Carbon and energy fluxes simulated by the Noah LSM and the Community Land Model

Lindsey E. Gulden, Enrique Rosero
Zong-Liang Yang & Guo-Yue Niu

September 28, 2007
Salvador, Brazil

THE UNIVERSITY OF TEXAS AT AUSTIN

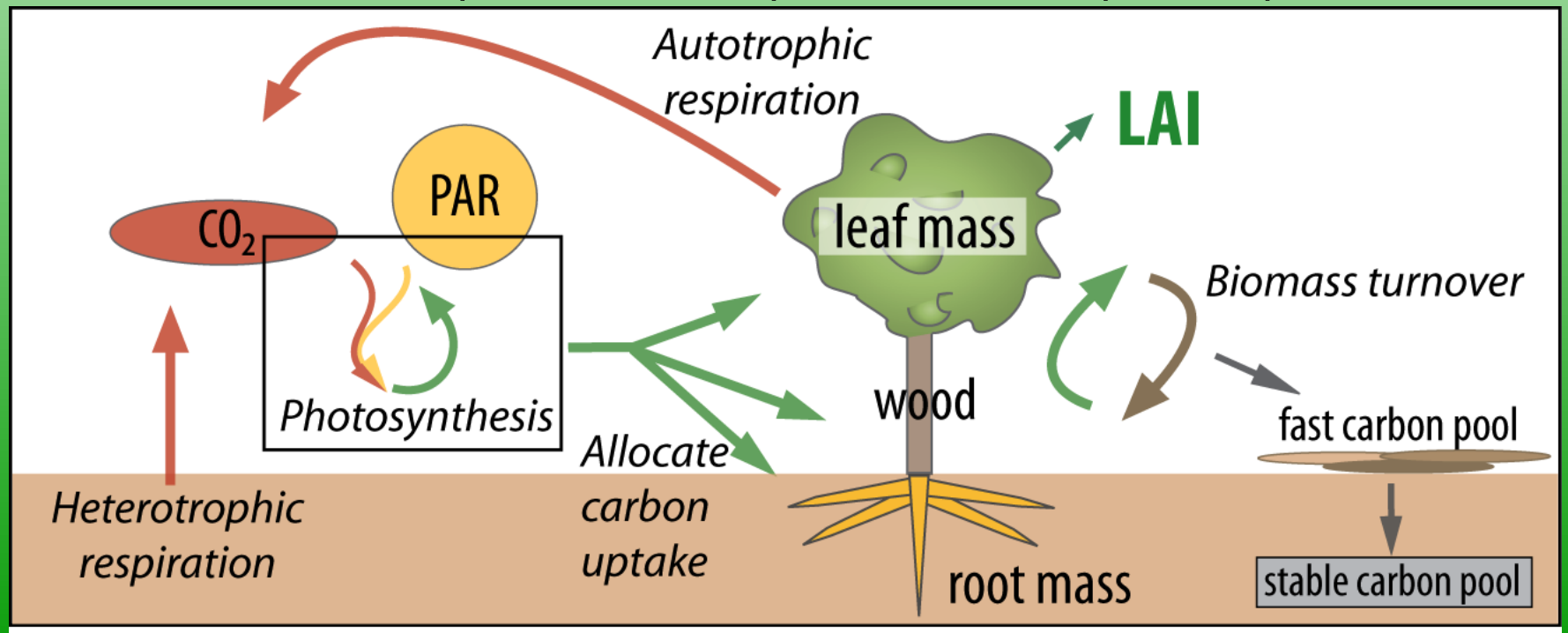
How well do commonly used LSMs simulate carbon and energy fluxes at LBA sites?

Four models applied to 8 LBA sites:

(1a) Noah-STD (1b) Noah-DV

(2a) CLM-STD (2b) CLM-DV

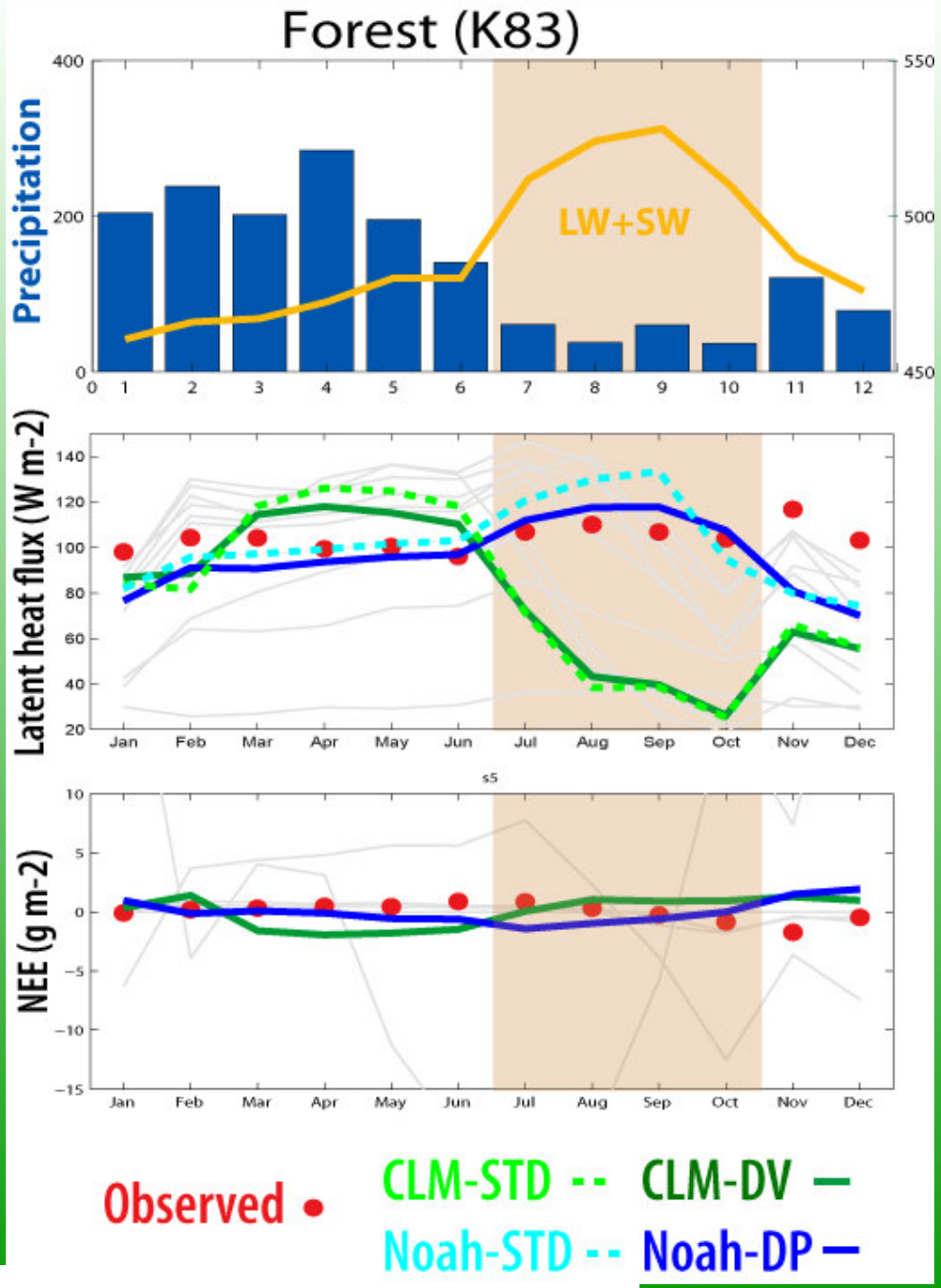
DV (Dickinson et al., 1998) allocates assimilated carbon to leaves, roots, & stems; it computes heterotrophic and autotrophic respiration



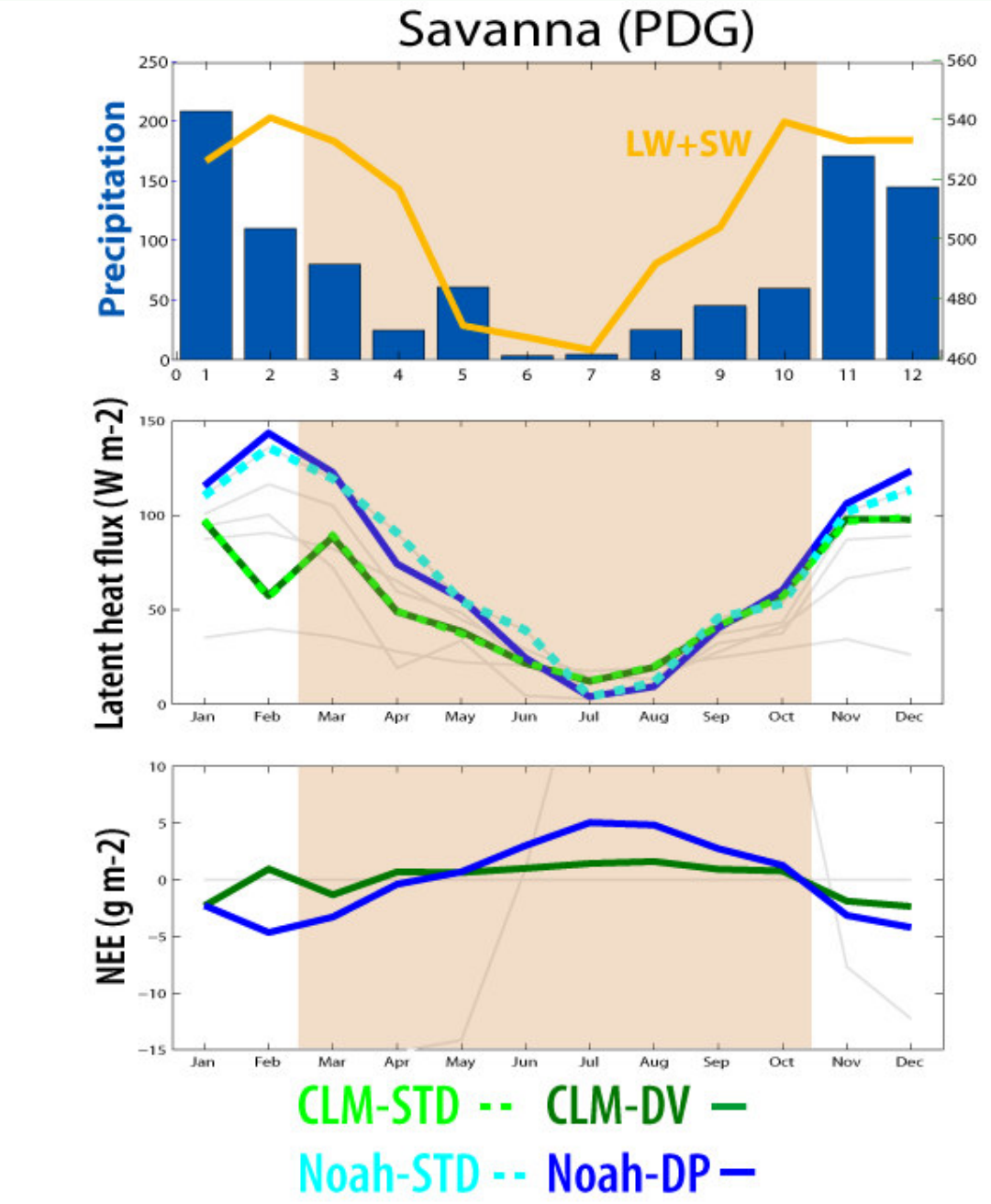
At forest site, Noah's seasonal LE cycle shows more skill than CLM's.

CLM significantly underestimates LE (and likely GPP) during the dry season.

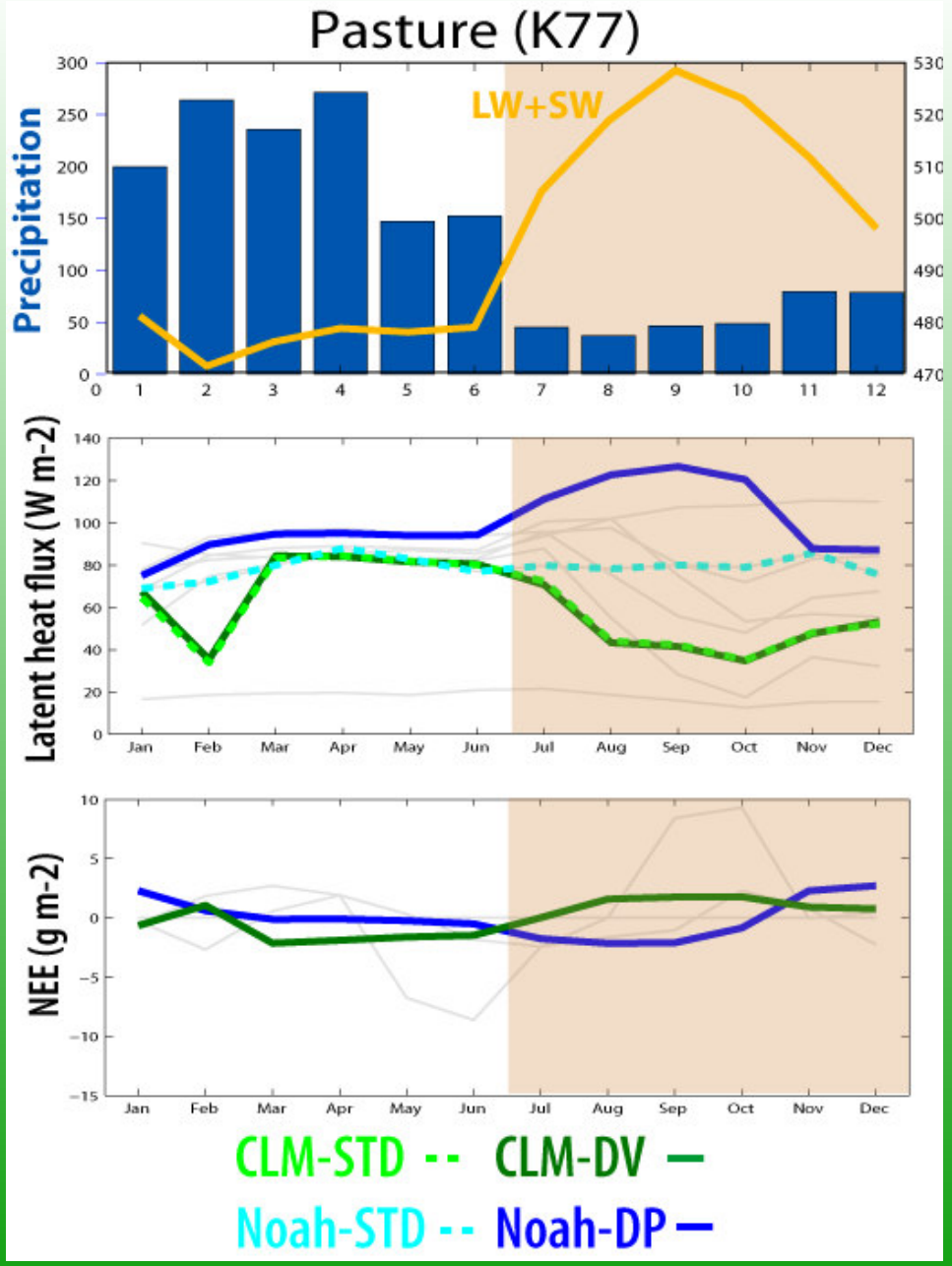
Both LSMs reproduce low-amplitude variation in mean NEE.



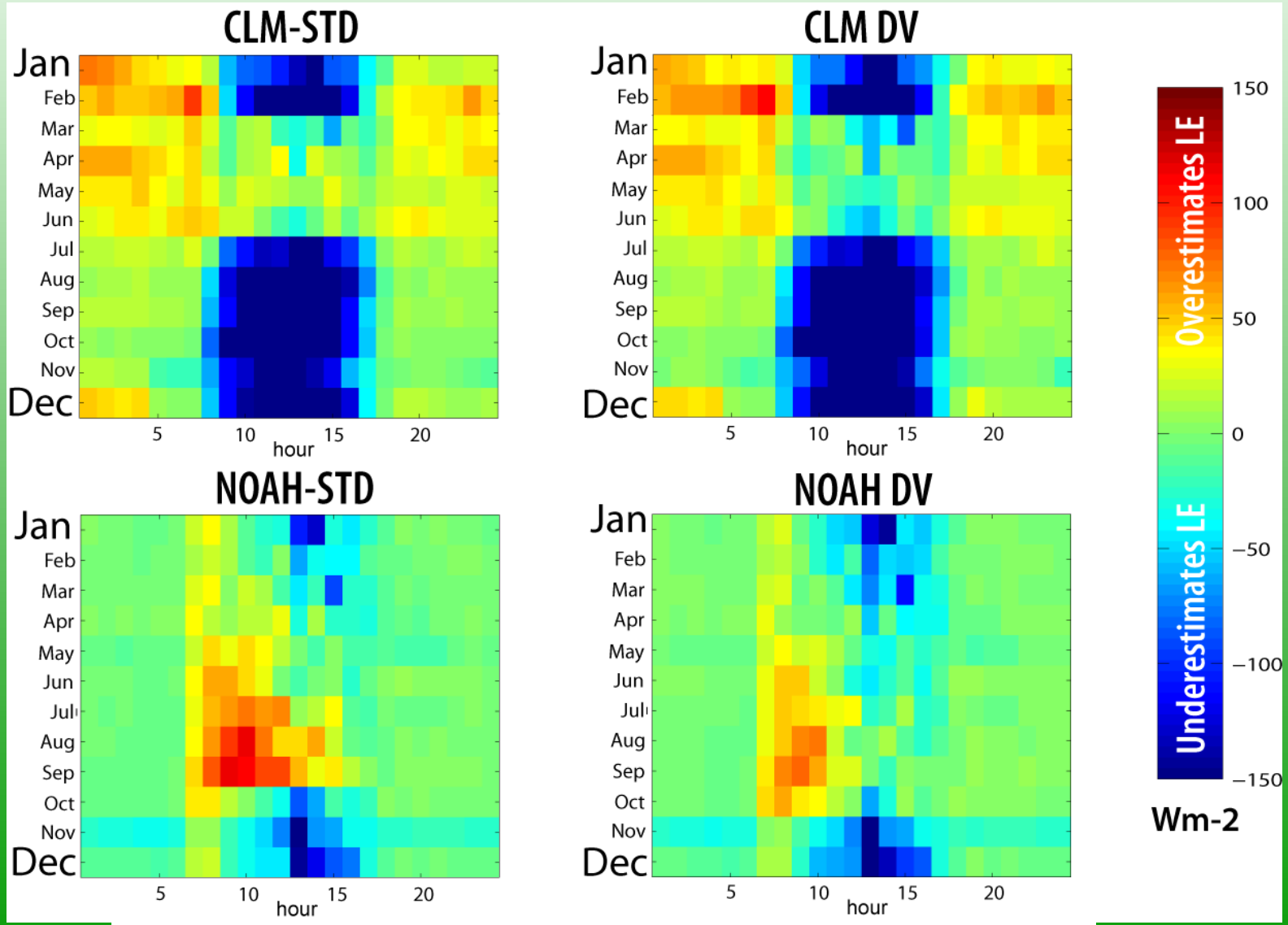
At savanna, LE simulated by Noah and CLM are in phase (unlike at forest and pastureland).



The LE and NEE simulated by Noah are out-of-phase with those simulated by CLM

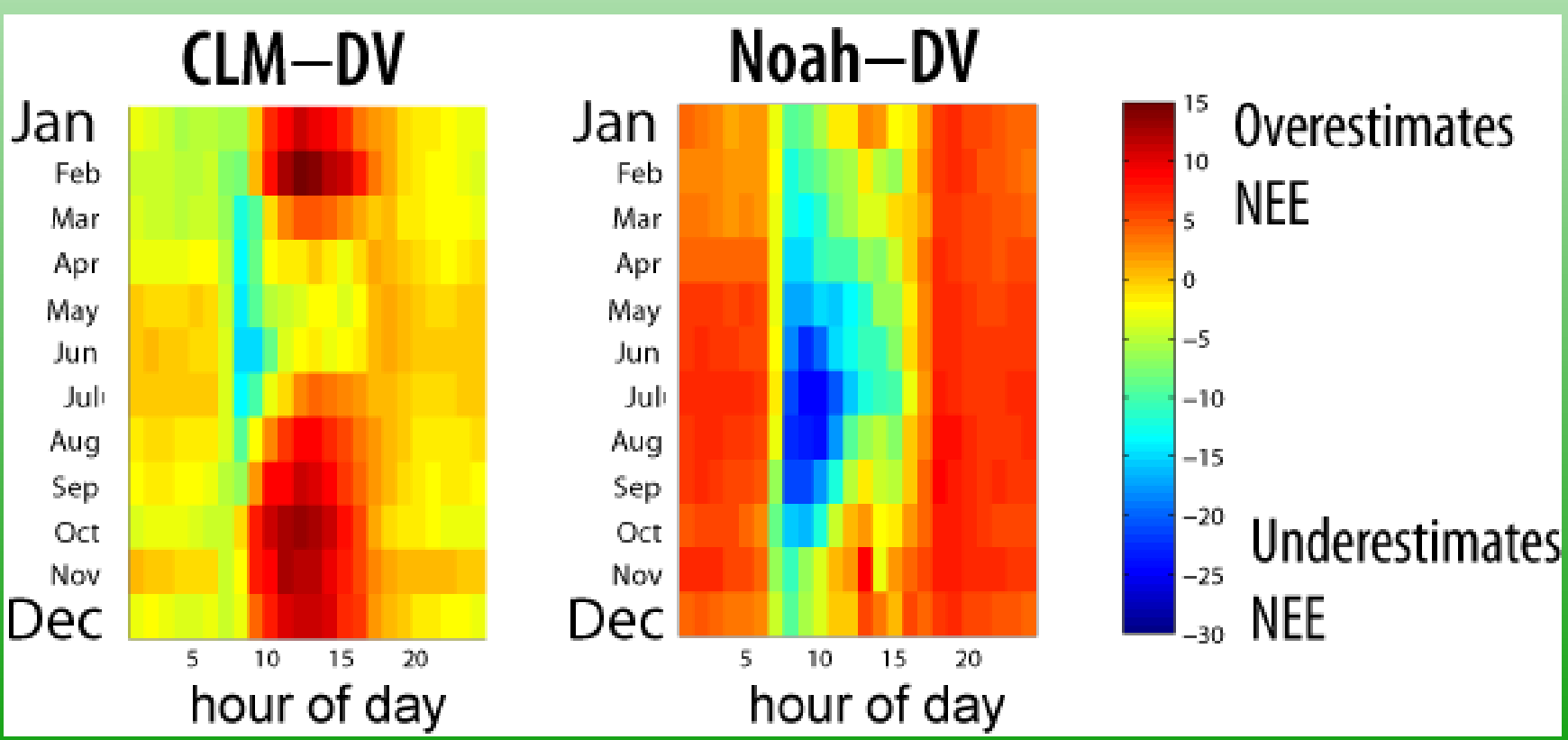


At forest site, Noah outperforms CLM when simulating the diurnal cycle of latent heat flux.



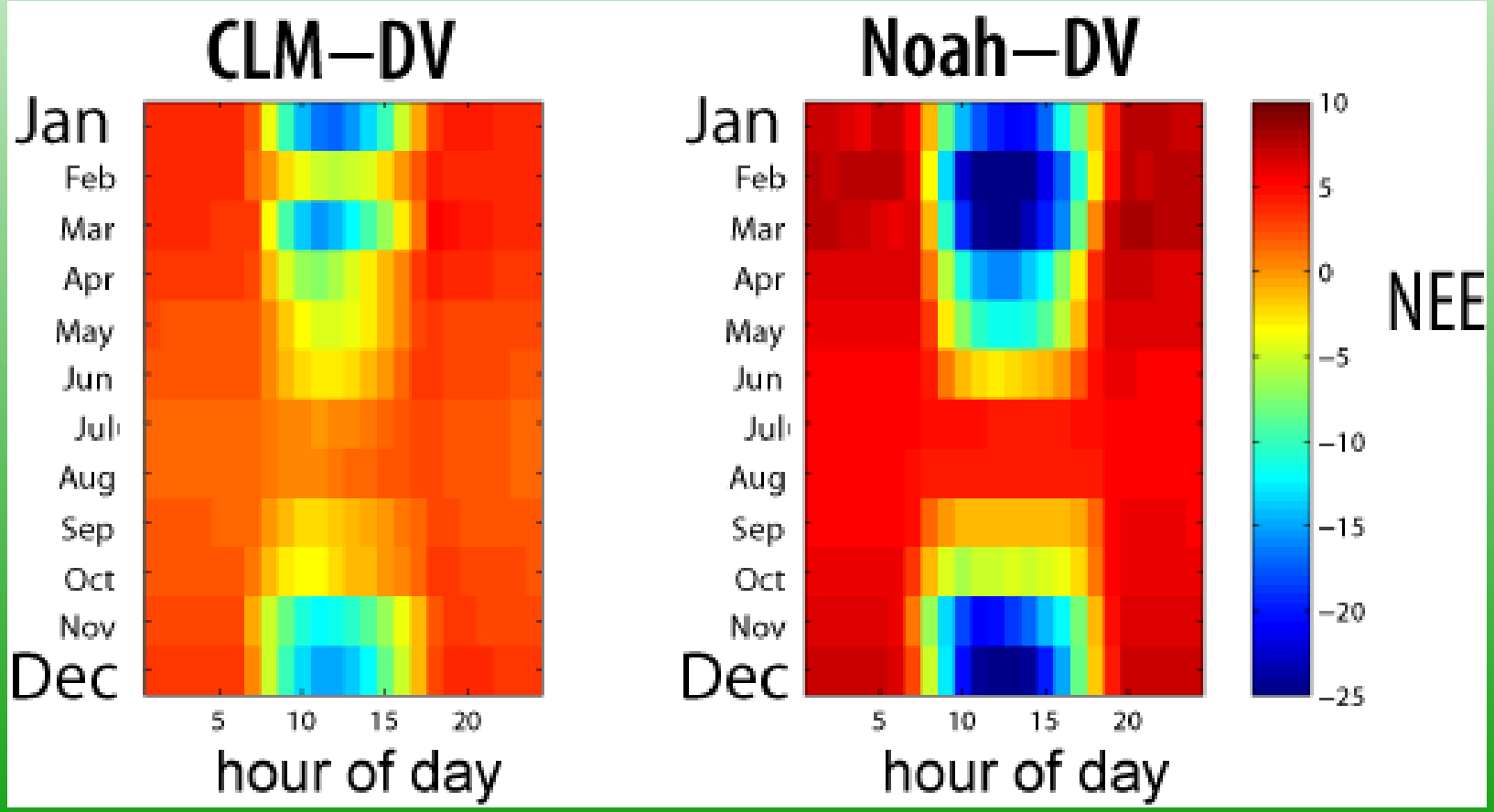
Anomaly* of NEE simulated at Forest (K83):

1. Noah simulates damped diurnal cycle of NEE; CLM simulates accentuated diurnal cycle (but pattern shifts in year).
2. Timing of anomaly shifts point to necessary changes in model



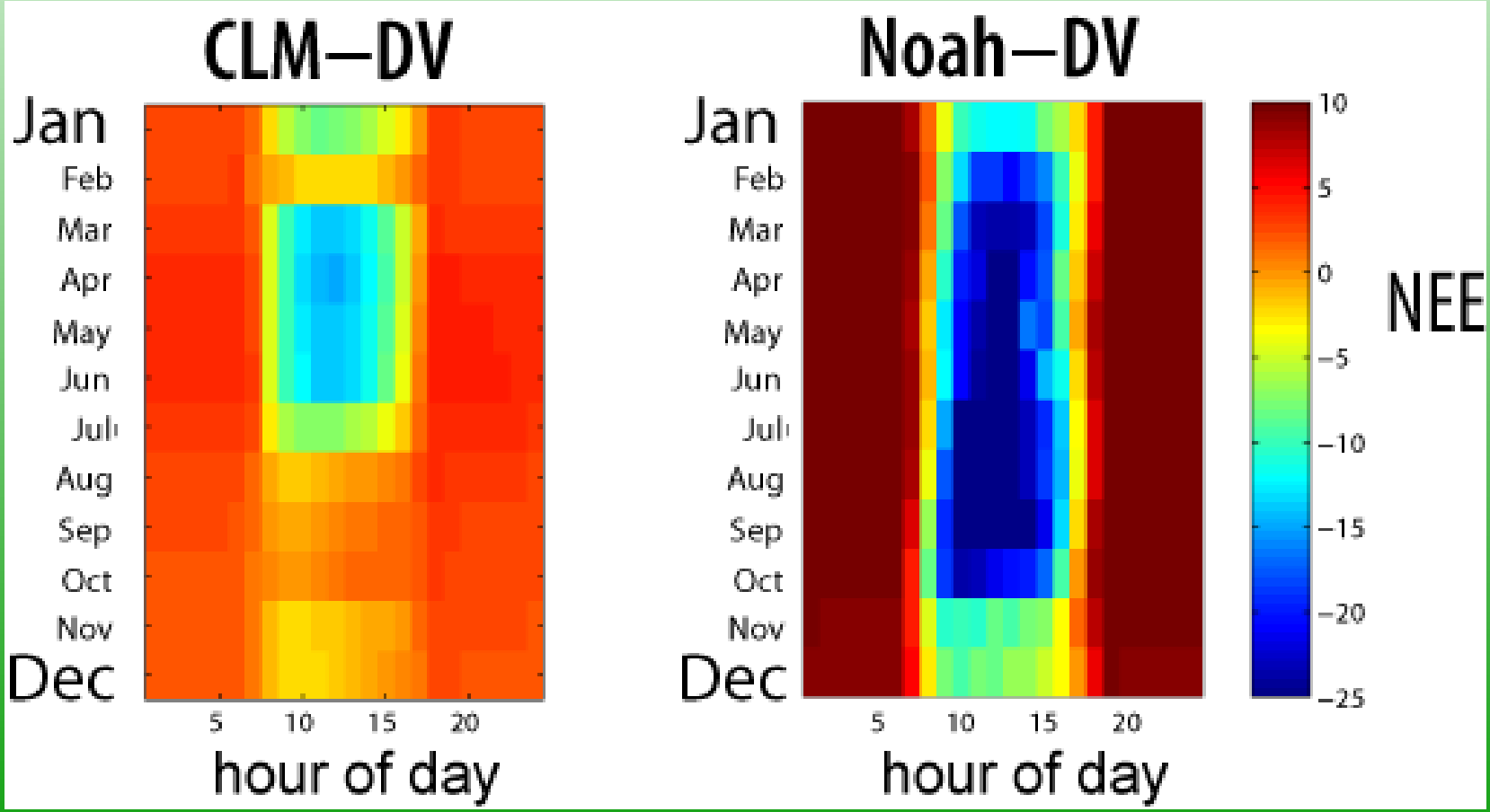
NEE simulated at Savanna (PDG):

1. Amplitude of Noah's diurnal cycle is larger than that of CLM's
2. Modeled NEE is qualitatively similar between models



NEE simulated at Pasture (K77):

1. Amplitude of Noah's diurnal cycle larger than CLM's
2. Modeled NEE is qualitatively similar between models



Summary

1. Noah LSM (both with and without DV) simulates LE fluxes at the forest site (K83) more skillfully than CLM on both diurnal and seasonal time scales.

3. Noah and CLM have inverted phenological responses in all sites but savanna.

5. Amplitude of Noah's diurnal NEE cycle is more accentuated than CLM's at savanna and pastureland; at forest Noah's is damped.

7. At the forest site, the shape of the Noah seasonal cycle is consistent with recent observations of a green-up during the dry season.

Thanks to the following researchers and their teams for providing the LBA site data: Drs. Borma/Colliccio, Dr. Rocha, Dr. Cabral, Drs. Manzi/Nobre/Santos, Dr. Araujo, Dr. Wofsy, Dr. Saleska, Dr. Camargo, Dr. Moraes, Dr. Sakai, Dr. Goulden, Dr. Miller, Dr. Cardoso, Dr. von Randow, Dr. Kruijt.

Thanks for your attention.

gulden@mail.utexas.edu

erosero@mail.utexas.edu