (croplands) over the 40 km × 40 km sample grid cells. (**A**) Daytime and (**B**) nighttime ΔLST between planted forests and grasslands. (**C**) Daytime and (**D**) nighttime ΔLST between planted forests and croplands.

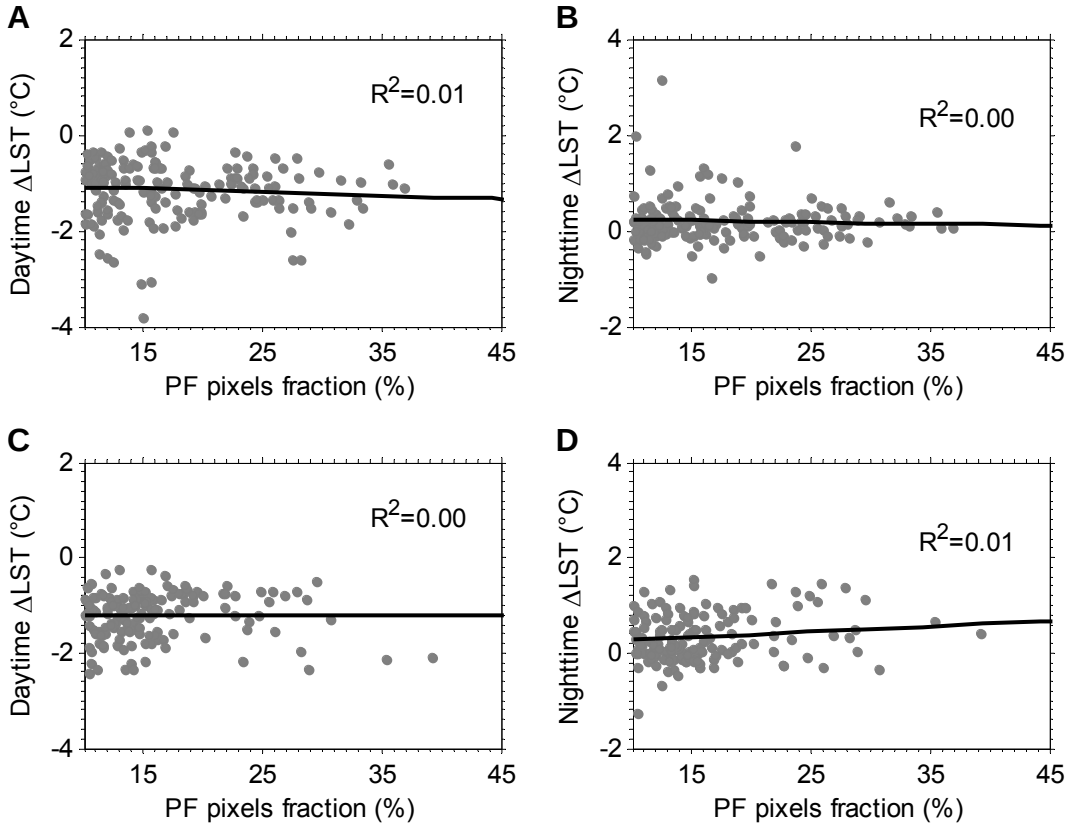

Figure S20. Relationships between difference in elevation from digital elevation model (ΔDEM) and annual daytime and nighttime ΔLST between planted forests and grasslands (croplands) across the sample grid cells. (**A**) Daytime and (**B**) nighttime ΔLST between planted forests and grasslands. (**C**) Daytime and (**D**) nighttime ΔLST between planted forests and croplands.

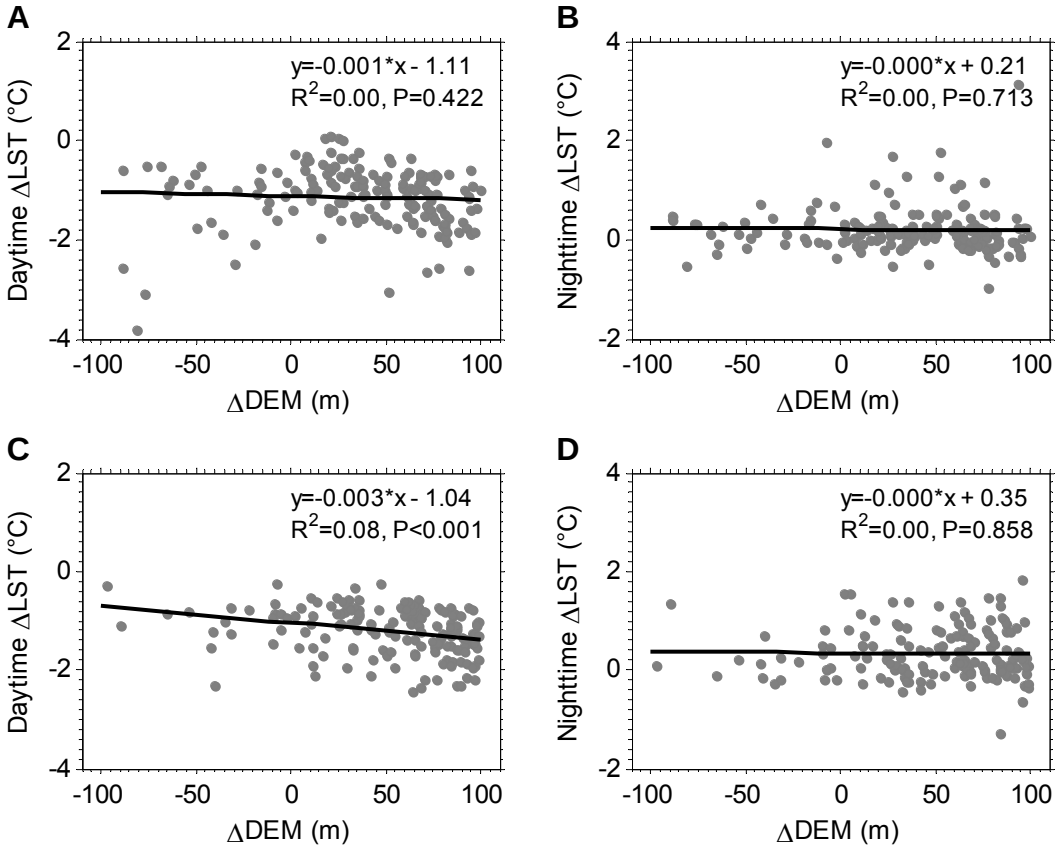

Figure S21. Same as Fig. 2, but for 50 km × 50 km sample grid cells.

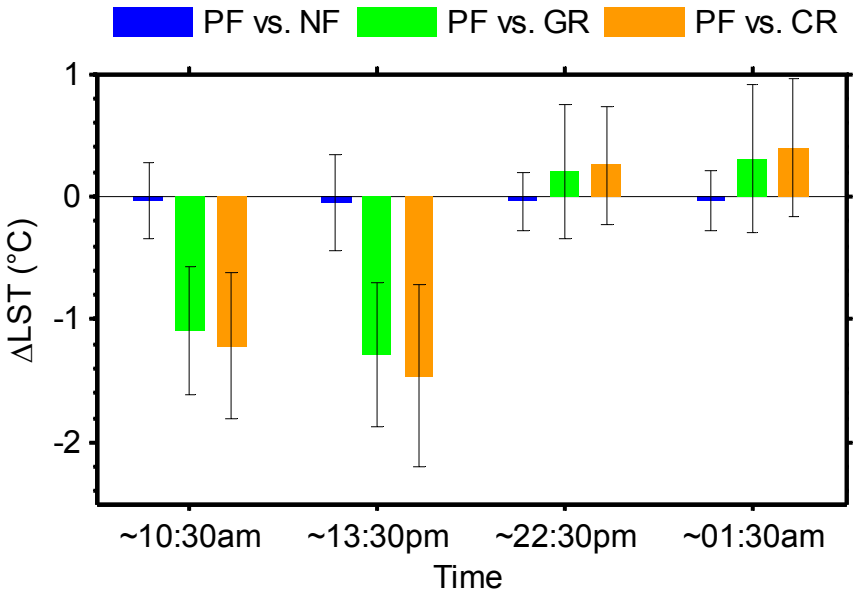

Figure S22. Same as Fig. 2, but for 100 km × 100 km sample grid cells.

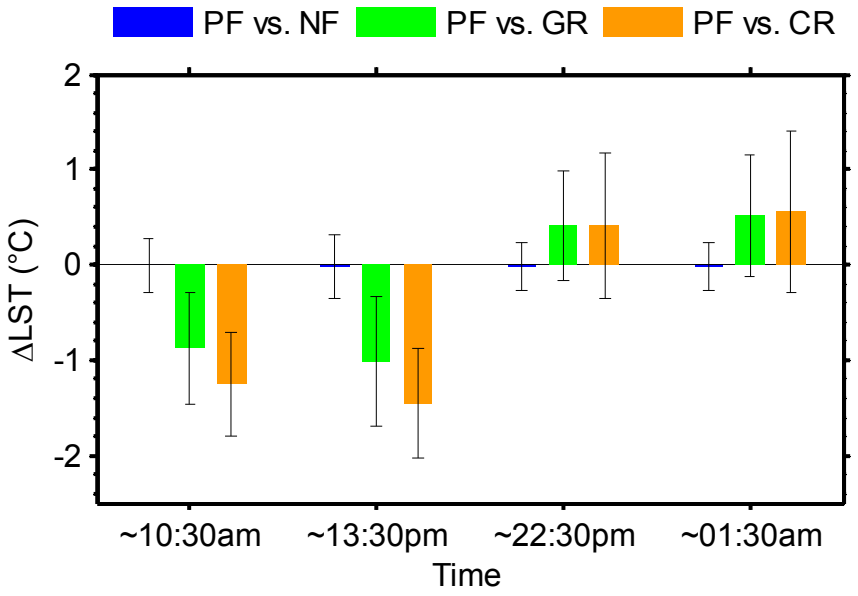

Figure S23. The spatial distributions of sample grid cells by regular grid sample method. **A**, 480 sample grid cells for comparison between planted forests and natural forests. **B**, 94 sample grid cells for comparison between planted forests and grasslands. **C**, 160 sample grid cells for comparison between planted forests and croplands. The red dots are the locations of the sample grid cells center.

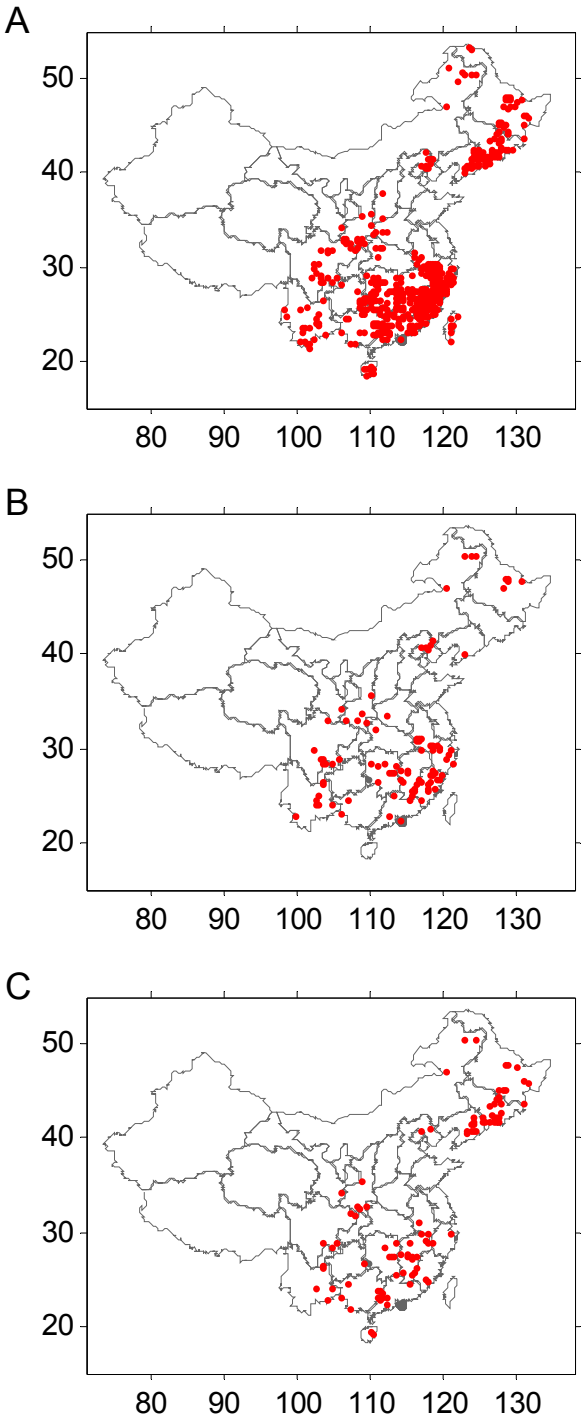

Figure S24. Same as Fig. 2, but for regular grid sample method.