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Interactive comment

Interactive comment on "A new version of the CABLE land surface model (Subversion revision r4546), incorporating land use and land cover change, woody vegetation demography and a novel optimisation-based approach to plant coordination of electron transport and carboxylation capacity-limited photosynthesis" by Vanessa Haverd et al.

Vanessa Haverd et al.

vanessa.haverd@csiro.au

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New figures attached (omitted from initial Response)

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Interactive comment on Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2017-265, 2017.

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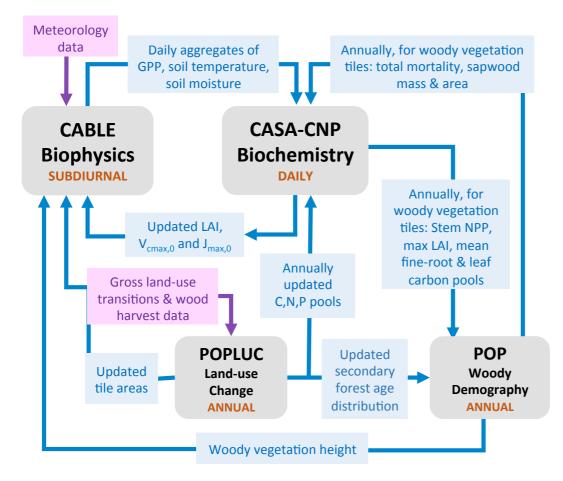


Fig. 1.

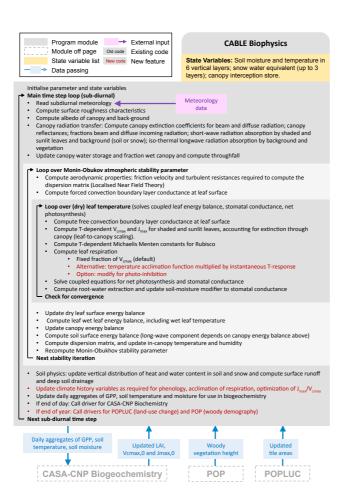


Fig. 2.

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CASA-CNP Biochemistry State variables: C, N, P pools in each of 3 plant **CABLE Biophysics** compartments (leaves, fine roots, wood); 3 litter compartments (metabolic litter, fine structural Daily aggregates of GPP, soil litter, coarse woody debris); 3 soil compartments Updated LAI, Vomey 0 temperature, soil moisture differing by turnover time (fast, slow, passive); soil and Jmay 0 mineral N and P pools; soil occluded P pool; labile Main time step loop (daily) Get leaf phenology phase for deciduous pfts based on remote-sensing climatology or climate history · Construct root-weighted soil temperature and moisture variables from vertical profiles. Evaluate autotrophic growth and maintenance respiration fluxes for leaves, stems (sapwood only) and fine-roots based on tissue nitrogen content. Assumed Lloyd and Taylor (1994) T-dependence. Option for acclimation based on temperature of warmest quarter, similar to acclimation of leaf respiration. Compute modifier to leaf base turnover rate based on cold and/or drought stress. For deciduous pfts, reduce or accelerate leaf turnover based on phenological phase. Calculate turnover rates of plant pools and fraction of plant turnover entering litter pool. For woody pfts, wood turnover rate is inherited from POP demography module. Check if soil nutrient supply can meet the plant uptake demand; otherwise reduce NPP Set allocation coefficients to partition NPP between leaves fine roots and wood. For woody ofts, relative leaf and woody allocation coefficients are based on leaf-area to sapwood-area ratio, with sapwood area inherited from POP demography module. · Compute temperature- and moisture-modifiers to base turnover rates of soil and litter carbon. New options to use Trudinger et al. (2016) moisture response and Lloyd and Taylor (1994) temperature response. Calculate turnover rates of plant, soil and litter carbon pools and the transfer coefficients between different pools Computing the reduction in litter and SOM decomposition when decomposition rate is N-limiting Compute N and P uptake by plants and allocation of each to plant compartments Update C. N and P stores according to turnover rates, NPP, allocation coefficients and transfer coefficients computed above. · Augment annual aggregates of carbon allocated to stems; maximum LAI, mean fine-root and leaf carbon pools . Compute LAI (from leaf carbon store) and Vcmax,0 from leaf N and P stores. Option to use global synthesis (Walker et al. 2014) to relate V_{cmax,0} to leaf N and P. J_{max,0} set to constant (1.7) times V_{cmax,0}. Adjust prior V_{cmax 0} and J_{max 0} using OptJV algorithm to minimize nitrogen cost of net photosynthesis, based on conditions for the last 5 days. Return updated LAI, V_{cmax,0} and J_{max,0} to CABLE biophysics Next daily time step OptJV algorithm for optimizing ratio V_{cmax 0}/ Annual, for Annual, for woody Annually woody vegetation tiles: total updated vegetation tiles: mortality, sapwood C,N,P · Define leaf nitrogen available for re-Stem NPP, max mass & area pools distribution, based on prior estimates of LAI, mean fine- $V_{cmax,0}$ and $b_{JV}=J_{max,0}/V_{cmax,0}$ root & leaf Find the value of b_{IV} that minimizes leaf carbon pools nitrogen cost per unit net photosynthesis (aggregated over the last 5 days) for each of sunlit and shaded leaves. Return to CABLE biophysics the next day's V_{cmax 0} and J_{max 0} for sunlit and shaded POP **POPLUC**

Fig. 3.

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Discussion paper



leaves, based on updated value of bia.

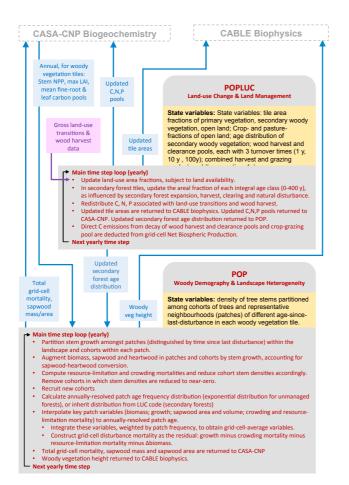


Fig. 4.

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