

Supporting Information for "The seasonal cycle of $\delta^{13}\text{C}$ of atmospheric carbon dioxide: Influences of land and ocean carbon fluxes and drivers."

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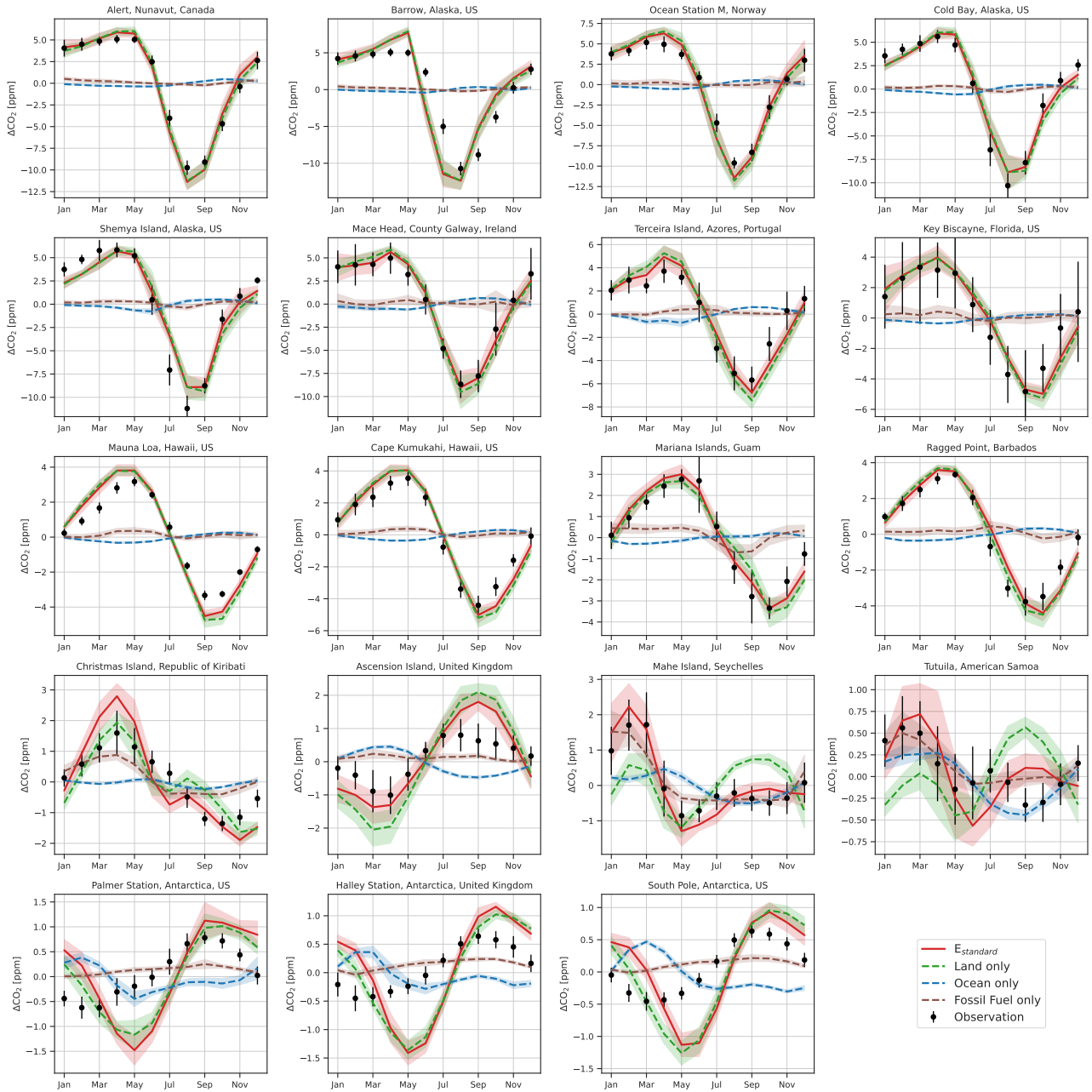


Figure S1. The seasonal cycle of CO_2 simulated by Bern3D-LPX and transported with TM3 (red), compared to observations (black dots). The calculation of the seasonal cycle only considers months between 1982 and 2012 where both the measurements and transport matrices are available. The location of the measurements is indicated in the title of the plot. The results of only transporting fluxes of terrestrial (green, dashed), oceanic (blue, dashed), and from fossil sources (brown, dashed) are shown with dashed lines. Error bars and shading correspond to the interannual standard deviation.

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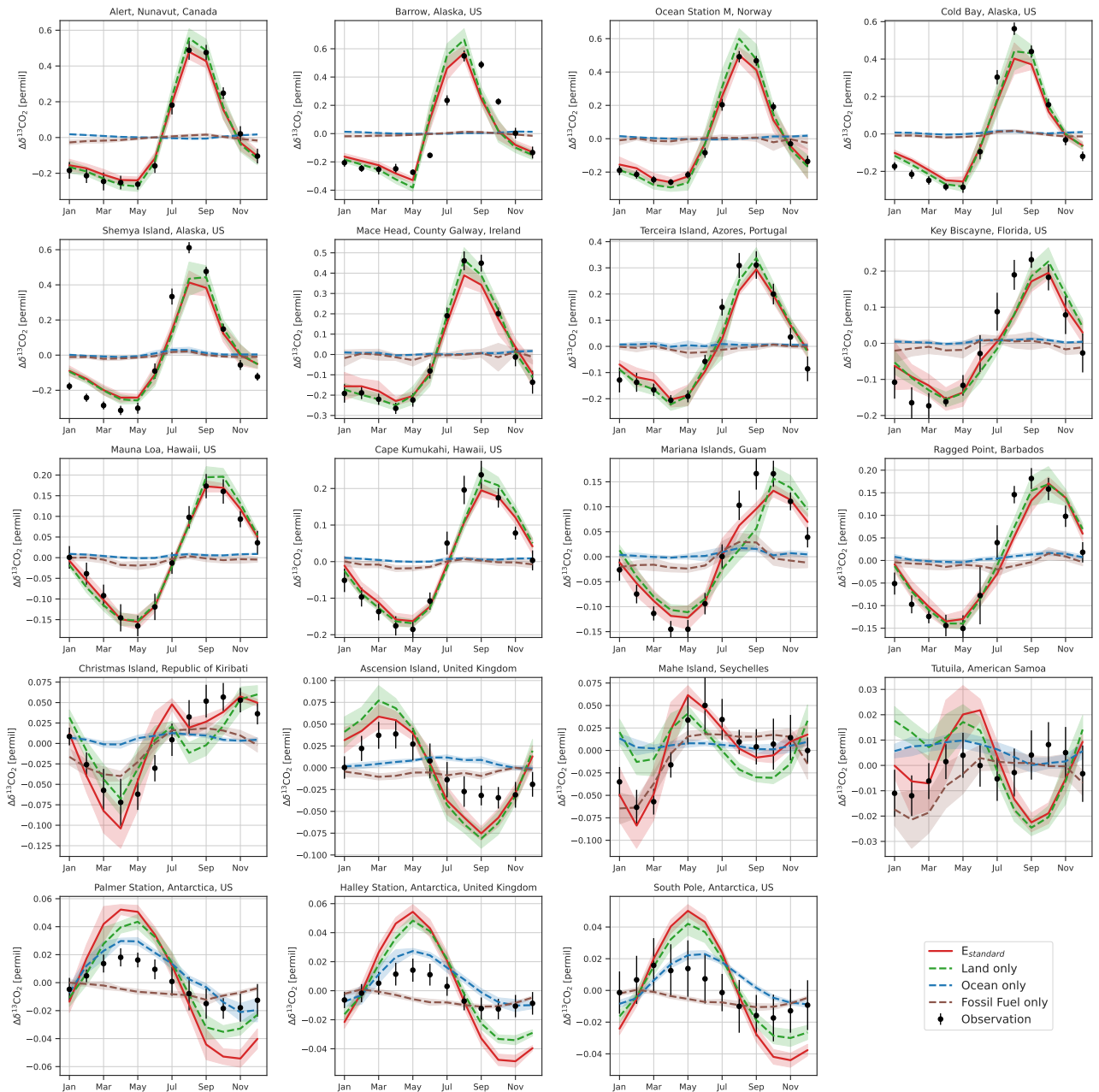


Figure S2. The seasonal cycle of $\delta^{13}\text{C}(\text{CO}_2)$ simulated by Bern3D-LPX and transported with TM3 (red), compared to observations (black dots). The calculation of the seasonal cycle only considers months between 1982 and 2012 where both the measurements and transport matrices are available. The location of the measurements is indicated in the title of the plot. The results of only transporting fluxes of terrestrial (green, dashed), oceanic (blue, dashed), and from fossil sources (brown, dashed) are shown with dashed lines. Error bars and shading correspond to the interannual standard deviation.

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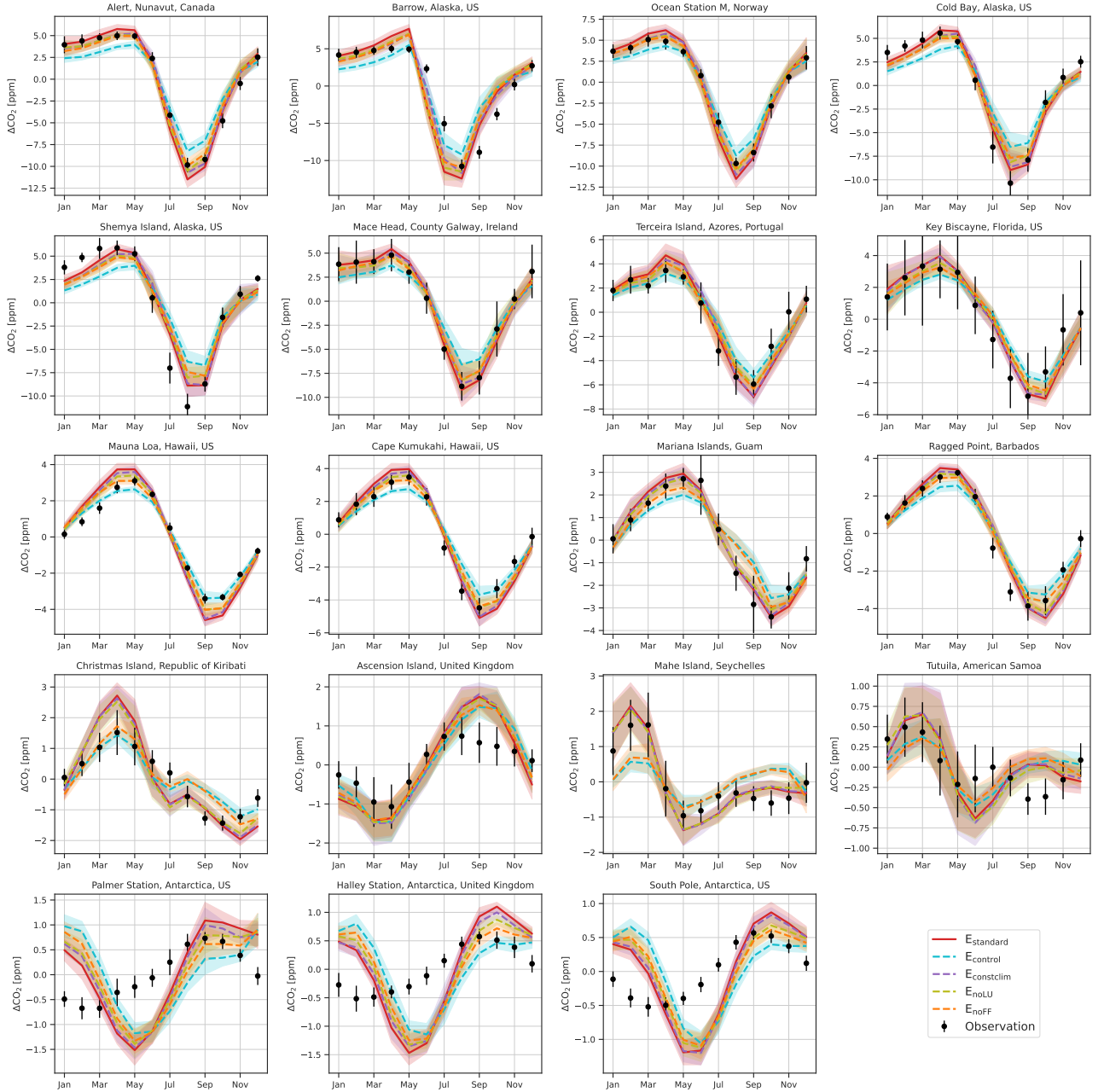


Figure S3. The seasonal cycle of CO₂ simulated by Bern3D-LPX and transported with TM3 (red), compared to observations (black dots). The calculation of the seasonal cycle only considers months between 1982 and 2012 where both the measurements and transport matrices are available. The results of sensitivity simulations are shown with dashed lines: E_{control} (cyan,dashed), $E_{\text{constclim}}$ (purple, dashed), E_{noLU} (olive, dashed), and E_{noFF} (orange, dashed). Shading and error bars correspond to the interannual standard deviation.

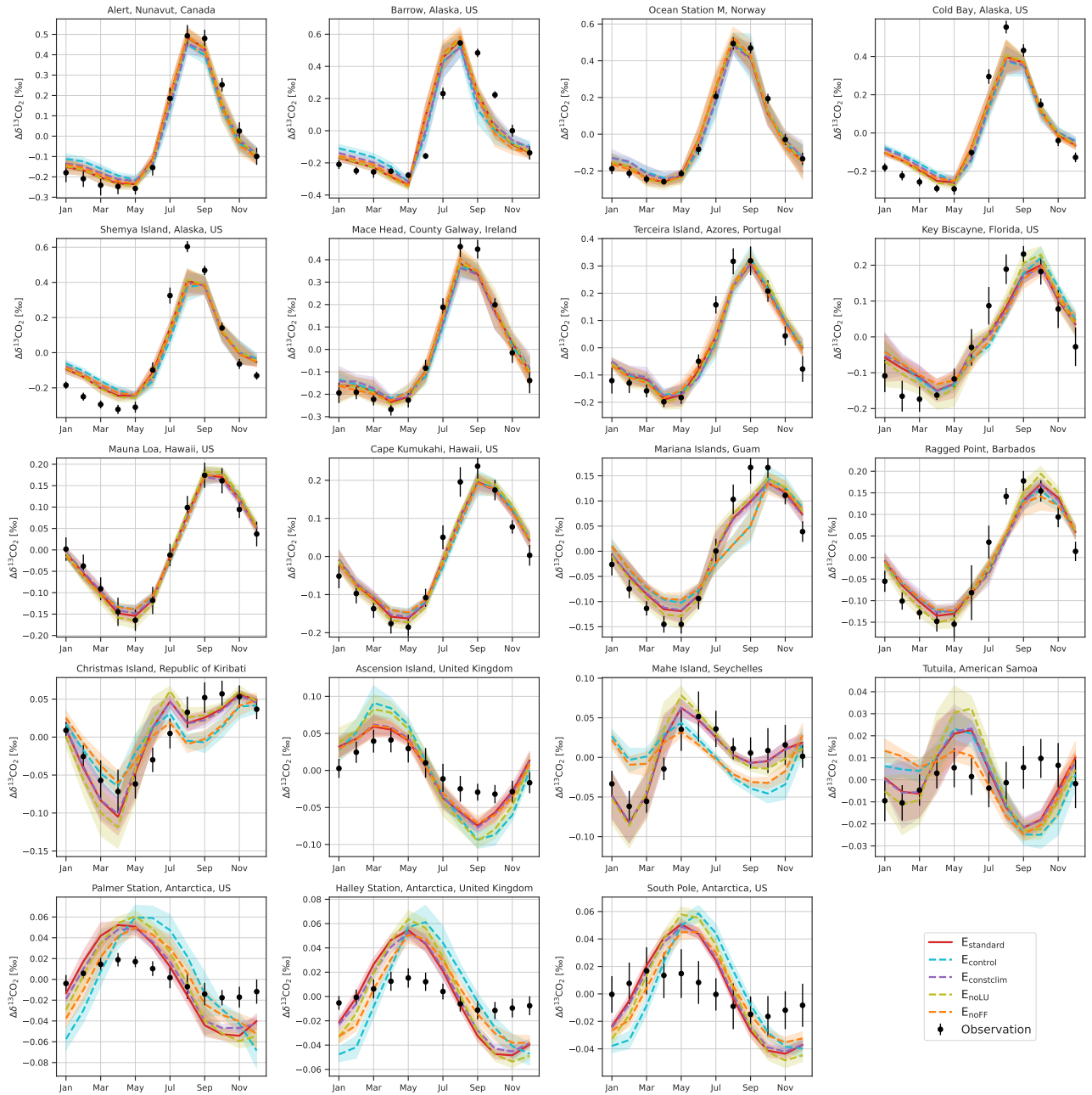


Figure S4. The seasonal cycle of $\delta^{13}\text{C}(\text{CO}_2)$ simulated by Bern3D-LPX and transported with TM3 (red), compared to observations (black dots). The calculation of the seasonal cycle only considers months between 1982 and 2012 where both the measurements and transport matrices are available. The results of sensitivity simulations are shown with dashed lines: E_{control} (cyan,dashed), $E_{\text{constclim}}$ (purple, dashed), E_{noLU} (olive, dashed), and E_{noFF} (orange, dashed). Shading and error bars correspond to the interannual standard deviation.

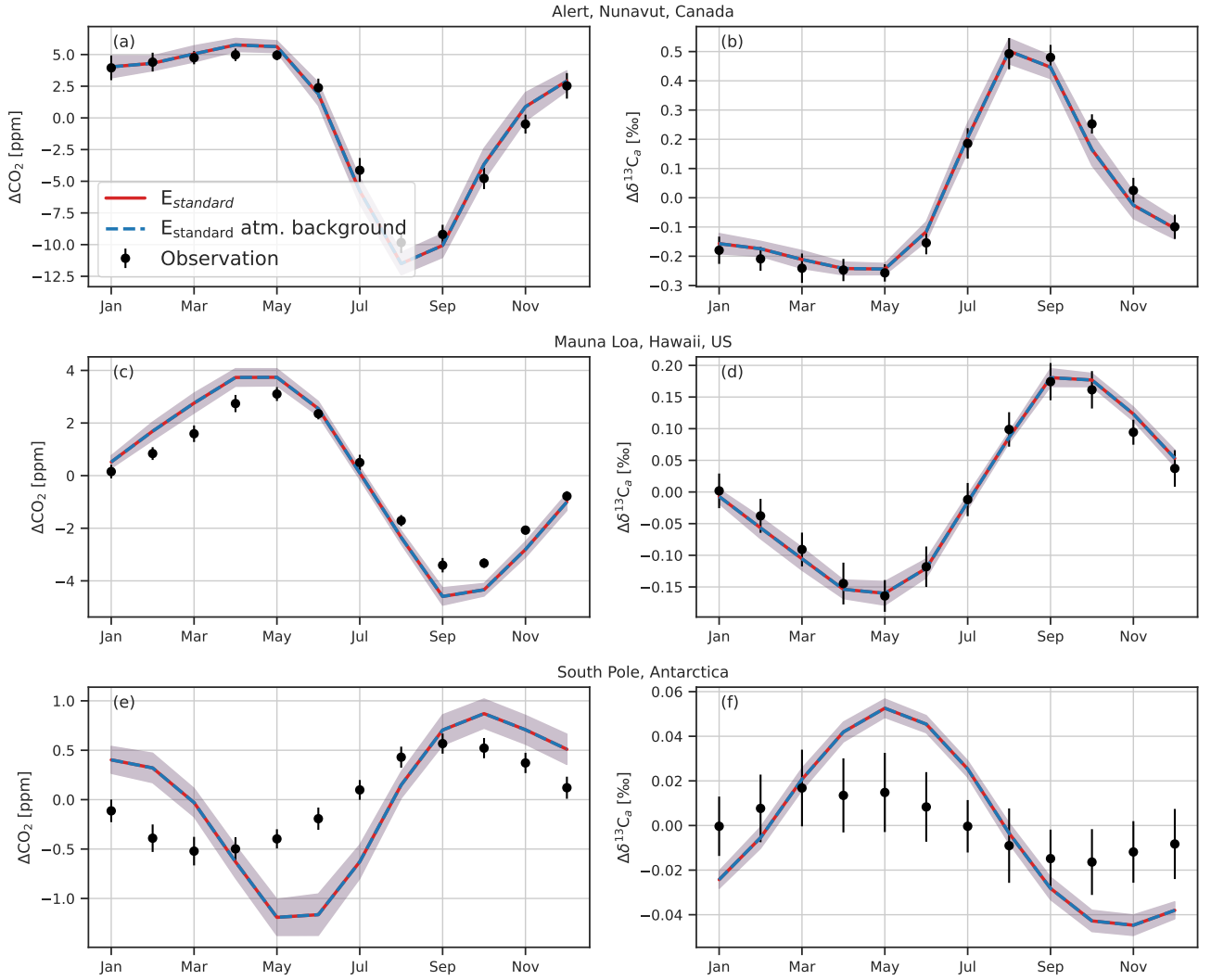


Figure S5. The seasonal cycle of CO_2 (left panels; a,c,e) and $\delta^{13}\text{C}_a$ (right panels; b,d,f) at Alert, northern Canada (a,b), Mauna Loa, Hawaii (c,d) and South Pole (e,f) as simulated by Bern3D-LPX and transported with TM3 (red), compared to observations (black dots). The calculation of the seasonal cycle only considers months between 1982 and 2012 where both the measurements and transport matrices are available. The result of running the transport model initialized with observed instead of simulated atmospheric concentration and signature is shown with dashed blue lines.

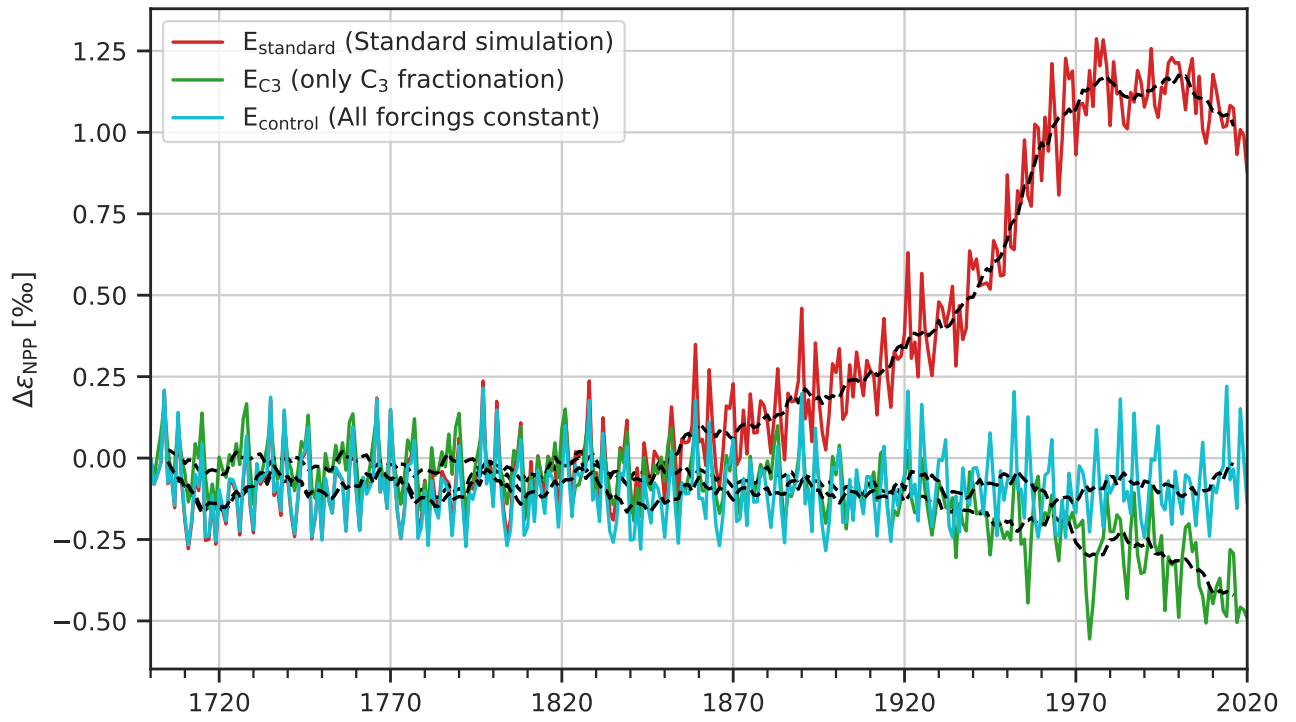


Figure S6. Simulated change in photosynthetic discrimination ϵ_{NPP} over the industrial period. The results of three simulations are shown: E_{standard} in red, E_{C_3} and E_{control} in cyan. 10-year running means are indicated with black dashed lines.