Corrigendum to "The biogeophysical effects of idealized land cover and land management changes in Earth System Models" published in Earth Syst. Dynam., 0, 1–11, 2023

Steven J. De Hertog[1], Felix Havermann[2], Inne Vanderkelen[1], Suqi Guo[2], Fei Luo[3,4], Iris Manola[3], Dim Coumou[3,4], Edouard L. Davin[5,6,7], Gregory Duveiller[8], Quentin Lejeune[9], Julia Pongratz[2,10], Carl-Friedrich Schleussner[9], Sonia I. Seneviratne[11], and Wim Thiery[1]

[1]Vrije Universiteit Brussel, Department of Hydrology and Hydraulic Engineering, Brussels, Belgium
[2]Ludwig-Maximilians-University Munich, Department of Geography, Munich, Germany
[3]Vrije Universiteit Amsterdam, Institute for Environmental studies, Amsterdam, Netherlands
[4]Royal Netherlands Meteorological Institute (KNMI), De Bilt, Netherlands.
[5]Wyss Academy for Nature, University of Bern, Bern, Switzerland.
[6]Climate and Environmental Physics division, University of Bern, Bern, Switzerland.
[7]Oeschger Centre for Climate Change Research, University of Bern, Bern, Switzerland
[8]Max-Planck-Institute for Biogeochemistry, Jena, Germany
[9]Climate Analytics, Berlin, Germany
[10]Max Planck Institute for Meteorology, Hamburg, Germany
[11]ETH Zurich, Institute for Atmospheric and Climate Science, Zurich, Switzerland.

Correspondence: Steven De Hertog (steven.de.hertog@vub.be)

This corrigendum is supposed to correct some mistakes that got into the final publication during the production process of the paper. Due to an oversight these mistakes were only discovered after publication of the paper.

Firstly, the affiliations in the initial article for Edouard Davin were outdated, here below the updated affiliations are given:
1) Wyss Academy for Nature, University of Bern, Bern, Switzerland
2) Climate and Environmental Physics division, University of Bern, Bern, Switzerland
3) Oeschger Centre for Climate Change Research, University of Bern, Bern, Switzerland

Furthermore Figure 5 in the published manuscript is wrong, accidentally the maps for MPI-ESM (2nd row) where showing the values of near-surface temperature instead of surface temperature as the header intended. The authors would like to acknowledge Johannes Winckler for his keen eye on spotting this error.

Here below the changes changes required to correct the text (section 3.2.1.) are described.

- line 364: remove lower so sentence becomes: MPI-ESM also simulates local warming over the tropics, but with a different spatial pattern and magnitude compared to CESM and EC-EARTH.

- line 373-174: replace by: In all ESMs, the local signals dominate the total response in the tropics.

Lastly an error was made in the postprocessing of the EC-EARTH output as the model specific sign convention of the turbulent heat fluxes (latent heat and sensible heat) was not taken into account. Therefore all figures showing these turbulent heat fluxes are wrong and should have an inverted sign. In general the main conclusions still hold, the main difference is that EC-EARTH is more in line with the other ESMs (especially for latent heat over the tropics). Regarding the energy balance decomposition latent and sensible heat should be switched. Below we show the relevant figures (i.e. Figure 4 panels a and b, Figure 9, Figure 10 and appendix figures

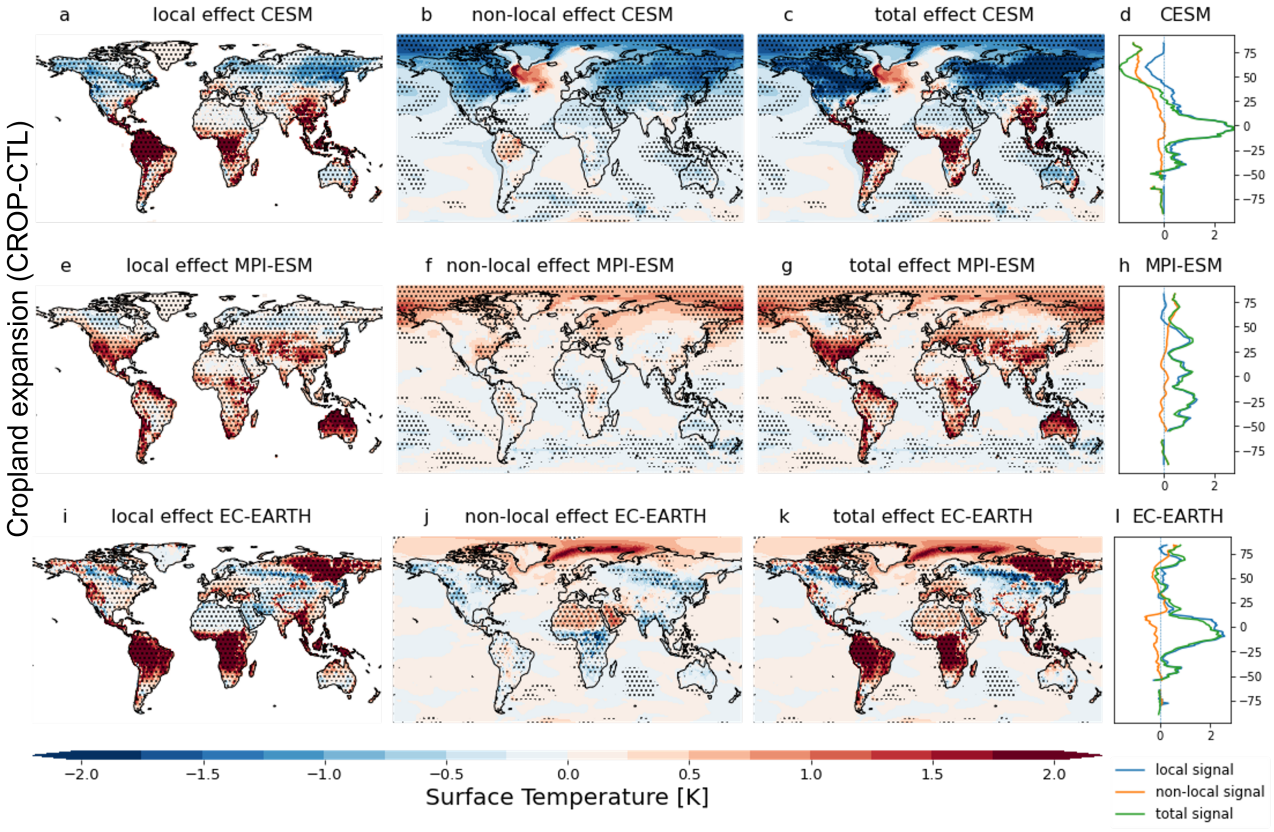

Figure 5. Annual mean surface temperature response to cropland expansion (CROP-CTL) of CESM (top row), MPI-ESM (middle row) and EC-EARTH (bottom row). For CESM: the local effect (a), the non-local effect (b) and the total effect (c), the global latitudinal average of the local (blue), non-local (yellow) and total (green) signals (d). (e-h): same as (a-d), but for MPI-ESM. (i-l): same as (a-d), but for EC-EARTH. The stippling on the maps shows grid cells where all 5 ensemble members agree on the sign of change.

E3, E4, E8, E9, E13, E14) and explain any changes in the accompanying text.
In Section 3.1. the following lines should be changed:

- line 311-312: remove 'whereas EC-EARTH shows opposite patterns' and instead add 'and EC-EARTH' as the results are now in line with the other ESMs.
- line 316-317: Change increase to decrease.
- line 322-323: Change decrease to increase.

In Section 3.3.1. the following line should be changed:
Line 435-439: Instead of 'both CESM and MPI-ESM' it should be 'all ESMs'. The entire sentence starting with 'This is in strong contrast to EC-EARTH' should be removed as well as the following sentence which starts with 'This is most likely caused by over productive cropland' as this explanation is wrong.

In section 3.3.2. the following line should be changed:
line 467-469: In EC-EARTH, the cooling is caused by changes in sensible heat flux (in stead of latent heat flux) and incoming longwave radiation, but is counteracted by a decrease in latent heat flux (instead of sensible heat flux).

In section 4.1. the messages still hold, however one example is wrong and should be changed: line 512-514 which is 'Both MPI-ESM and CESM show that local latent heat flux changes determine the surface temperature response in the tropics, while in EC-EARTH, a decrease in sensible heat flux along with an increase in incoming longwave radiation induce the warming response.' no longer holds and therefore should be replaced with 'All three ESMs show that local latent heat flux changes determine the surface temperature response in the tropics. However, the role of local sensible heat flux changes differs across ESMs, showing a cooling effect in CESM and EC-EARTH in contrast to MPI-ESM where it has a warming effect.'. Although the meaning of the sentence has changed, it doesn't alter the message as they were just both meant to illustrate the statement on line 511: 'However, they (i.e. the ESMs) disagree on how these changes occur.', which even though the differences are less strong now still holds.

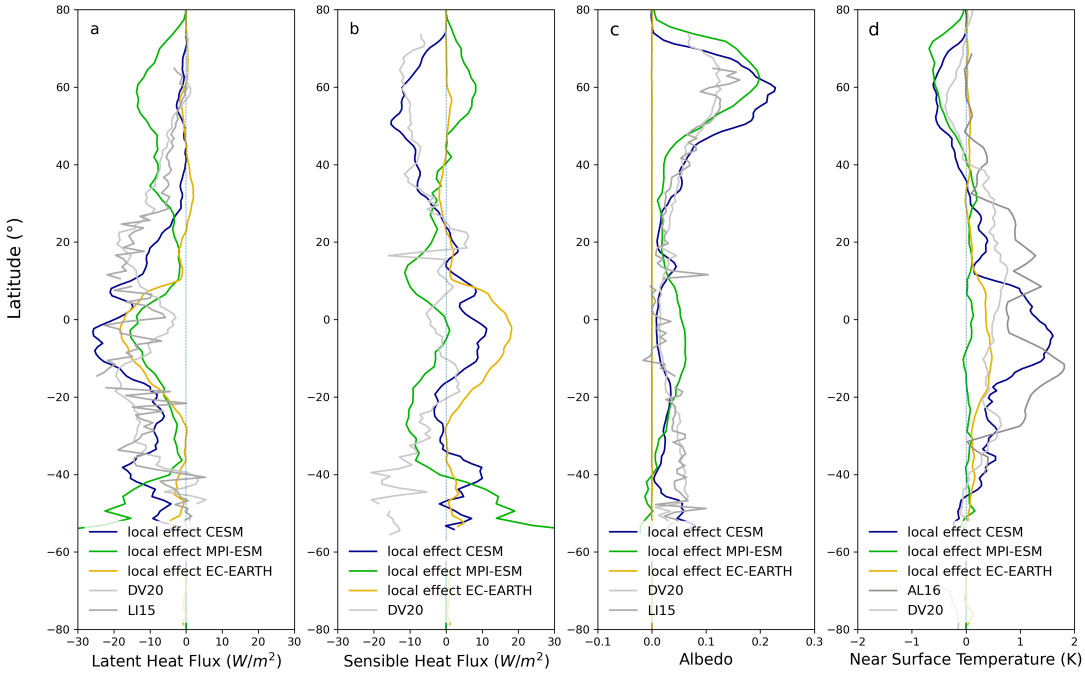

Figure 4. Latitudinal evaluation of local energy and climate variables derived from full deforestation experiments (CROP-FRST). The local effect simulated by CESM (blue), MPI-ESM (green) and EC-EARTH (yellow) of latent heat flux (W/m^2) (a) compared to observational estimates by Li et al. (2015); Duveiller et al. (2018) (DV20 and LI15, respectively), of sensible heat flux (W m^{-2}) (b) compared to Duveiller et al. (2018) (DV20), of albedo (-) (c) compared to Li et al. (2015); Duveiller et al. (2018) (LI15 and DV20) and near surface temperature (K) (d) compared to Alkama and Cescatti (2016); Duveiller et al. (2020) (AL16 and DV20). Note that for all ESMs a running latitudinal mean of 2° was computed.

In section 4.4., line 649-650 the following part ('unrealistic response in the turbulent energy fluxes and the') should be removed so the sentence becomes: 'This causes some clear biases such as the unrealistic partition of albedo as a non-local feature in EC-EARTH (Figure 4c).'

In section 5, line 692-693 should be removed, i.e. 'However, the sign of change in the turbulent heat fluxes is opposite in EC-EARTH compared to CESM and MPI-ESM.' The rest of the conclusion holds.

The updated appendix figures are added as a reference.

References

Alkama, R. and Cescatti, A.: Climate change: Biophysical climate impacts of recent changes in global forest cover, Science, 351, 600–604, https://doi.org/10.1126/science.aac8083, 2016.

Duveiller, G., Hooker, J., and Cescatti, A.: The mark of vegetation change on Earth's surface energy balance, Nature Communications, 679, https://doi.org/10.1038/s41467-017-02810-8, 2018.

Duveiller, G., Caporaso, L., Abad-Viñas, R., Perugini, L., Grassi, G., Arneth, A., and Cescatti, A.: Local biophysical effects of land use and land cover change: towards an assessment tool for policy makers, Land Use Policy, 91, 104 382, https://doi.org/10.1016/j.landusepol.2019.104382, 2020.

Li, Y., Zhao, M., Motesharrei, S., Mu, Q., Kalnay, E., and Li, S.: Local cooling and warming effects of forests based on satellite observations, Nature Communications, 6, https://doi.org/10.1038/ncomms7603, 2015.

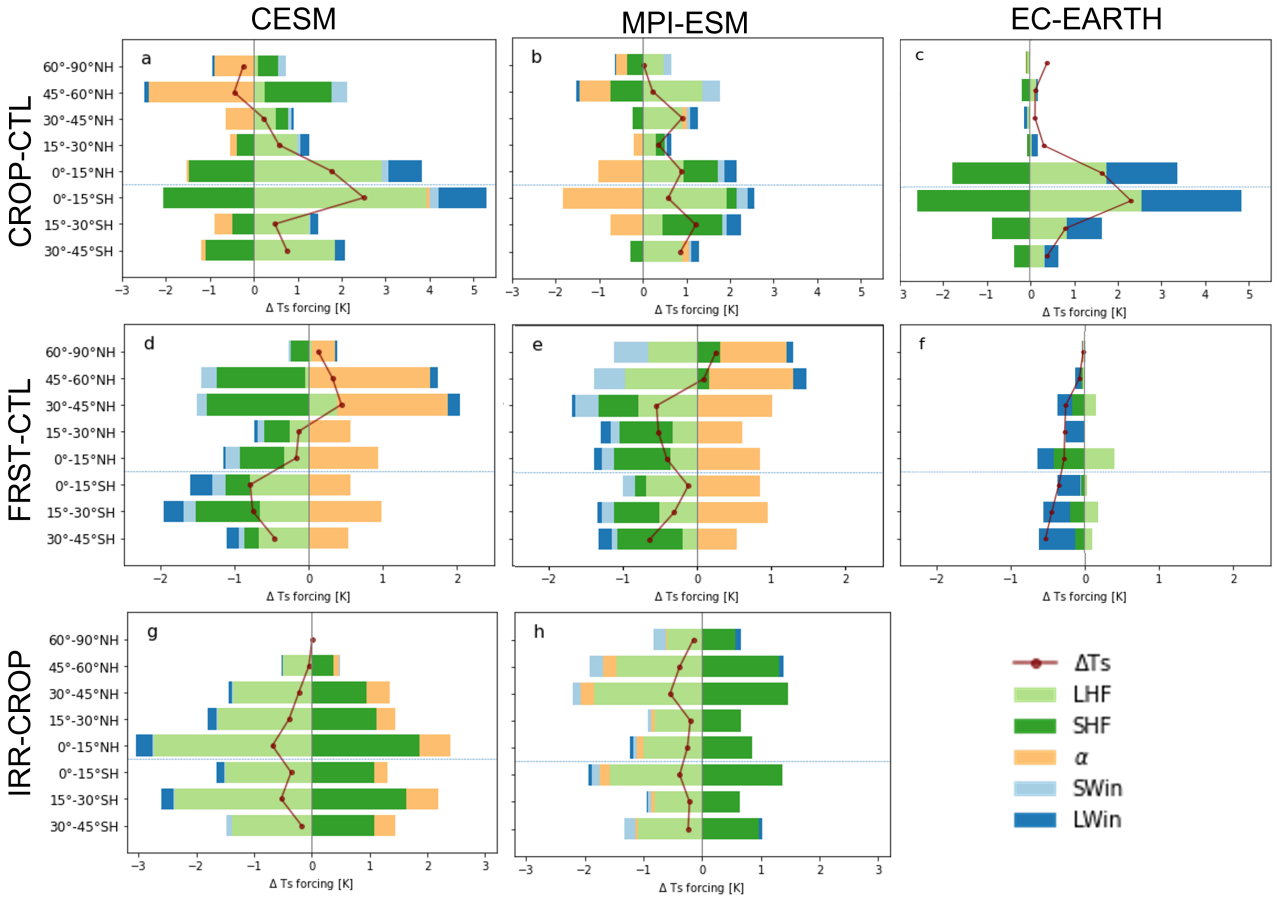

Figure 9. The energy balance decomposition of the local surface temperature for the different latitudinal bands. The response to cropland expansion (CROP-CTL) for CESM (a), MPI-ESM (b), and EC-EARTH (c), the response to afforestation (FRST-CTL) for CESM (d), MPI-ESM (e), and EC-EARTH (f) and the response to irrigation expansion (IRR-CROP) for CESM (g) and MPI-ESM (h). EC-EARTH is not shown for irrigation expansion as the local effects are too small for any meaningful analysis.

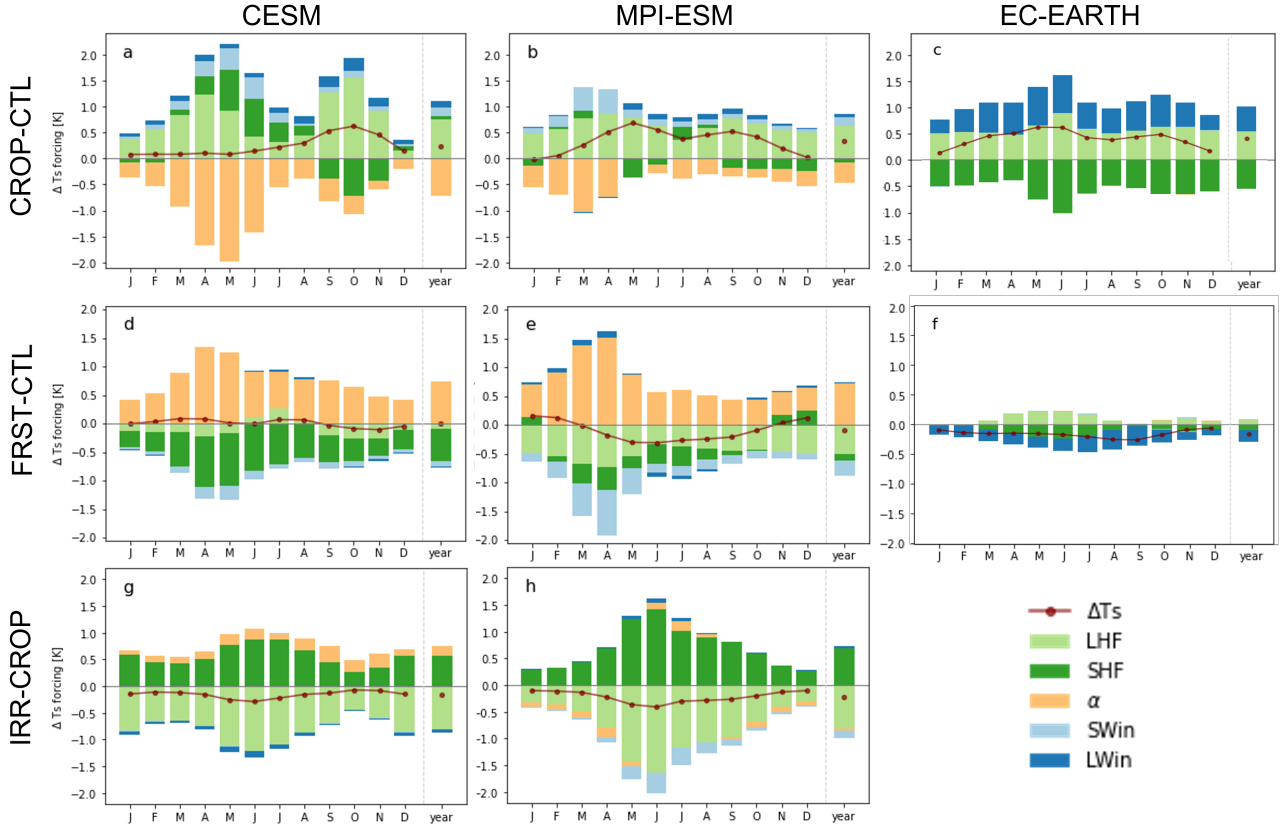

Figure 10. Global average seasonal cycle of energy balance decomposition of local surface temperature. The response to cropland expansion (CROP-CTL) for CESM (a), MPI-ESM (b), and EC-EARTH (c), the response to afforestation (FRST-CTL) for CESM (d), MPI-ESM (e), and EC-EARTH (f) and the response to irrigation expansion (IRR-CROP) for CESM (g) and MPI-ESM (h).

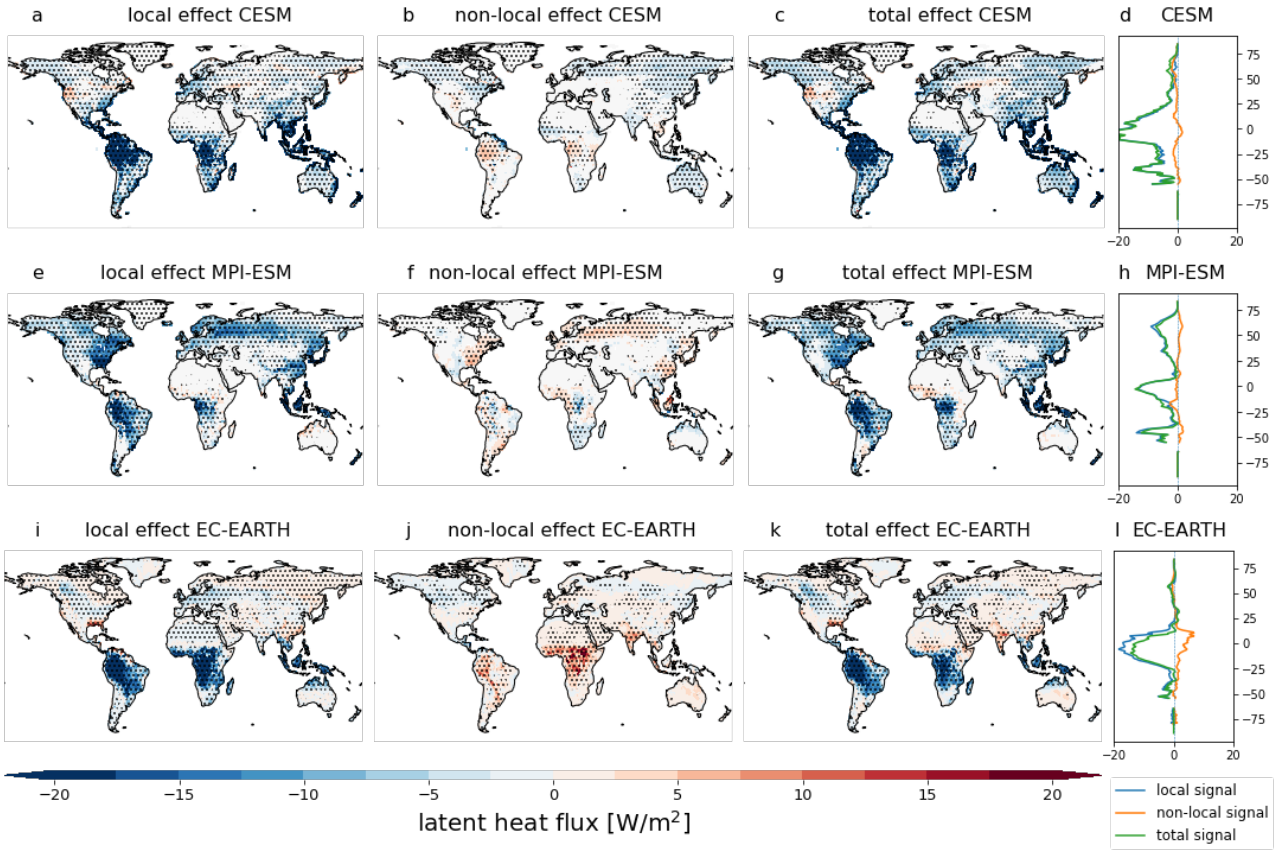

Figure E3. Annual mean latent heat flux response to cropland expansion (CROP-CTL) of CESM, MPI-ESM and EC-EARTH. The local effect in CESM (a), the non-local effect (b) and the total effect (c). The latitudinal average of the local (blue), non-local (yellow) and total (green) signals of CESM (d). (e-h): same as (a-d), but for MPI-ESM. (i-l): same as (a-d), but for EC-EARTH. The stippling on the maps shows grid cells where all 5 ensemble members agree on the sign of change.

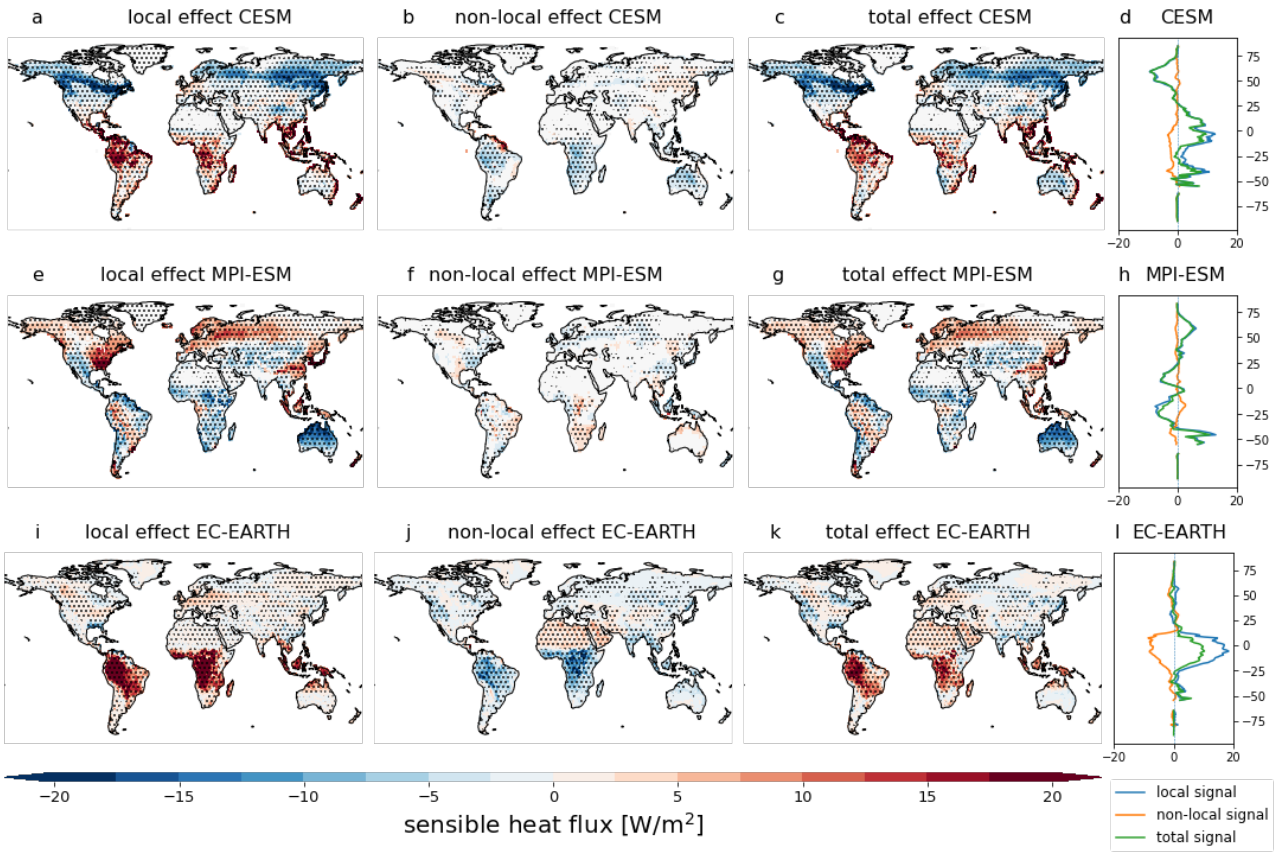

Figure E4. Annual mean sensible heat flux response to cropland expansion (CROP-CTL) of CESM, MPI-ESM and EC-EARTH. The local effect in CESM (a), the non-local effect (b) and the total effect (c). The latitudinal average of the local (blue), non-local (yellow) and total (green) signals of CESM (d). (e-h): same as (a-d), but for MPI-ESM. (i-l): same as (a-d), but for EC-EARTH. The stippling on the maps shows grid cells where all 5 ensemble members agree on the sign of change.

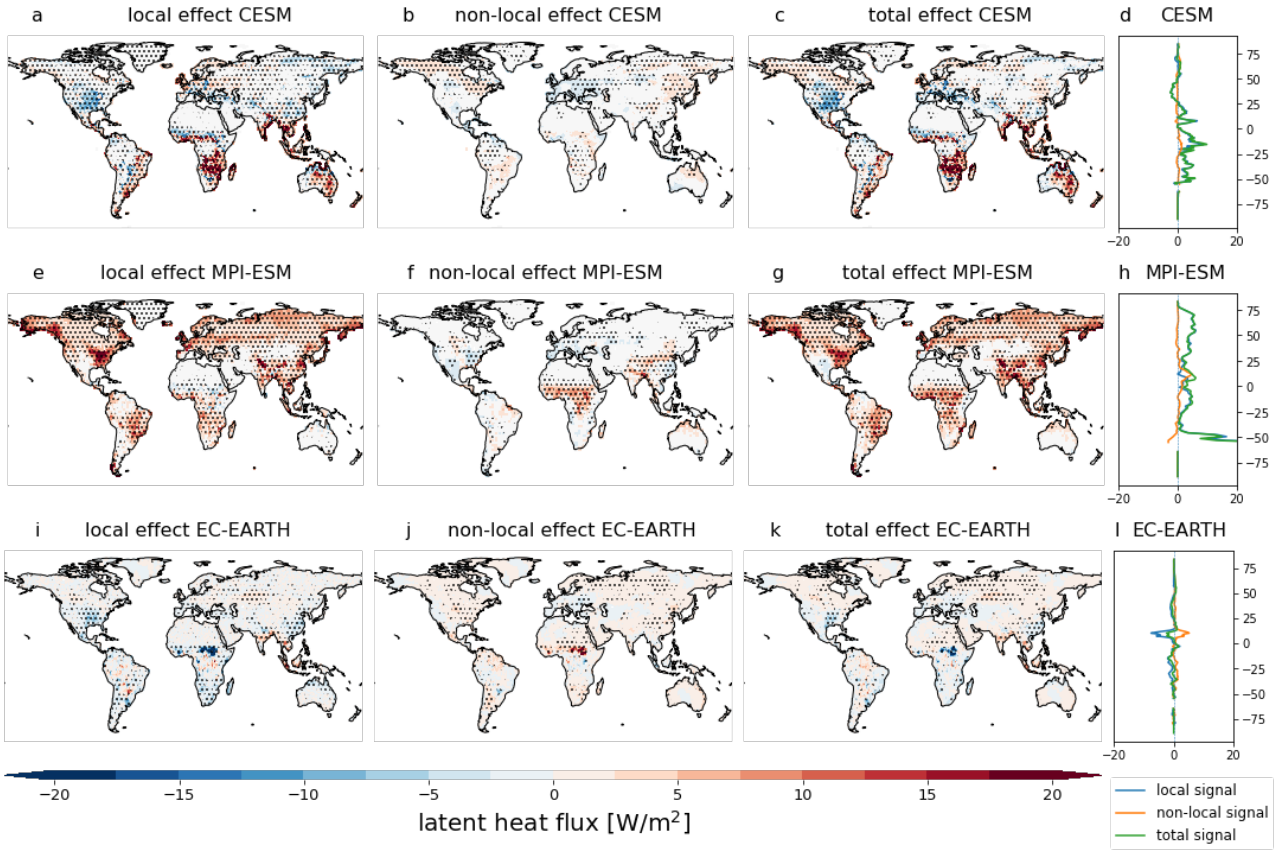

Figure E7. Annual mean latent heat flux response to afforestation (FRST-CTL) of CESM, MPI-ESM and EC-EARTH. The local effect in CESM (a), the non-local effect (b) and the total effect (c). The latitudinal average of the local (blue), non-local (yellow) and total (green) signals of CESM (d). (e-h): same as (a-d), but for MPI-ESM. (i-l): same as (a-d), but for EC-EARTH. The stippling on the maps shows grid cells where all 5 ensemble members agree on the sign of change.

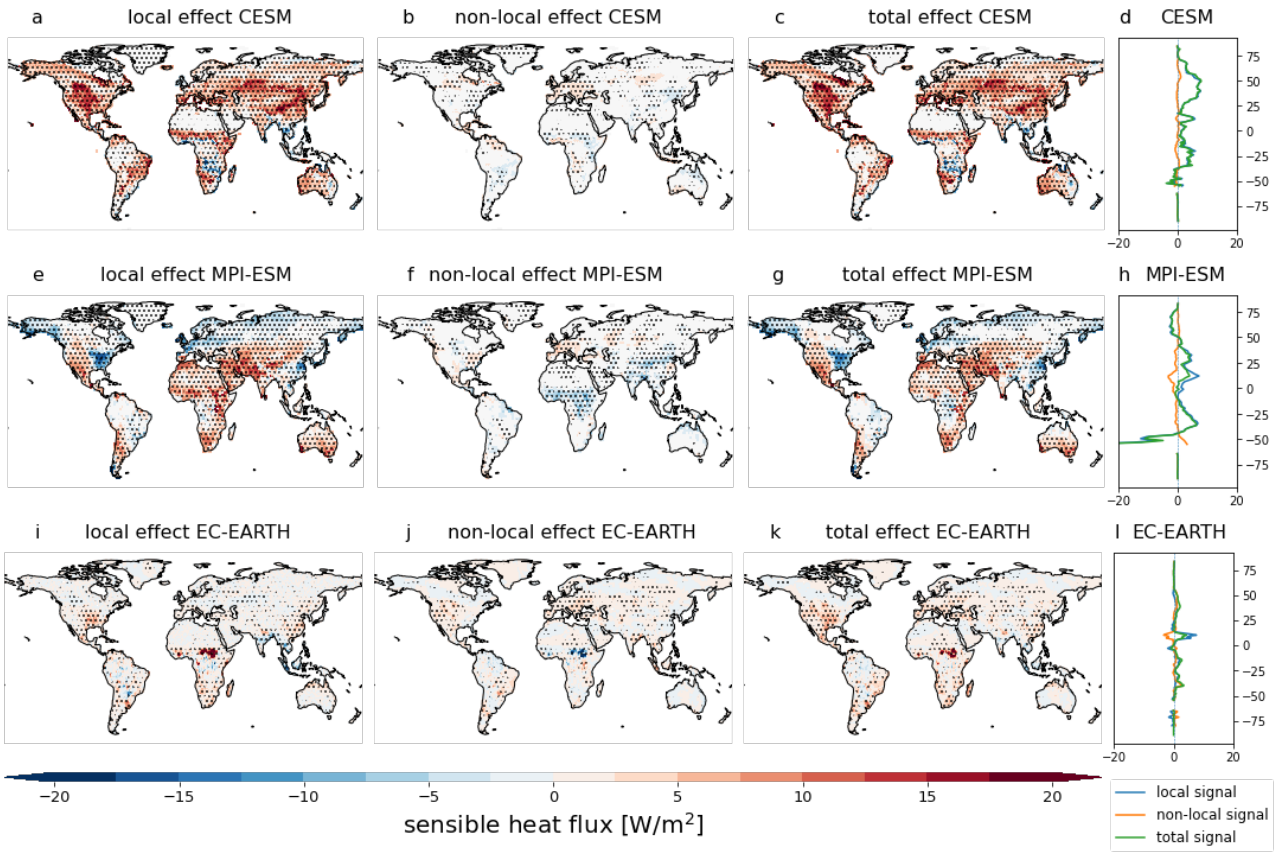

Figure E8. Annual mean sensible heat flux response to afforestation (FRST-CTL) of CESM, MPI-ESM and EC-EARTH. The local effect in CESM (a), the non-local effect (b) and the total effect (c). The latitudinal average of the local (blue), non-local (yellow) and total (green) signals of CESM (d). (e-h): same as (a-d), but for MPI-ESM. (i-l): same as (a-d), but for EC-EARTH. The stippling on the maps shows grid cells where all 5 ensemble members agree on the sign of change.

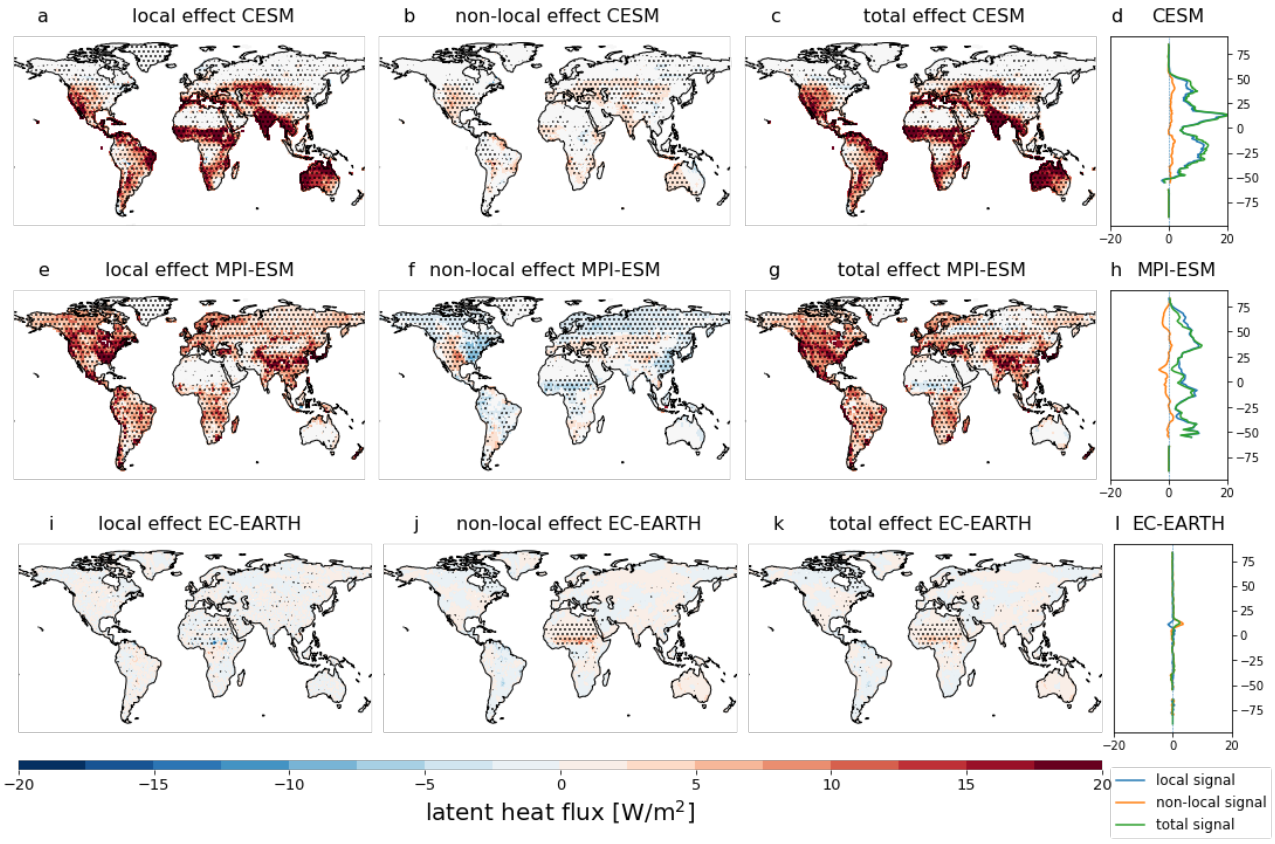

Figure E13. Annual mean latent heat flux response to irrigation expansion (IRR-CROP) of CESM, MPI-ESM and EC-EARTH. The local effect in CESM (a), the non-local effect (b) and the total effect (c). The latitudinal average of the local (blue), non-local (yellow) and total (green) signals of CESM (d). (e-h): same as (a-d), but for MPI-ESM. (i-l): same as (a-d), but for EC-EARTH. The stippling on the maps shows grid cells where all 5 ensemble members agree on the sign of change.

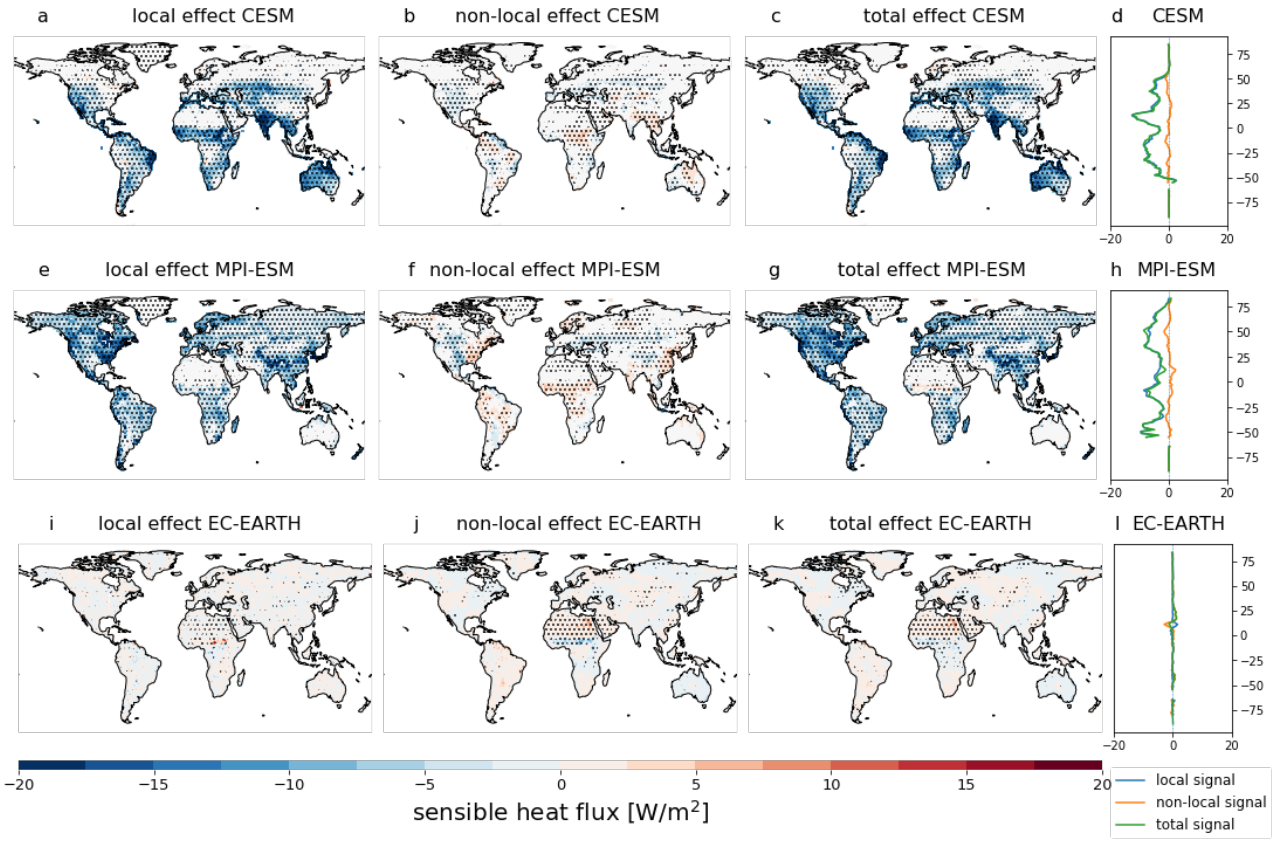

Figure E14. Annual mean sensible heat flux response to irrigation expansion (IRR-CROP) of CESM, MPI-ESM and EC-EARTH. The local effect in CESM (a), the non-local effect (b) and the total effect (c). The latitudinal average of the local (blue), non-local (yellow) and total (green) signals of CESM (d). (e-h): same as (a-d), but for MPI-ESM. (i-l): same as (a-d), but for EC-EARTH. The stippling on the maps shows grid cells where all 5 ensemble members agree on the sign of change.