Supplementary Information for

Decreased cloud cover partially offsets the cooling effects of surface albedo change due to deforestation

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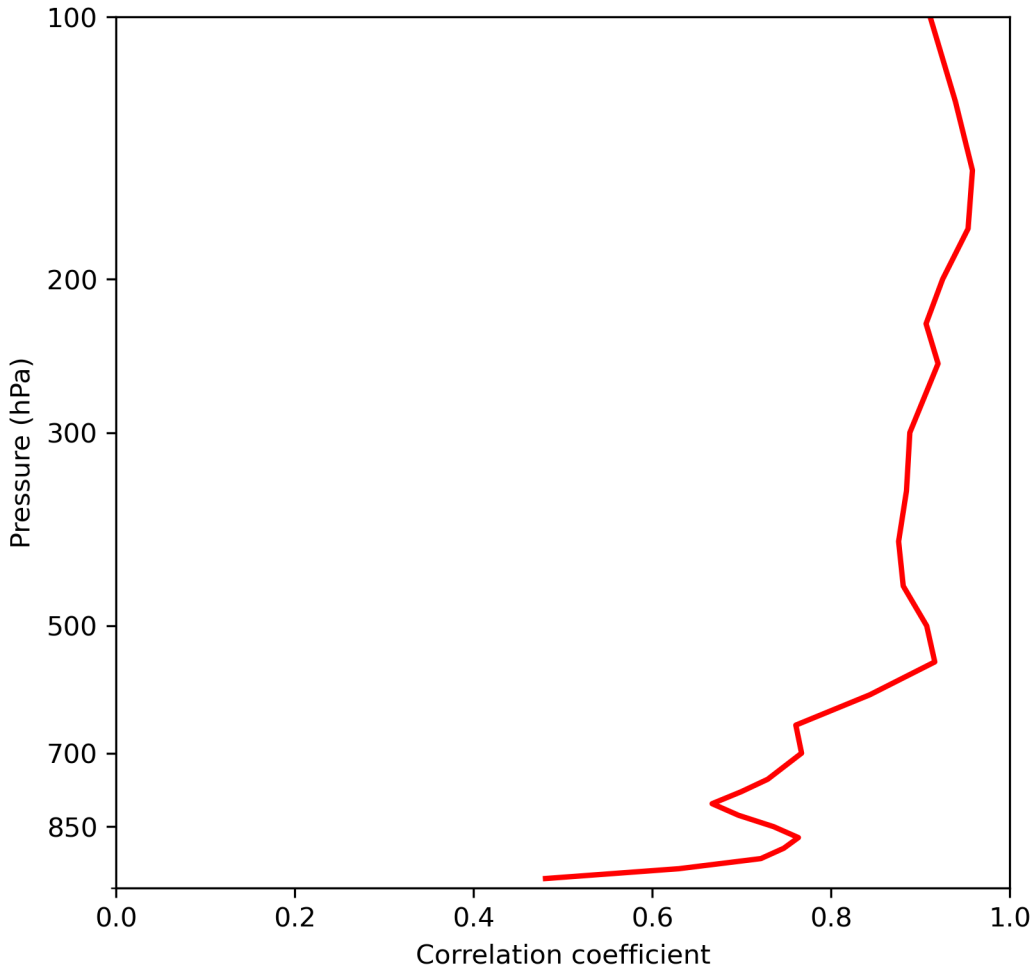
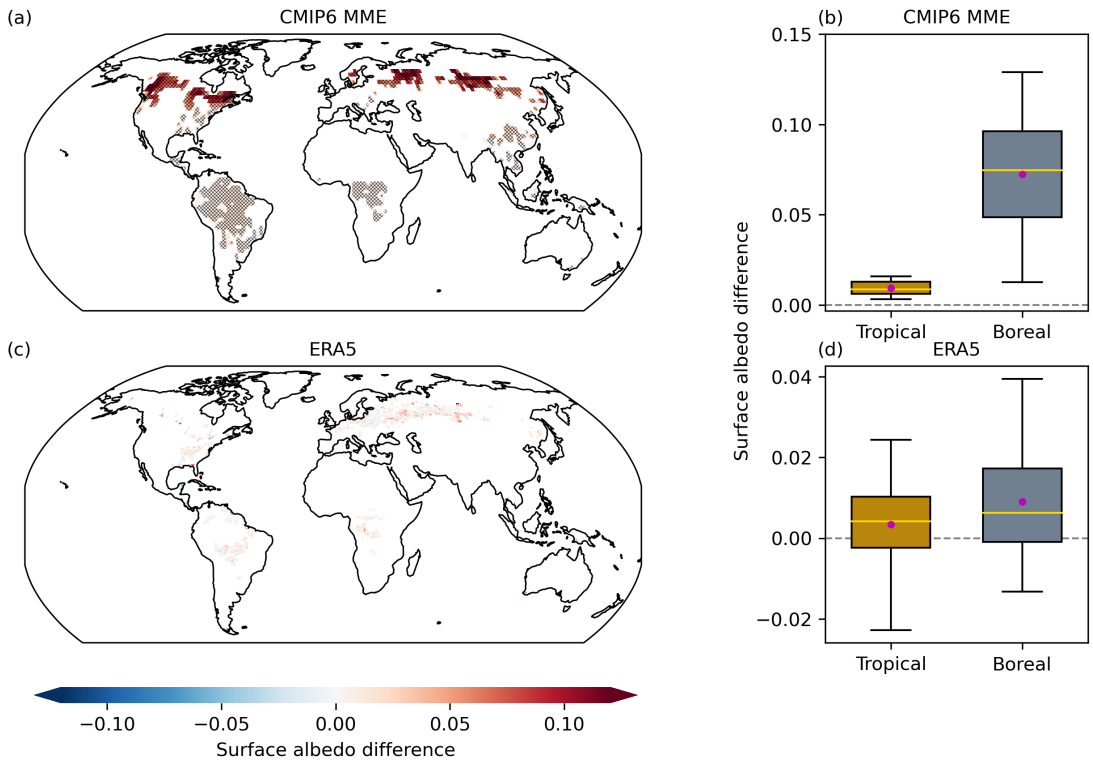
Supplementary Table 1. List of CMIP6 models used in this study. All of the simulations have the variant label 'r1i1p1f1'.

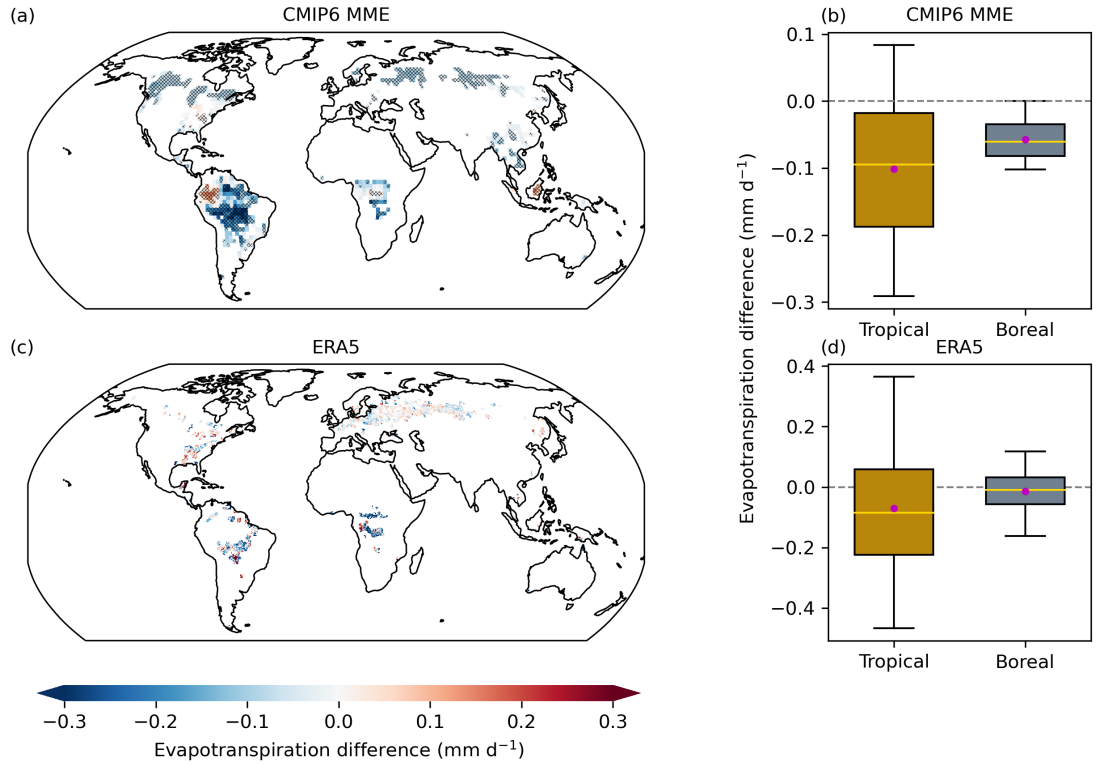
No.	Model	Grid	Level	References
1	BCC-CSM2-MR	320×160	46	Wu, et al. [1]
2	CESM2	288×192	32	Danabasoglu, et al. [2]
3	CMCC-ESM2	288×192	30	Lovato, et al. [3]
4	IPSL-CM6A-LR	144×143	79	Boucher, et al. [4]
5	NorESM2-LM	144×96	32	Seland, et al. [5]



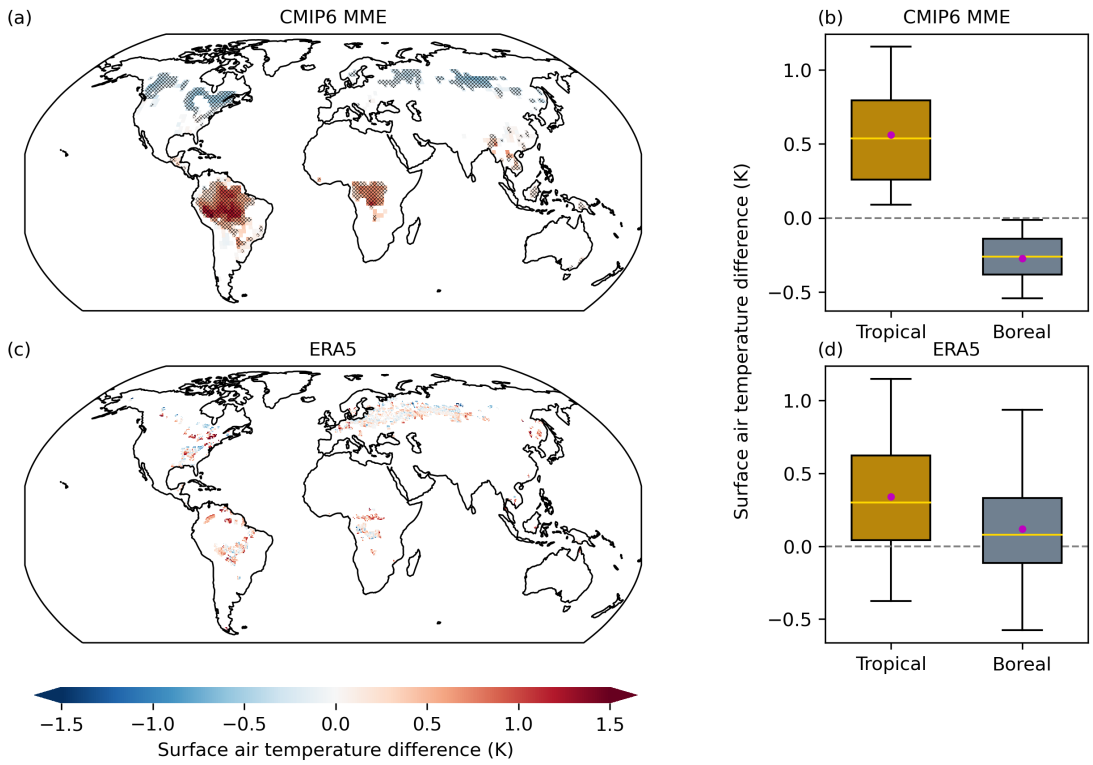
Supplementary Figure 1. Correlation coefficient for the horizontal spatial variability of the 4-year (2007−2010) average cloud profiles from ERA5 and CALIPSO-CloudSat retrievals. The ERA5 cloud profiles are bilinearly gridded spatially into 2° × 2° to align with the CALIPSO-CloudSat data.



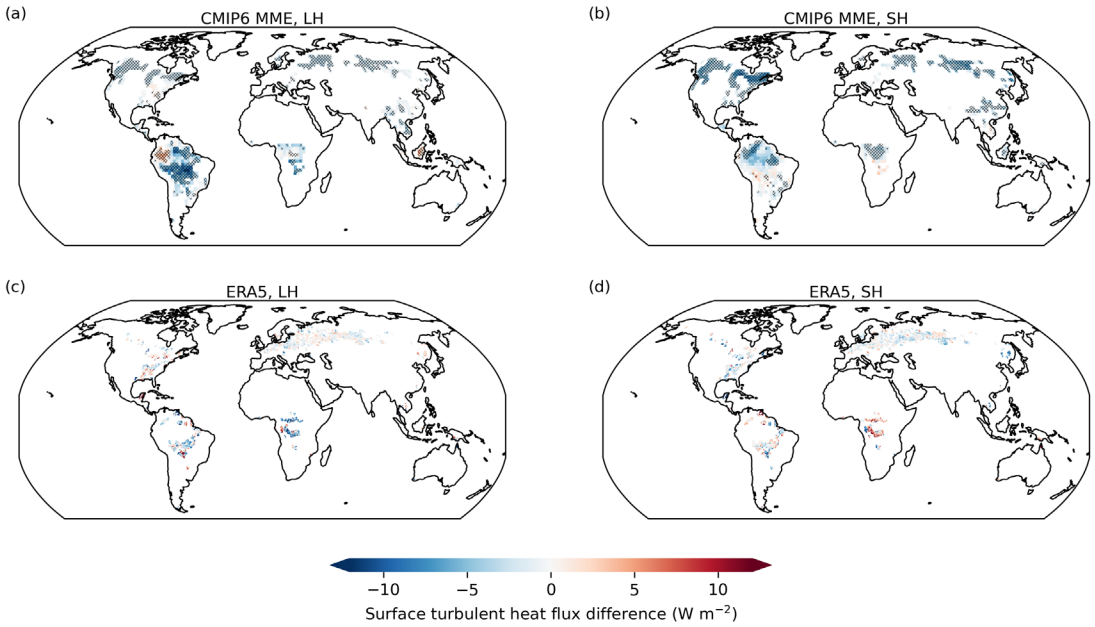
Supplementary Figure 2. Changes in surface albedo due to deforestation. (a) Global pattern of the surface albedo difference between the deforest-glob and piControl simulations (deforest-glob minus piControl). The diagonal grids indicate four or more of the five models showing the same symbol. (b) Box plots of the CMIP6 surface albedo differences between the deforest-glob and piControl simulations over both tropical and boreal areas. (c) ERA5 surface albedo variations due to deforestation using the space-for-time substitution (see Methods). (d) Box plots of the ERA5 surface albedo variations due to deforestation. The data in (a-b) is the ensemble mean of the local effect extracted from CMIP6 model simulations (see Methods). Boxes in (b and d) show the 25th to 75th percentiles of the data, whiskers display the 5th to 95th percentiles, horizontal yellow lines in the boxes represent the median values, and red dots are the mean values.



Supplementary Figure 3. Changes in evapotranspiration due to deforestation. Same as Supplementary Fig. 2 but for evapotranspiration (mm day^{-1}).



Supplementary Figure 4. Changes in surface air temperature due to deforestation. Same as Supplementary Fig. 2 but for surface air temperature.



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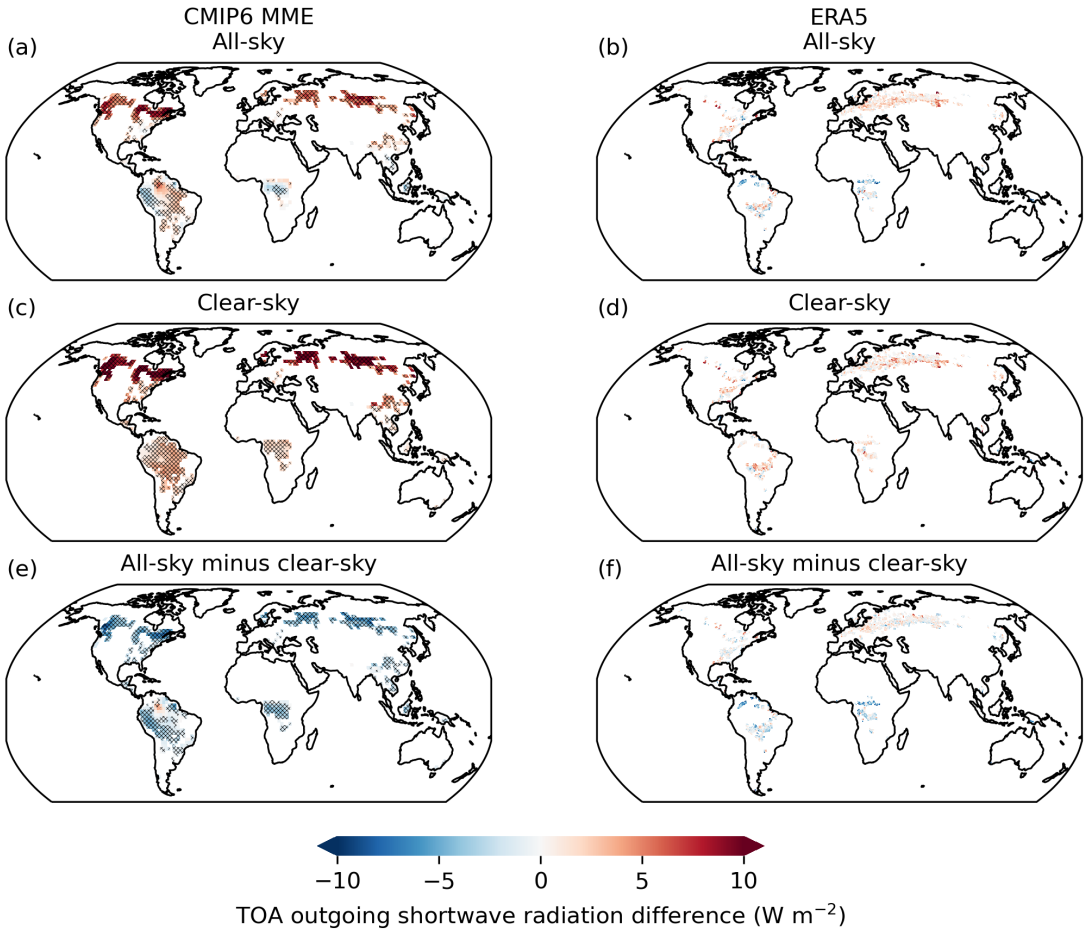
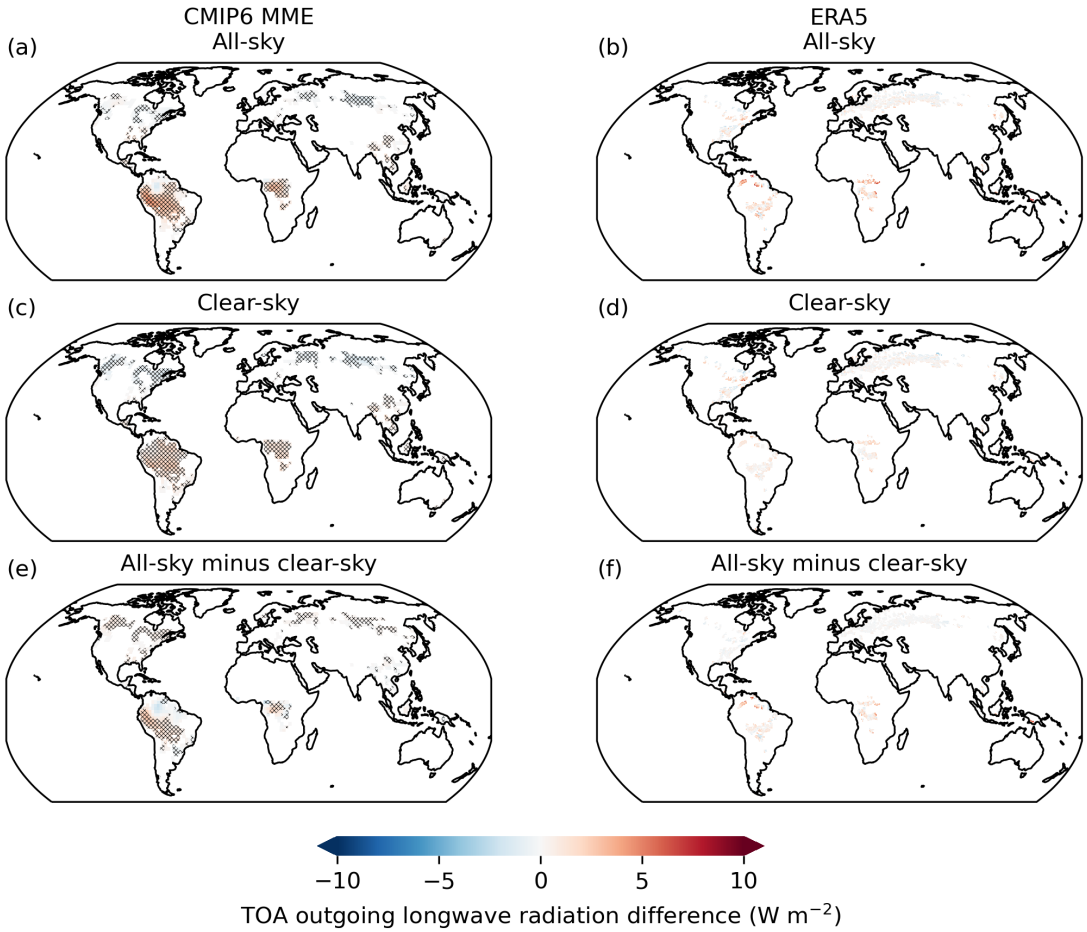
43 **Supplementary Figure 5. Changes in surface turbulent heat flux due to**
44 **deforestation.** (a and b) Same as Supplementary Fig. 2 (a), but for latent heat flux
45 (LH) and sensible heat flux (SH), respectively. (c and d) Same as Supplementary Fig.
46 2 (c), but for LH and SH, respectively.



Supplementary Figure 6. Changes in outgoing shortwave radiation at the top of atmosphere (TOA) due to deforestation. (a, c, and e) Global pattern of the TOA outgoing shortwave radiation difference between the deforest-glob and piControl simulations (deforest-glob minus piControl), respectively, under all-sky, clear-sky, and all-sky minus clear-sky circumstances. The diagonal grids indicate four or more of the five models showing the same symbol. (b, d, and f) ERA5 TOA outgoing shortwave radiation variations due to deforestation using the space-for-time substitution (see Methods). The CMIP6 data is the ensemble mean of the local effect extracted from multi-model simulations (see Methods).



Supplementary Figure 7. Changes in outgoing longwave radiation at the top of atmosphere (TOA) due to deforestation. Same as Supplementary Fig. 6, but for longwave radiation.

Supplementary references

1 Wu, T. *et al.* BCC-CSM2-HR: a high-resolution version of the Beijing Climate Center Climate System Model. *Geosci. Model Dev.* **14**, 2977-3006, doi:10.5194/gmd-14-2977-2021 (2021).

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