Biogeosciences

Supplement of

An improved parameterization of leaf area index (LAI) seasonality in the Canadian Land Surface Scheme (CLASS) and Canadian Terrestrial Ecosystem Model (CTEM) modelling framework

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Supplementary information

Individual contributions of the three model modifications made to improve LAI phenology

The individual contributions of the three model modifications made to improve LAI phenology as detailed in sections 2.1.1 to 2.1.4 of the manuscript are shown in Figure S1 for the Harvard Forest site. A similar behaviour is seen at the other two sites. Observation-based measurements are shown in black and simulated mean daily values are shown in red (for the original model version indicated as CLASS-CTEM Original) and blue (for the modified version indicated as CLASS-CTEM Modified). Panel (a) of Figure S1 shows the resulting LAI after implementing the first modification which reallocates NSC from the leaf and stem components to leaves during the leaf out period, presented in section 2.1.2. The reallocation occurs only in early spring and as expected, it improves the ascending side of the simulated LAI during the same period. In panel (b), the effect of the second modification which reduces allocation of carbon to leaves after summer solstice (section 2.1.3) is also included. Reduction in carbon allocated to leaves after summer solstice affects the LAI during the peak growing season and shifts the annual maximum LAI to occur earlier. Finally, the effect of the third modification (section 2.1.4) which increases the lower temperature threshold for leaf litter generation is also included (panel c). This leads to leaf litter fall (not shown) occurring earlier and leads to an improvement on the descending side of the LAI curve. Together, the three modifications lead to an overall improved simulated leaf phenology.
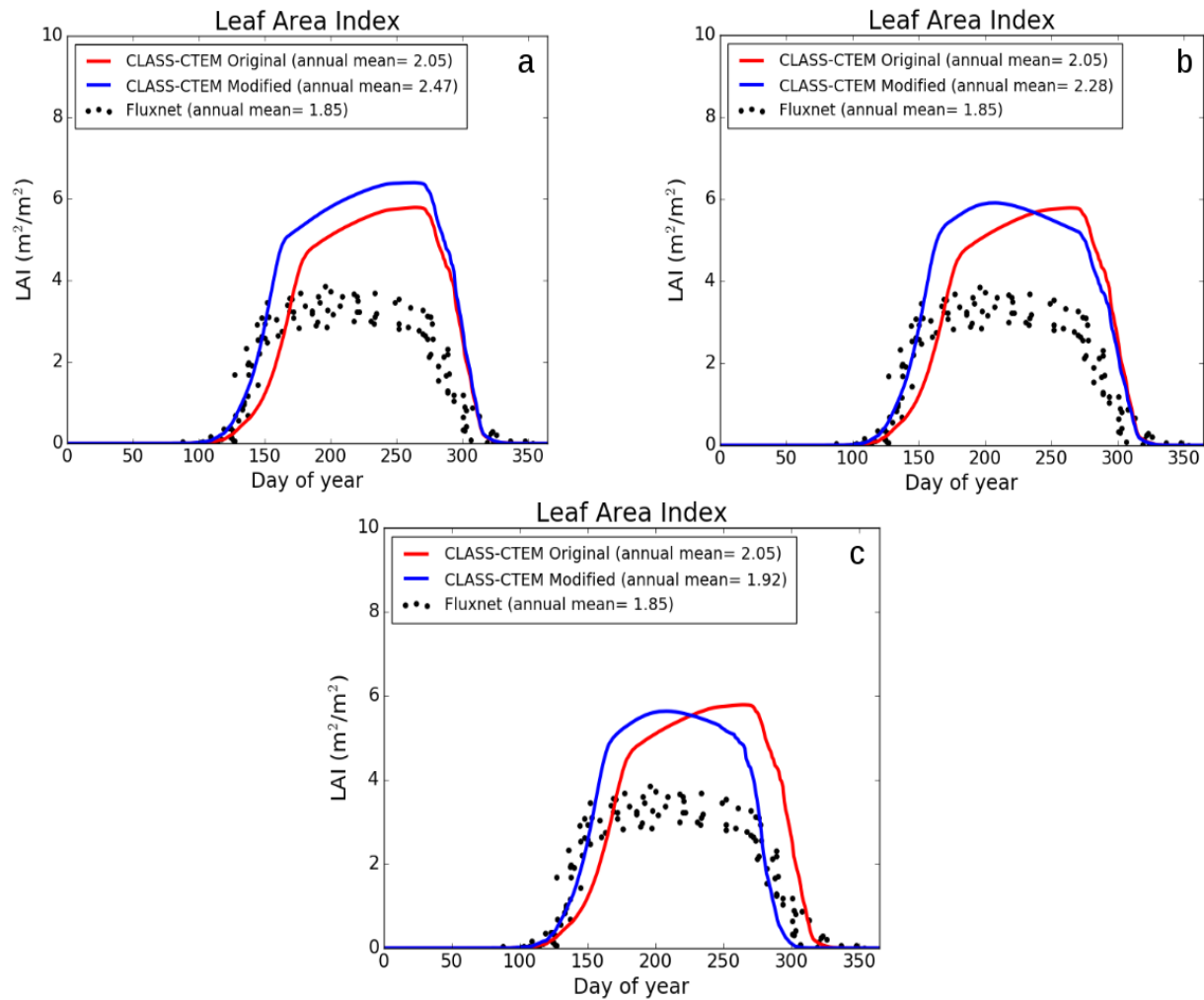
Figure S1. The effect of inclusion of the three model modifications on leaf phenology at US-Ha1 (Harvard Forest) Fluxnet site. CLASS-CTEM simulated averaged daily values of LAI (m^2/m^2) are compared with observation-based estimates to show the effect of each model modification made incrementally. Panel a) shows the effect of inclusion of NSC pools and reallocation of NSC during leaf out period in early spring. Panel b) shows the additional effect of reduced carbon allocation to leaves after summer solstice. Finally, panel c) shows the additional effect of increasing the lower temperature threshold for leaf litter loss due to cold stress.