Corrigendum to Earth Syst. Dynam., 12, 745–762, 2021
https://doi.org/10.5194/esd-12-745-2021-corrigendum

Earth System Dynamics
Open Access

Corrigendum to "Comparison of uncertainties in land-use change fluxes from bookkeeping model parameterisation" published in Earth Syst. Dynam., 12, 745–762, 2021

Ana Bastos[1,2], **Kerstin Hartung**[1,a], **Tobias B. Nützel**[1], **Julia E. M. S. Nabel**[3], **Richard A. Houghton**[4], and **Julia Pongratz**[1,3]

[1]Department of Geography, Ludwig Maximilian University of Munich, 80333 Munich, Germany
[2]Max Planck Institute for Biogeochemistry, Department of Biogeochemical Integration, 07745 Jena, Germany
[3]Max Planck Institute for Meteorology, 20146 Hamburg, Germany
[4]Woodwell Climate Research Center, Falmouth, MA 02540, USA
[a]now at: Deutsches Zentrum für Luft- und Raumfahrt, Institut für Physik der Atmosphäre, Oberpfaffenhofen, Germany

Correspondence: Ana Bastos (abastos@bgc-jena.mpg.de)

Published: 23 November 2021

Problem: After publication of the paper, one error in the preprocessing script converting HN2017 parameters to BLUE maps was found. While the slash fractions for harvest were being calculated as described in Sect. 2.1, they were not being saved correctly to the files used as input parameters to the BLUE simulations. Therefore, carbon (C) mass was not being conserved under harvest in the two simulations using allocation parameters from HN2017 (i.e. S_{HNFull} and S_{HNAlloc}). Below, we summarize the main implications for the conclusions and describe the key changes in results after error correction.

Conclusions affected

- The impact of C allocation parameters from HN2017 on F_{LUC} estimated by BLUE is substantially lower than in the published paper for both global and regional fluxes.

- C density parameters are now by far (globally and in most regions) the most dominant factor explaining differences between HN2017 and BLUE from model parameterization.

- Simulations of BLUE using all selected parameters from HN2017 lead to higher cumulative F_{LUC} from 1850–2015 and are more consistent with values reported in the literature.

Global fluxes and C stocks

The error was the reason why the runs S_{HNFull} and S_{HNAlloc} resulted in rather low cumulative F_{LUC} in 1850–2015 (which we discussed in Sect. 3.1 of the published paper). Below, we show a revised version of Fig. 2. Here and in the subsequent figures, the affected simulations are S_{HNAlloc} (yellow) and S_{HNFull} (cyan); all other simulations remain unaltered. We refer to the original paper for the previous versions of the figures.

The text on p. 570 should be changed to

> The cumulative F_{LUC} in 1850–2015 is 164 and 207 PgC for S_{HNCdens} and $\mathrm{SH}_{\mathrm{NAlloc}}$, respectively, i.e. 24 % and 4 % lower than $S_{\mathrm{BL-Net}}$, and closer to the HN2017 estimate on global scale.

And

> The resulting cumulative F_{LUC} for S_{HNFull} is 160 PgC, 26 % lower than $S_{\mathrm{BL-NET}}$. This value is within the range of previous estimates (Hansis et al., 2015; Houghton et al., 2012) and of the

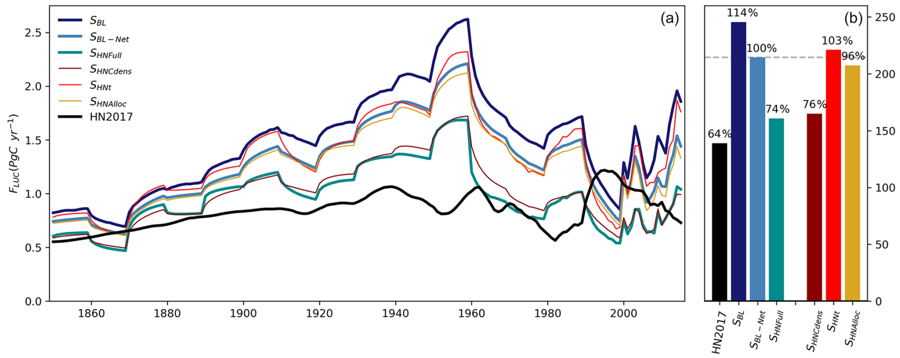

Figure 2. Global F_{LUC} between 1850 and 2015 **(a)** from the two bookkeeping model estimates in GCB2019 (HN2017 in black and S_{BL} for BLUE in dark blue), the BLUE simulations with net LUC transitions and standard BLUE parameterisation (light blue, $S_{BL\text{-}Net}$, used as reference for all subsequent BLUE runs) and using all tested HN2017 parameterisations together (cyan, S_{HNFull}). The factorial simulations with only one set of parameters changed are shown in thin lines ($S_{HNCdens}$ in dark red, S_{HNt} in red, $S_{HNAlloc}$ in yellow). The corresponding cumulative totals between 1850 and 2015 are shown in panel **(b)**, and values relative to $S_{BL\text{-}Net}$ are shown by the numbers above bars.

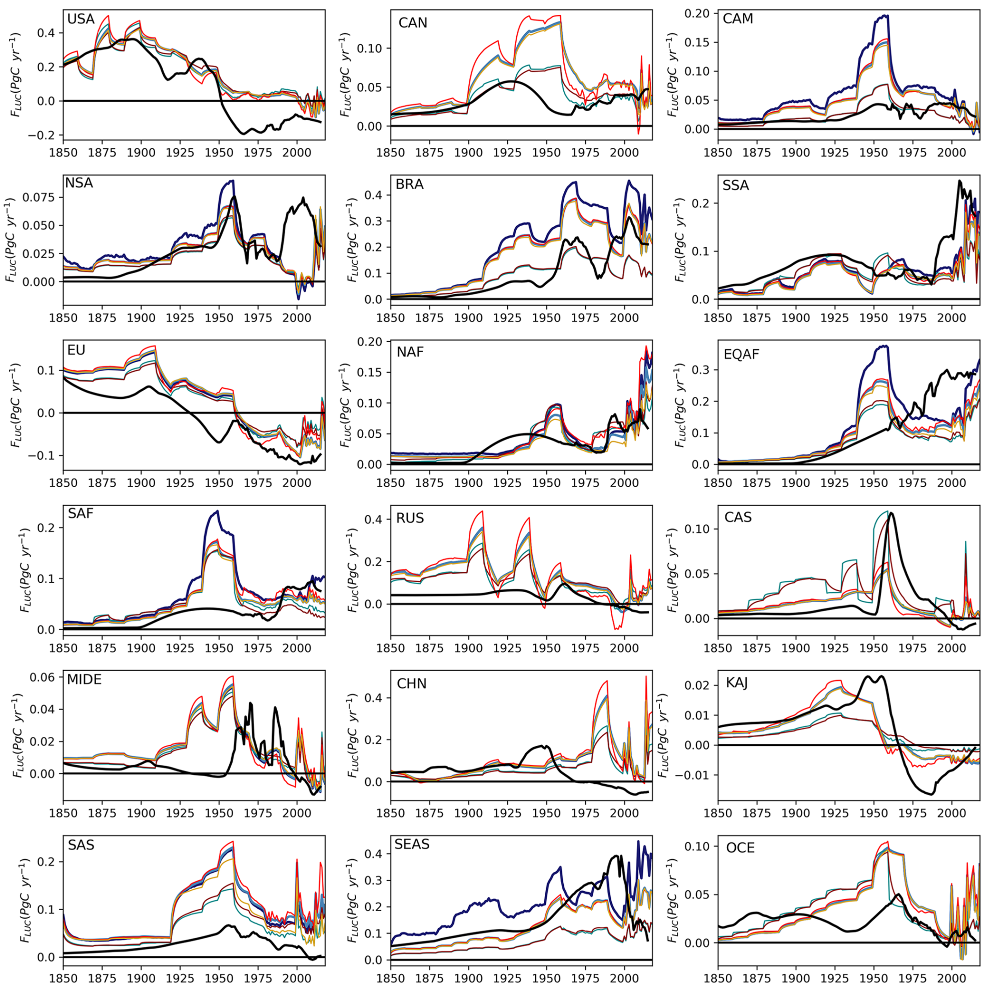

Figure 3. Regional F_{LUC} between 1850 and 2015 from the two BK model estimates in GCB2019 (HN2017 in black and S_{BL} for BLUE in dark blue), the BLUE simulations with net LUC transitions and standard parameterisation (light blue, $S_{BL\text{-}Net}$) and using HN2017 parameterisations (cyan, S_{HNFull}). The factorial simulations with only one set of parameters changed are shown in thin lines ($S_{HNCdens}$ in dark red, S_{HNt} in red, $S_{HNAlloc}$ in yellow).

https://doi.org/10.5194/esd-12-745-2021

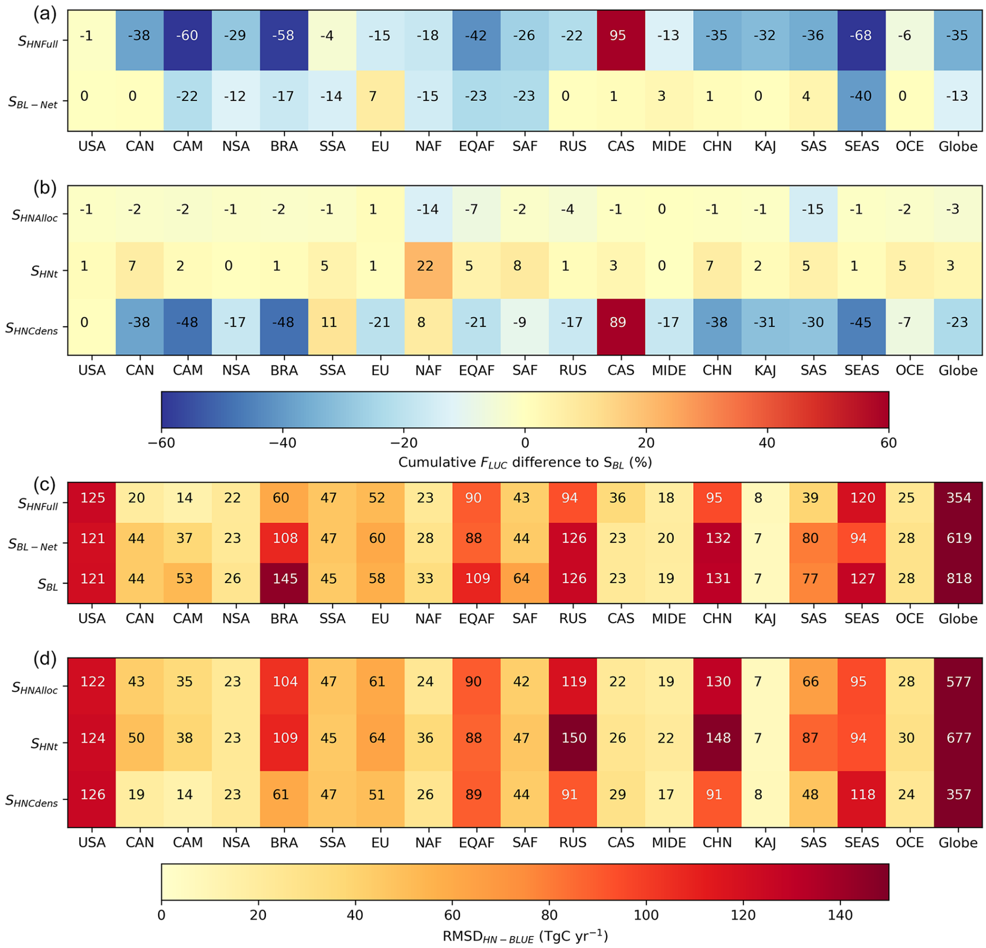

Figure 4. (a) Relative changes in cumulative simulated F_{LUC} between 1850 and 2015 for each region for $S_{\mathrm{BL\text{-}Net}}$ and S_{HNFull} compared to S_{BL} (top two rows) and the relative effect of each parameter change, compared to $S_{\mathrm{BL\text{-}NET}}$ (bottom three rows) indicated by the colours and numbers in the centre of cells. **(b)** The $\mathrm{RMSD}_{\mathrm{HN\text{-}BLUE}}$ for each simulation is indicated by the colours and numbers in the centre of cells. All panels show results for the period 1850–2015.

> cumulative budget range of the GCB2019 (205 ± 60 PgC 1850–2018) and its reported uncertainty (0.7 PgC yr^{-1}) after 1959.

The resulting changes in C stocks in soil and vegetation are very small and hardly discernible in Fig. 6.

Regional fluxes

The C densities are now the dominant factors for all, not just most, regions. Using HN2017 allocation fractions to pools for harvest and clearing still results in lower cumulative F_{LUC} everywhere (S_{HNAlloc}) and decreases the $\mathrm{RMSD}_{\mathrm{HN-BLUE}}$ at global scale and in most regions, as originally published (see updated Fig. 4 below). However, the differences are now smaller than in the version originally published. Two exceptions are worth noting: NAF and SAS, where allocation rules still lead to substantially lower cumulative F_{LUC} and $\mathrm{RMSD}_{\mathrm{HN-BLUE}}$.

The text in p. 751 should be revised to

> As seen for global F_{LUC}, the simulation using HN2017 parameter values (S_{HNFull}) leads to a reduction of F_{LUC} compared to S_{BL} in most regions and by more than 50 % in CAM, BRA and SEA (dark blue colours; see values in the centre of grid cells in Fig. 4a), except for CAS, where an increase of 95 % is estimated, mainly due to differences in C density parameters. Decreases in the $\mathrm{RMSD}_{\mathrm{HN-BLUE}}$ between S_{HNFull} and $S_{\mathrm{BL-Net}}$ globally and for 12 of the 18 regions (Fig. 4b), with small increases elsewhere.

And to

> The differences between $S_{\mathrm{BL-Net}}$ and each of the factorial simulations (bottom panel of Fig. 4a) show that C densities are the dominant factor not just for global F_{LUC} but also in most regions,

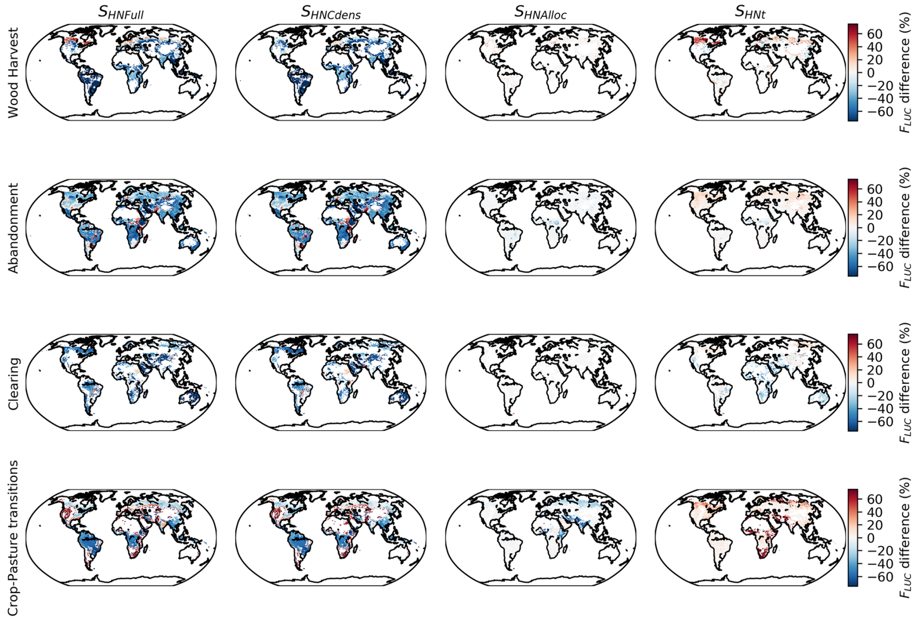

Figure 5. Spatial distribution of relative differences in average F_{LUC} between 1850 and 2018 for each of the four simulations with HN2017 parameters (S_{HNFull}, S_{HNCdens}, S_{HNAlloc}, S_{HNt}), compared to $S_{\mathrm{BL\text{-}Net}}$ for different F_{LUC} components: wood harvest, abandonment, clearing and crop–pasture transitions. Regions with average low values of F_{LUC} (e.g. deserts) are masked.

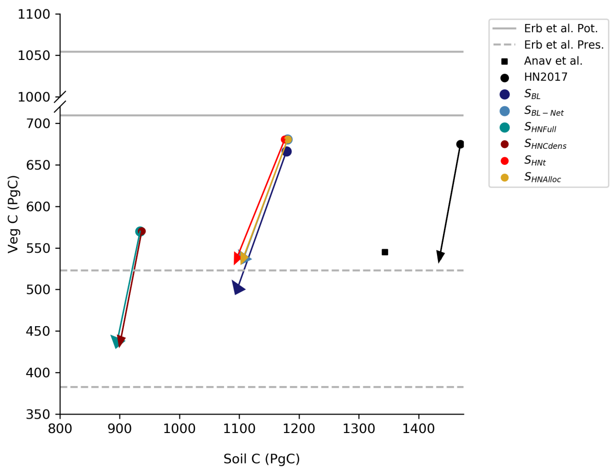

Figure 6. Carbon stocks in vegetation (y axis) and soils (x axis) simulated by BLUE for the pre-industrial period (1850, big circles) and present time (2018, small circles, end of arrows). These values are compared to two observation-based reference datasets: that of Anav et al. (2013) for both vegetation and soil carbon stocks (black square) and the upper and lower values of potential (solid lines) and present-day (dashed lines) carbon stocks in vegetation from Erb et al. (2018).

and lead to lower $\mathrm{RMSD_{HN-BLUE}}$, compared to $S_{\mathrm{BL-Net}}$ (Fig. 4b). Using HN2017 allocation fractions to pools for harvest and clearing also results in lower cumulative F_{LUC} in all regions except EU and MIDE (S_{HNAlloc}) and decreases the $\mathrm{RMSD_{HN-BLUE}}$ at global scale and in 10 of the 18 regions.

The differences in the interannual variability follow those summarized in Fig. 4. The updated time series for each region are shown in Fig. 3.

Gross fluxes

With regard to the gross fluxes, the correction in S_{HNAlloc} leads to much smaller differences in cumulative F_{LUC} for the abandonment transitions and a switch in the sign of the cumulative F_{LUC} for wood harvest (since mass is now being conserved), though with virtually no impact on the results of S_{HNFull}.