When different LSMs drive the same dynamic phenology module, which better simulates surface-to-atmosphere fluxes?

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Hypotheses:

Adding a dynamic phenology module (*Dickinson et al.,* 1998) improves the ability of Noah and CLM to simulate surface-to-atmosphere fluxes over LBA sites Using DV changes the behavior of CLM and Noah in qualitatively similar fashion

Specific questions:

- 1. How well do each of the two baseline models (Noah-STD and CLM-STD) simulate the diurnal cycle of LE? What is the effect of the addition of DV?
- 2. How does DV change the seasonal variability of Noah's (CLM's) ability to simulate the diurnal cycle of LE?





Dickinson's phenology module added to Noah LSM 2.7 and CLM 3.0



DV allows LAI to respond to short-term environmental change, allocates assimilated carbon to leaves, roots, and wood and computes heterotrophic and autotrophic respiration.





Sites and data sets:

1	Site	PI	Reference
~	Manaus K34	Manzini, Nobre, Sant	tos. Araujo et al., (2002).
10	7	INPA, Brasil.	
	Santarem K83	Goulden, UC Irvine.	Rocha et al., (2004).
-		Miller, SUNY-Albany.	Goulden, et al. (2004).
	5	Rocha, USP.	
	Santarem K77	Fitzjarrald, SUNY.	Sakai et al., (2004).
3-		Moraes, UFSM, Brasi	il
Rio	Fazenda Nossa Senhora	Manzi, INPA. Cardoso	o, Randow (2004)
1		UFR.	Kruijt et al., (2004)
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Wet Forest: Santarem K83

CLM-DP —





Sensible heat flux (W m-2)



CLM-standard --

Soil wetness (-)



Noah-DP ---

Noah-standard - -



Wet Forest: Manaus K34





Sea

Οđ

Nov.

Dec.

Sensible heat flux (W m-2)





Pasture: Santarem K77 and F. Nossa Senhora

Seasonal variation of latent heat flux

Diurnal cycle of LE: CLM damped; Noah accentuated





Addition of DV improves Noah's ability to simulate diurnal cycle of LE, but it degrades CLM performance





Summary and conclusions:

For both of the wet forest sites:

Noah-STD and Noah-DV simulate hourly, daily, and annual LE better than either CLM-STD or CLM-DV.

At annual time scales, addition of DV does not degrade the performance of Noah-STD but significantly degrades that of CLM-STD. The seasonal cycle of CLM-STD and CLM-DV are out of phase with both Noah and observations (for LE, SH, and soil wetness)

Addition of DV improves Noah's ability to simulate diurnal cycle of LE, but it degrades CLM performance, especially during the wet season.

For both wet forest and pastureland sites:

At annual time scales, CLM LE fluxes appear decoupled from soil wetness. Future work will investigate causes.



