What I was ASSIGNED to do, what I've DONE, and what I WANT TO DO.

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Colorado State University
LBA-DMIP Workshop
Biosphere 2, Arizona
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Assignment:

- Paper: What determines seasonality of NEE?
- Did I do this? Not really...
- But I do have a paper, ready for coauthor review, that talks about seasonality in Amazonia

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Surface ecophysiological behavior across vegetation and moisture gradients in Amazonia

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Abstract. Surface ecophysiology at 6 sites across vegetation and moisture gradients is investigated. From the moist northwest (Manaus) to the relatively dry southeast (Pé de Gigante) simulated seasonal cycles of latent, sensible, and carbon flux produced with the Simple Biosphere Model (SiB) are confronted with observational data. In the northwest, abundant moisture is available suggesting that these ecosystems are light-limited. In the wettest regions, Bowen ratio is consistently low, with little or no annual cycle. Carbon flux shows little or not annual cycle as well; efflux and uptake are determined by high-frequency variability in light and moisture availability. Moving downgradient in annual precipitation amount, dry season length is more clearly defined. In these regions, a dry season sink of carbon is observed and simulated. This sink is the result of the combination of increased photosynthetic production due to higher light levels, and decreased respiratory efflux due to soil drying. The differential response time of photosynthetic and respiratory processes produce observed annual cycles of net carbon flux. At dryer regions, moisture and carbon fluxes are in-phase; there is carbon uptake during seasonal rains and efflux during the dry season. At the driest regions (cerrado, or savanna), there is also a large annual cycle in latent and sensible heat flux. The transition forest, or cerradão, is a highly heterogeneous region incorporating elements of forest and savanna. Our simulations closely resemble a previously described cerradão site, but have substantive differences from the transition forest site explored in this study.

1. Introduction

The Amazon Basin occupies a central role in our ability to understand and predict interactions between earth and atmosphere across multiple spatial and temporal scales. The dense forest and large spatial extent means this region stores a significant fraction of global biomass [*Houghton et al.*, 2001], up to 10%. It has been predicted that climate change will result in the conversion of Amazonian forest to savanna or grassland, releasing much of the carbon stored at the surface and further altering the radiation characteris of the atmosphere [*Cox et al.*, 2000; *Huntingford et al.*, 2 *Huntingford et al.*, 2008]. Predictions such as these pla premium on our ability to understand the surface ecop iology of tropical systems. If we are to predict global mate under changing radiative conditions, we must be to translate our understanding of the physical system numerical models, and tropical Amazonia will play a sig icant role.

Surface ecophysiology in Amazonia is tightly couple the atmosphere. Seasonal temperature range is small, annual variability is primarily defined by the intensity duration of wet and dry seasons. Bidirectional coupling tween surface and atmosphere plays a critical role in tim duration, and magnitude of seasonal rains, and the l areal extent of the basin provides Amazonia with influ on regional to global-scale circulation patterns. The re is important to global carbon flux, due to the large car stores and fluxes.

The behavior of the land surface is tightly couple the cycles of wet and dry seasons that define seasona in the region. In the tropical Americas, there is an an cycle, whereby convective precipitation associated with Intertropical Convergence Zone (ITCZ) is centered over

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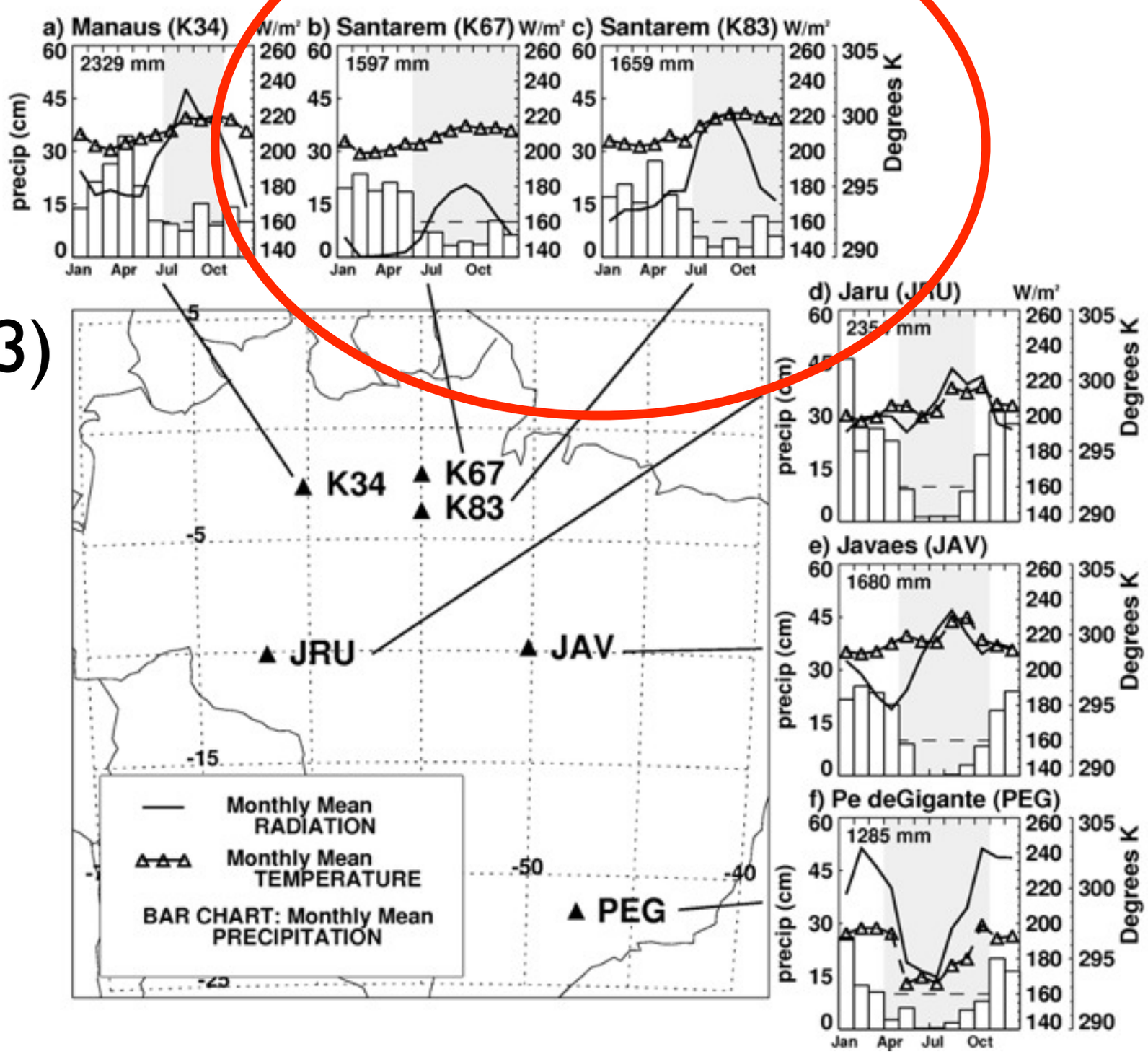
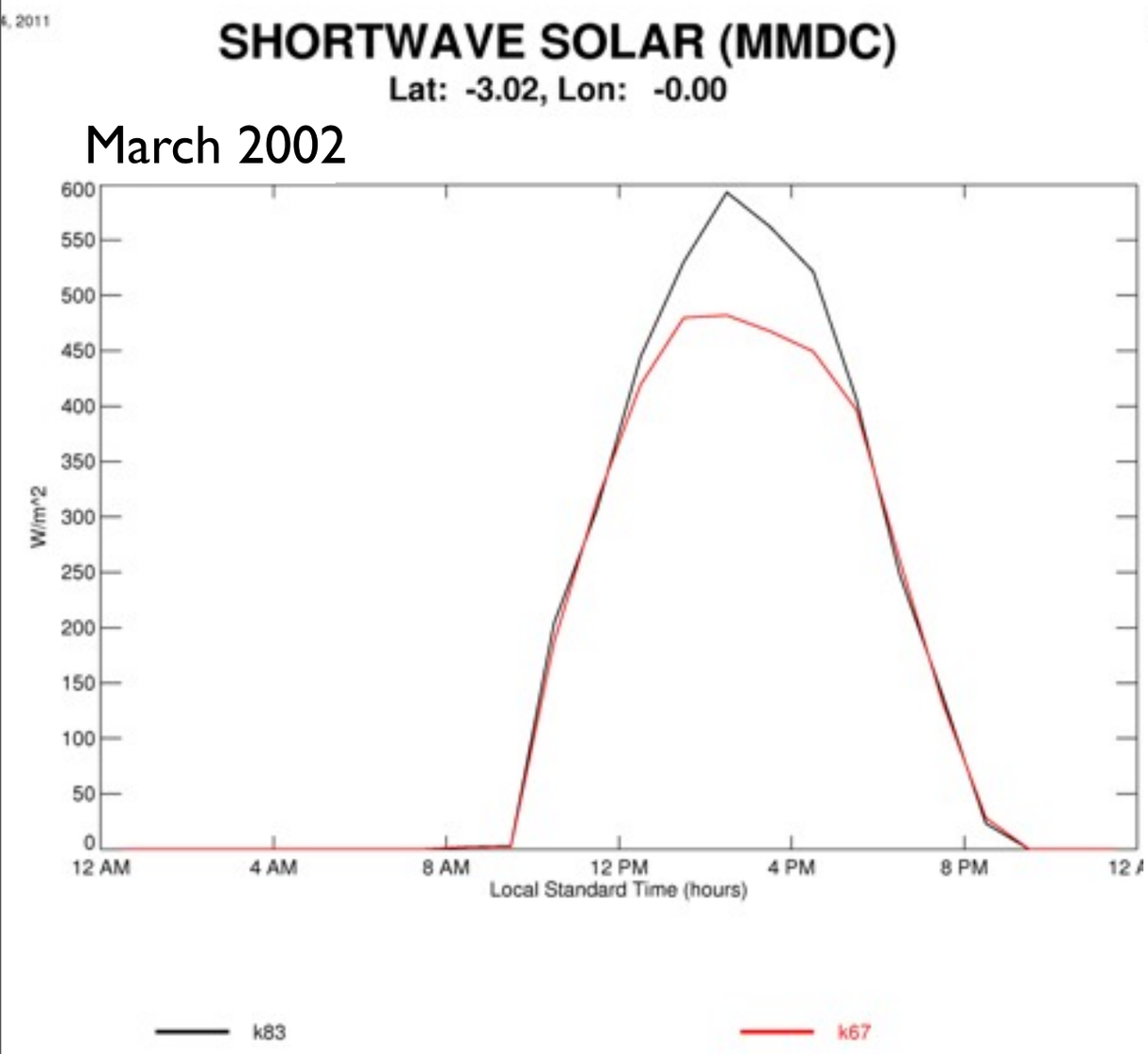
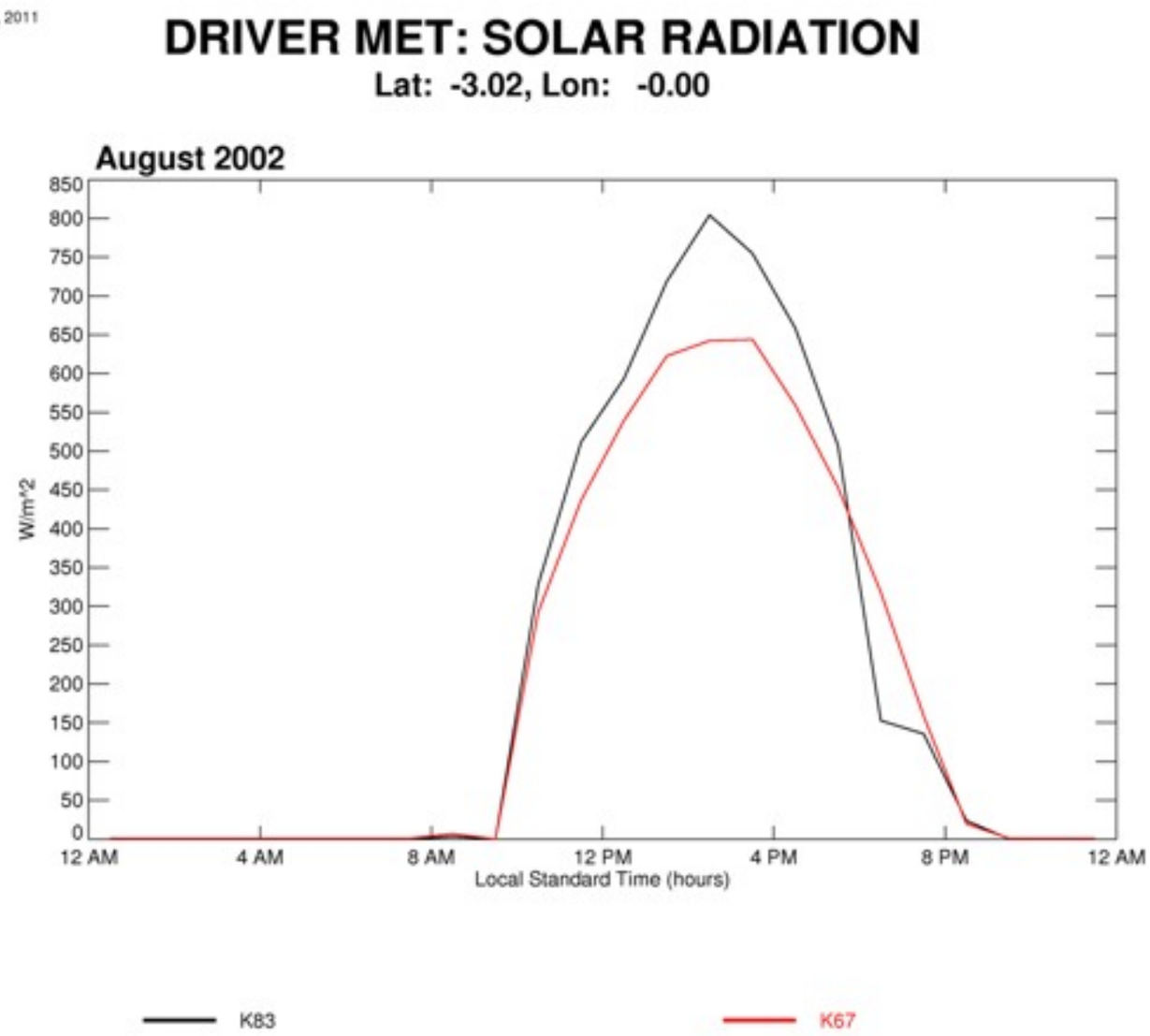
Site Comparison

- Tapajos River National Forest, Brazil (KM67/KM83)
- Sites are near each other
- Virtually identical- but look at radiation!



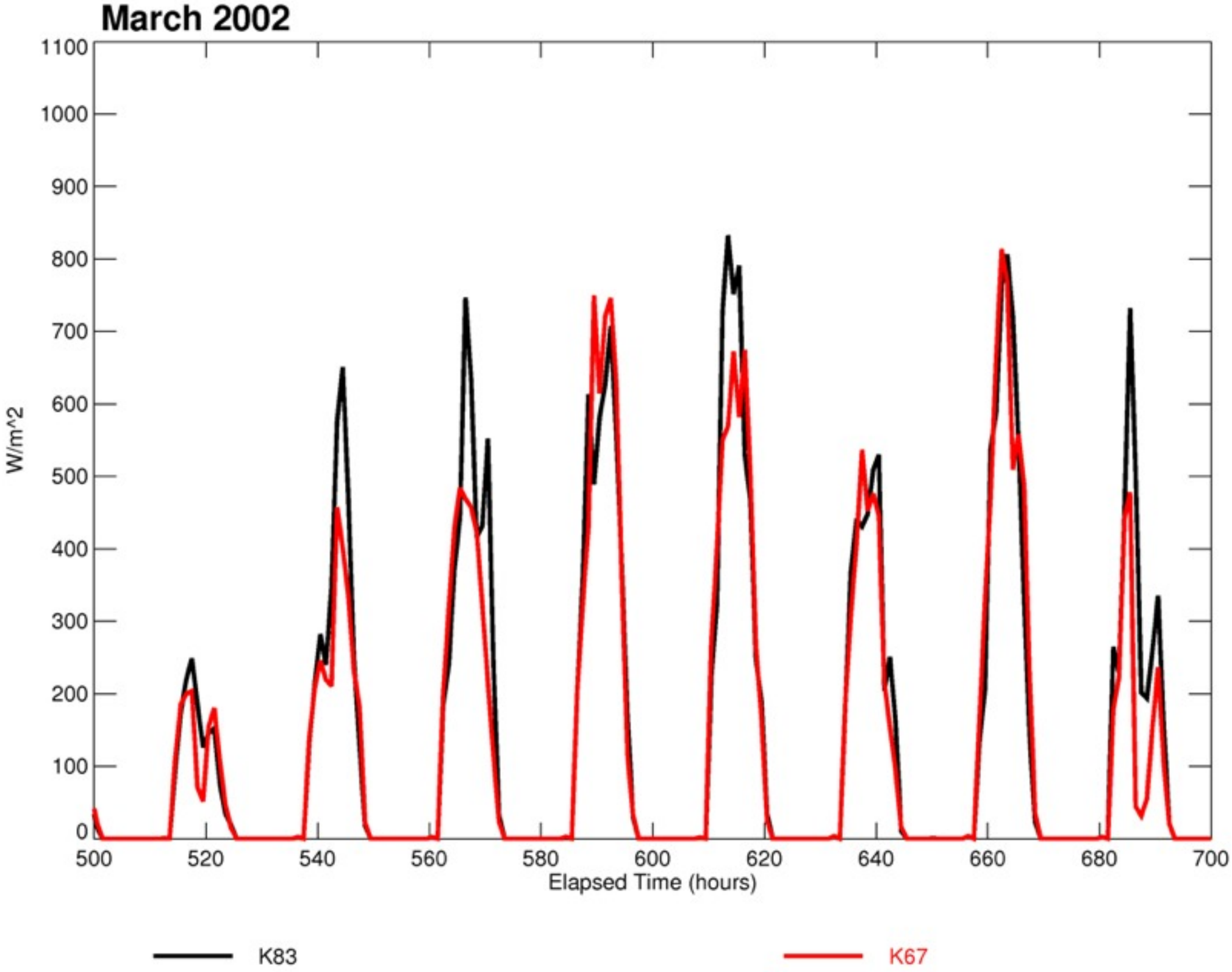
Diurnal Composites





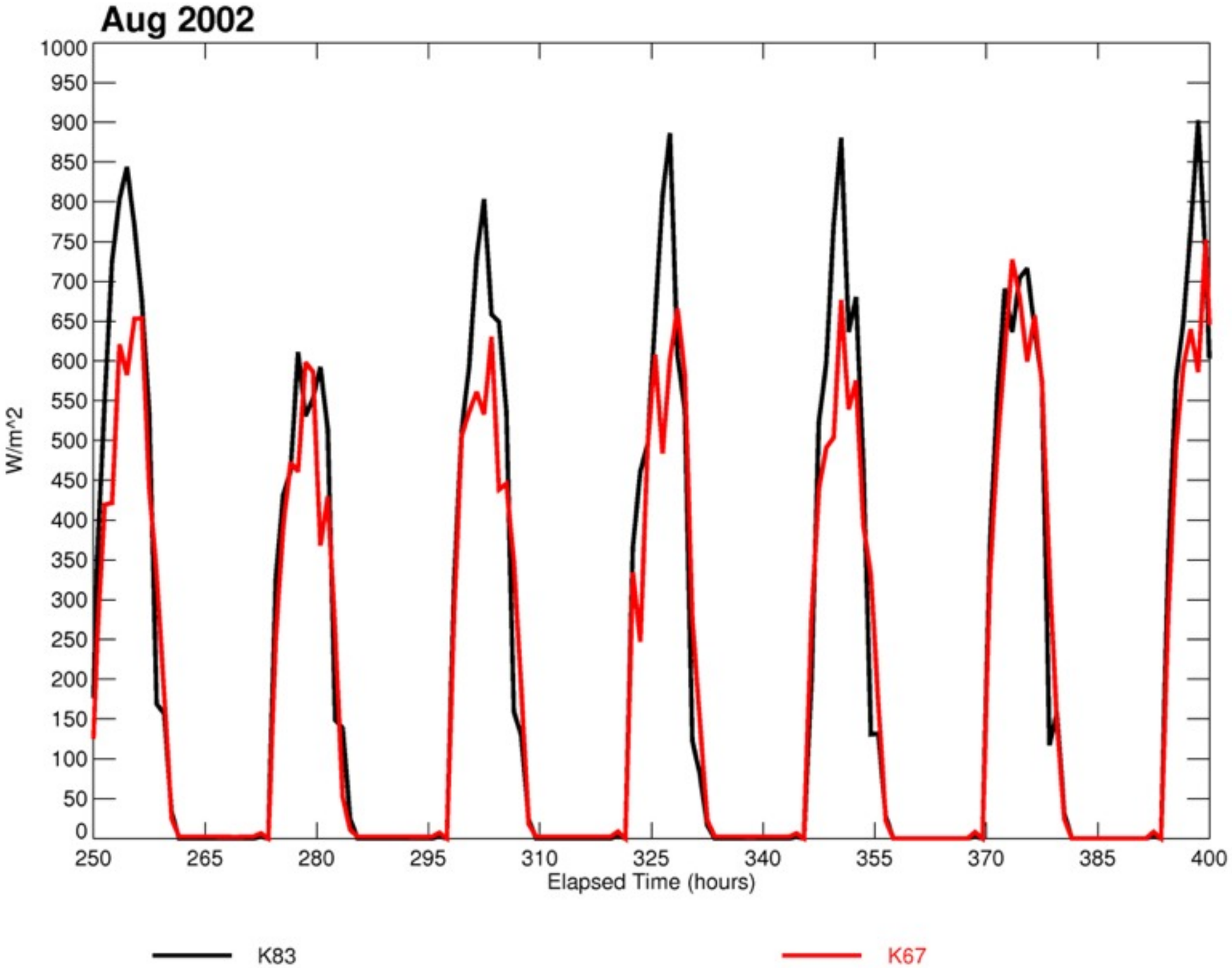
SHORTWAVE SOLAR

Lat: -3.02, Lon: -0.00



DRIVER MET: SOLAR RADIATION

Lat: -3.02, Lon: -0.00



So What's Going On?

- River Breeze (Silva Dias et al. 2004)
- Convergence line (Lu et al. 2005)
- K67 is 'shaded' by this quasi-persistent cloud more frequently than K83!

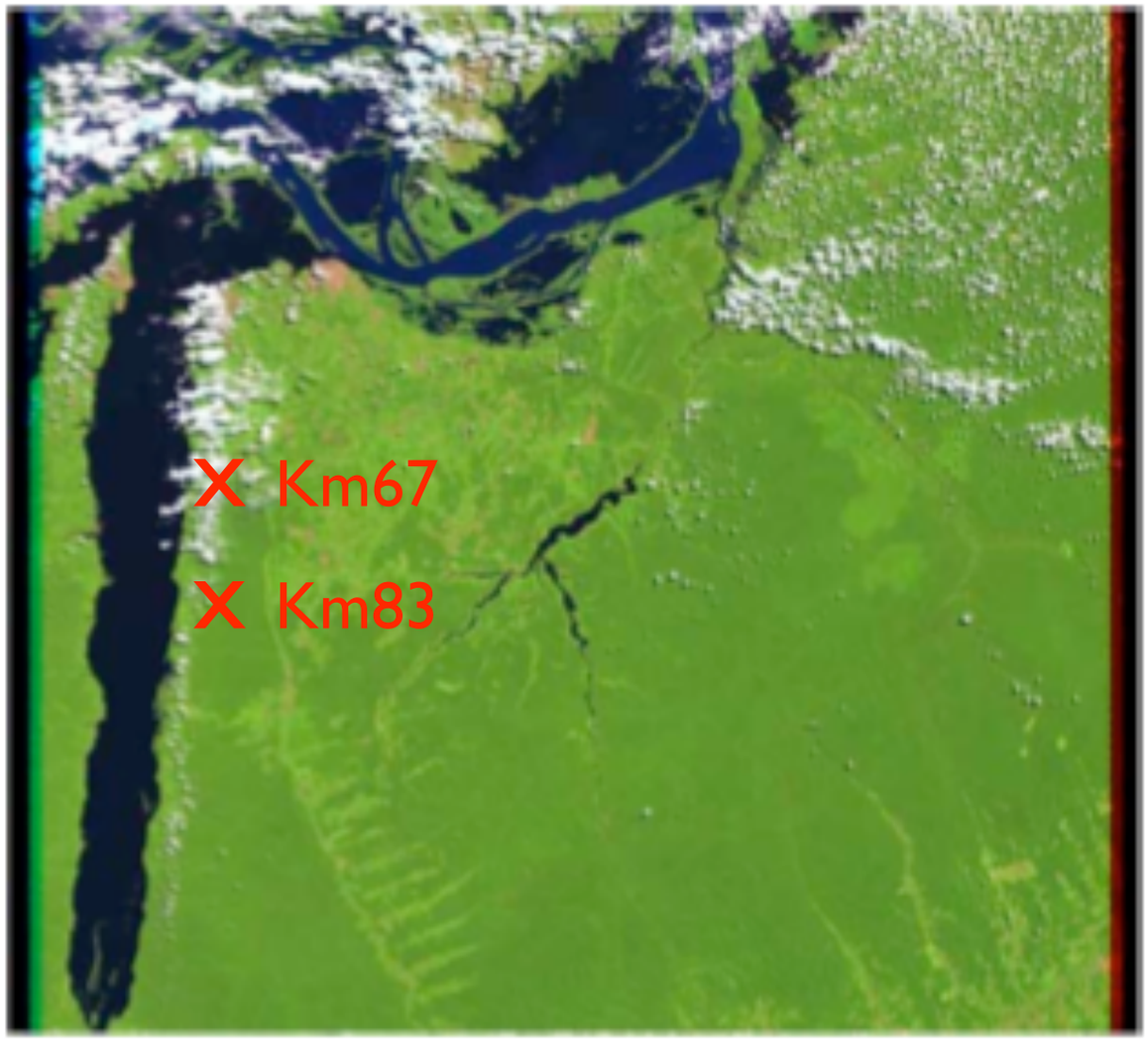
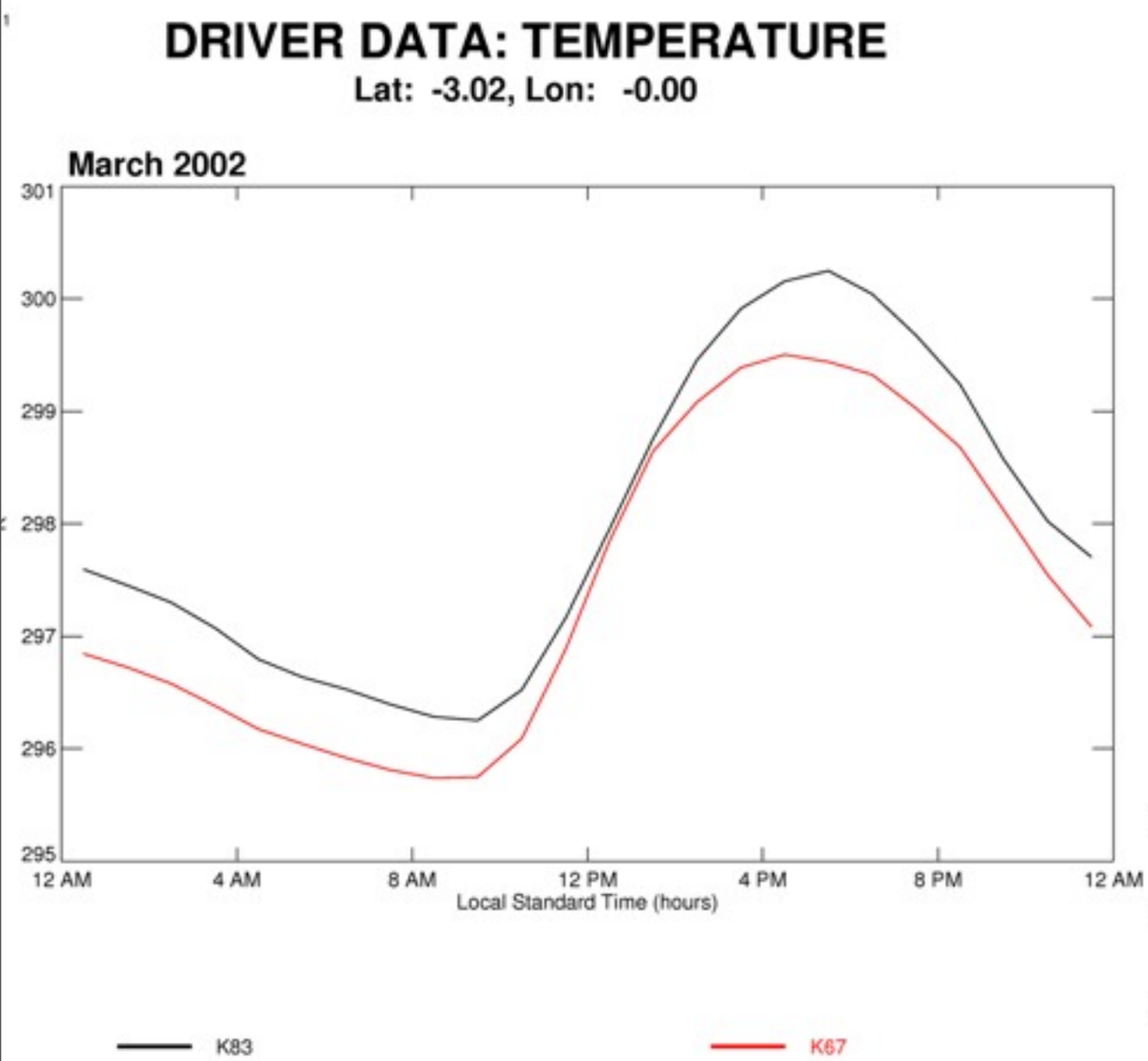
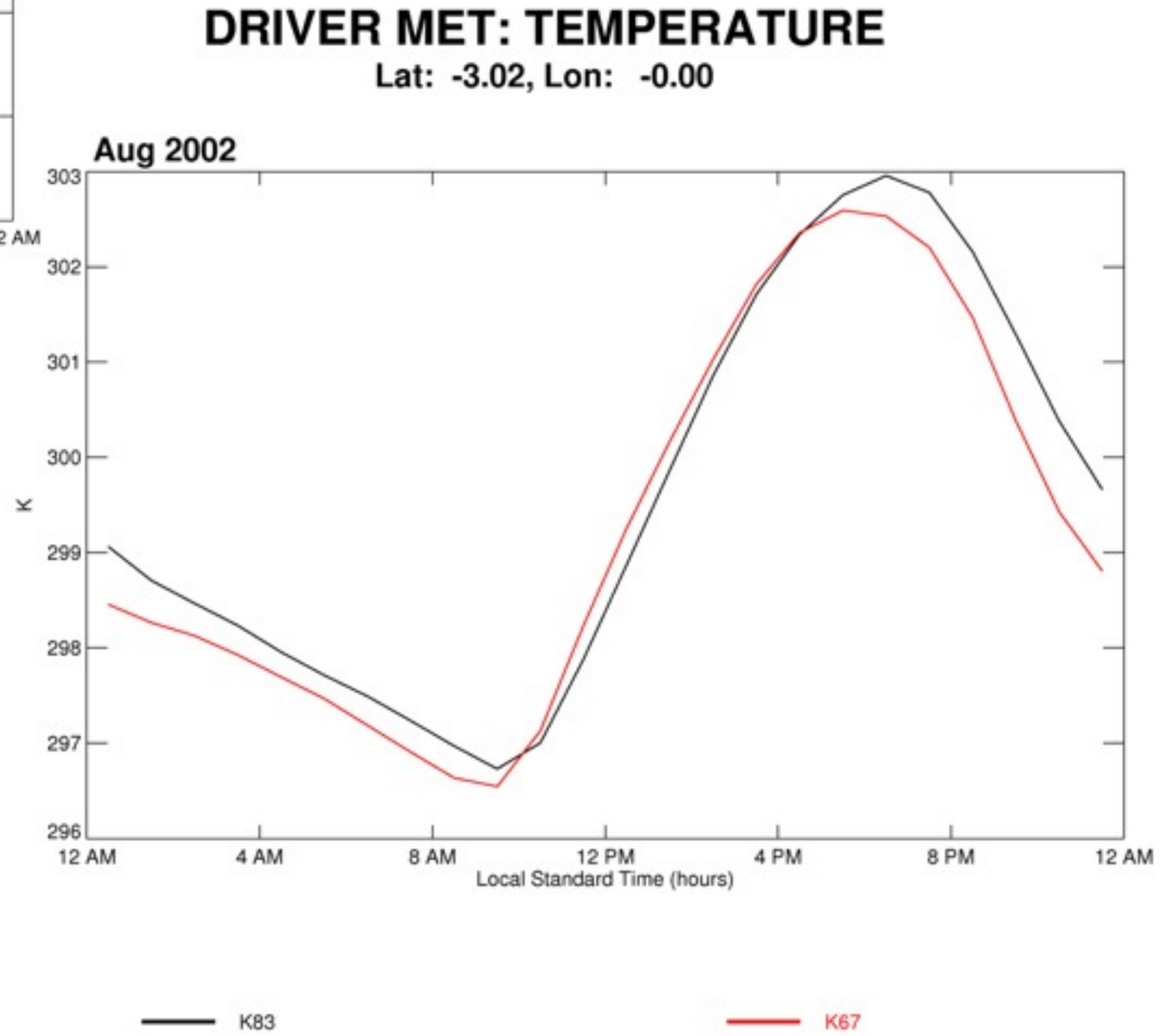


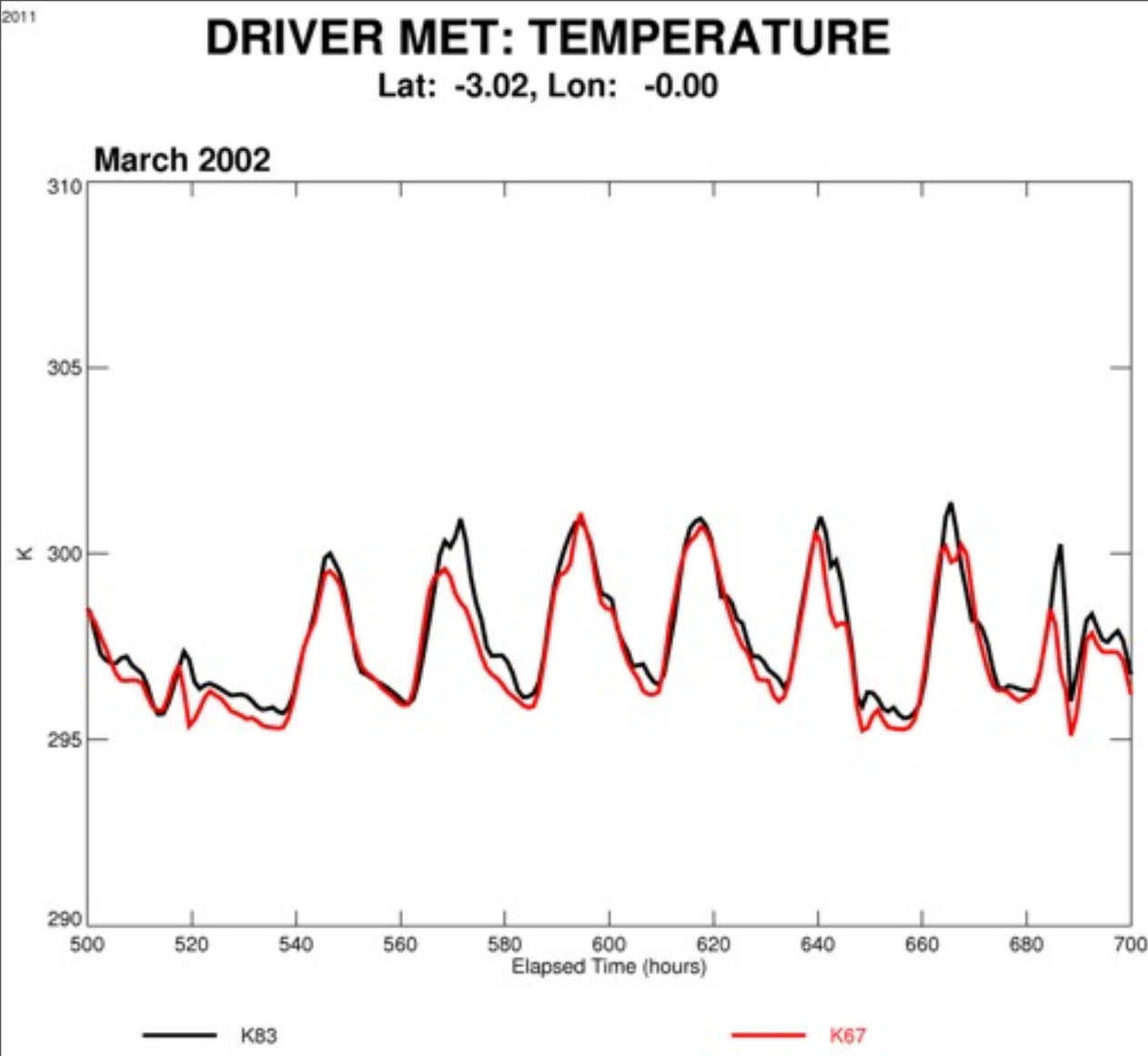
Figure 9. Satellite image obtained from LandSat 7 ETM+ scene for path 227 and row 62, on 31 July 2001. It shows that during a clear day, the low-level cumulus clouds favor the east bank of Tapajós River. The image is located at the Web site of Tropical Rain Forest Information Center (TRFIC), which is jointly hosted by LBA-ECO and Michigan State University.



This feature influences temperature...

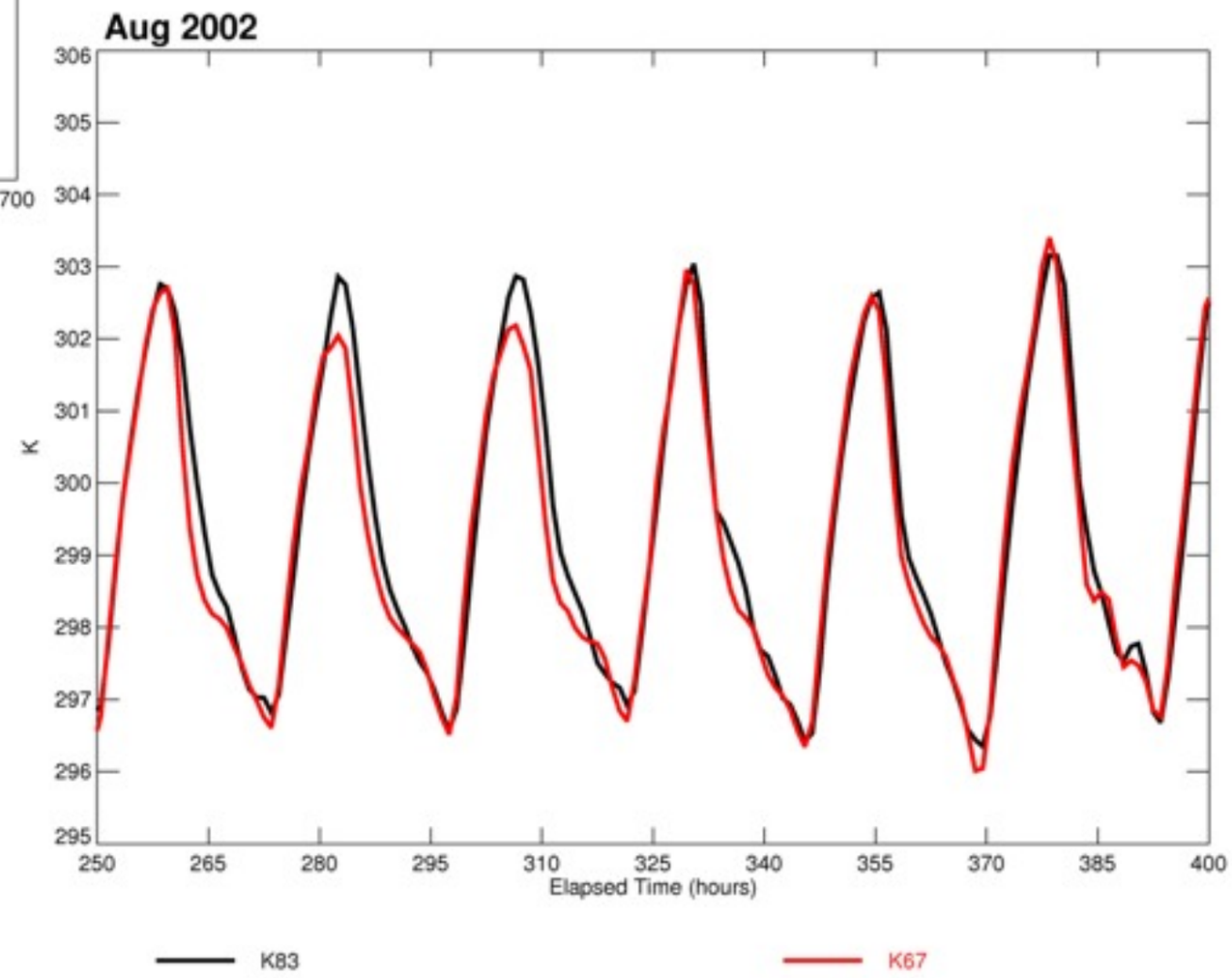


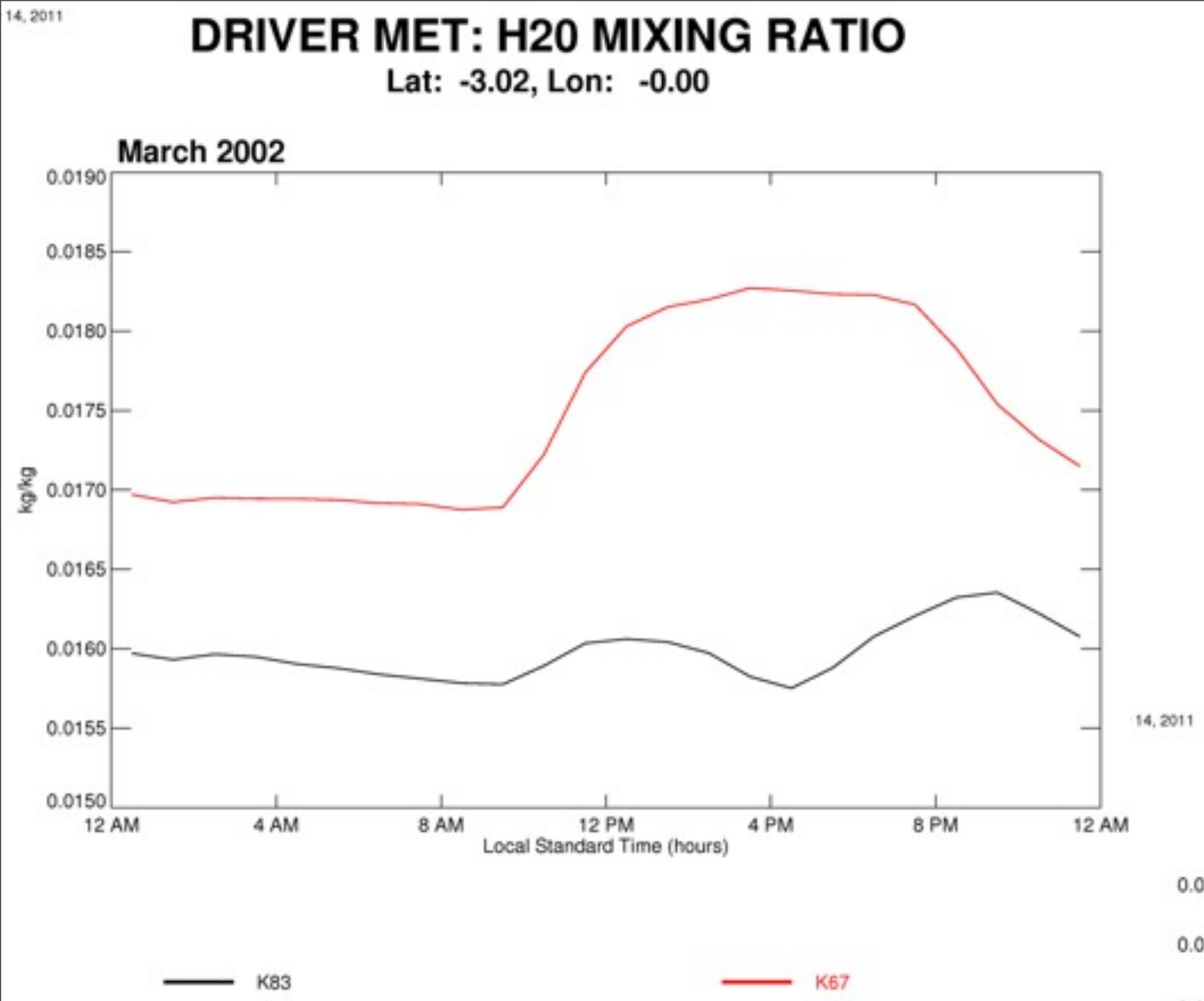
Diurnal Composites



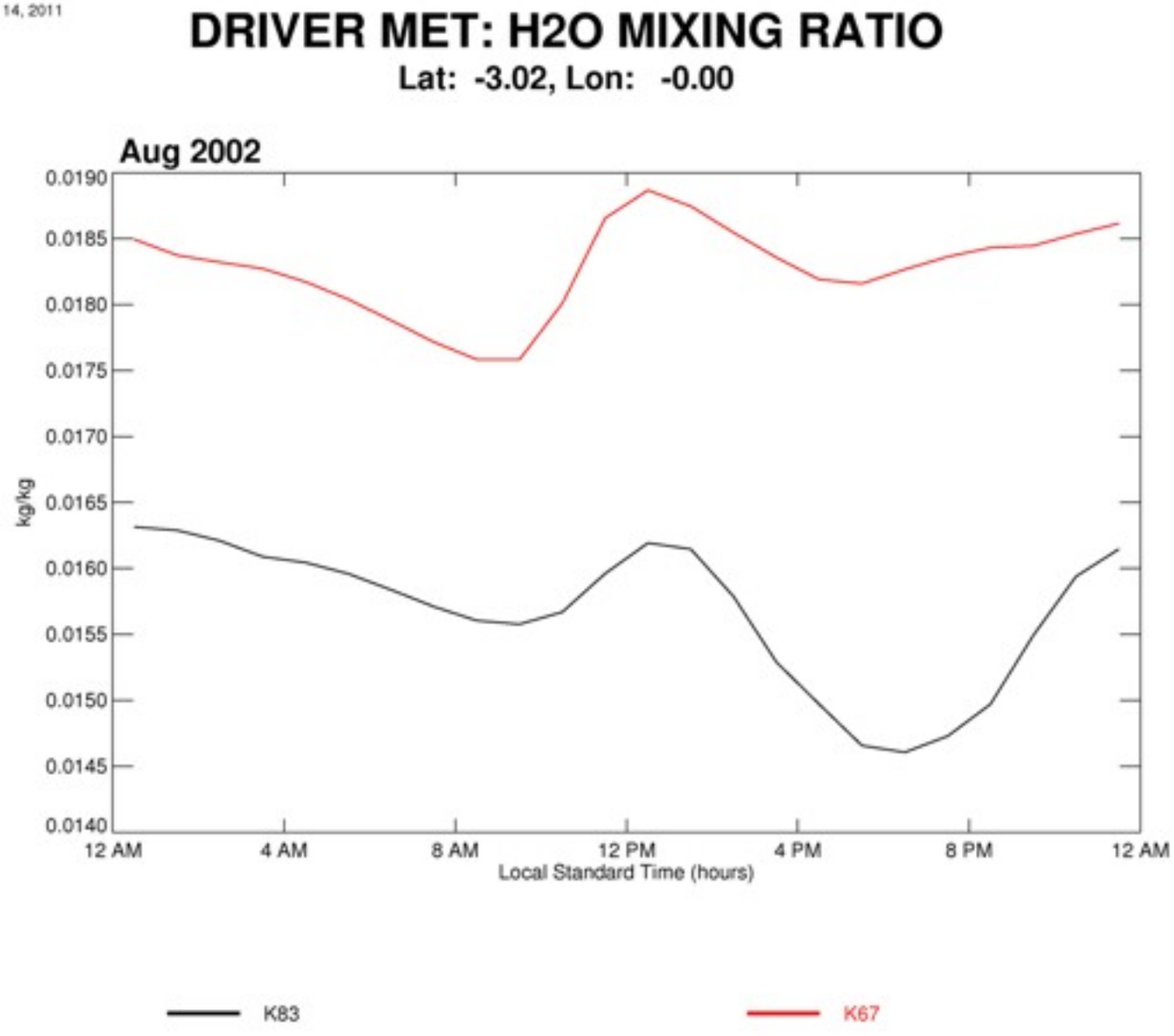
This feature influences temperature...

Time series- several days





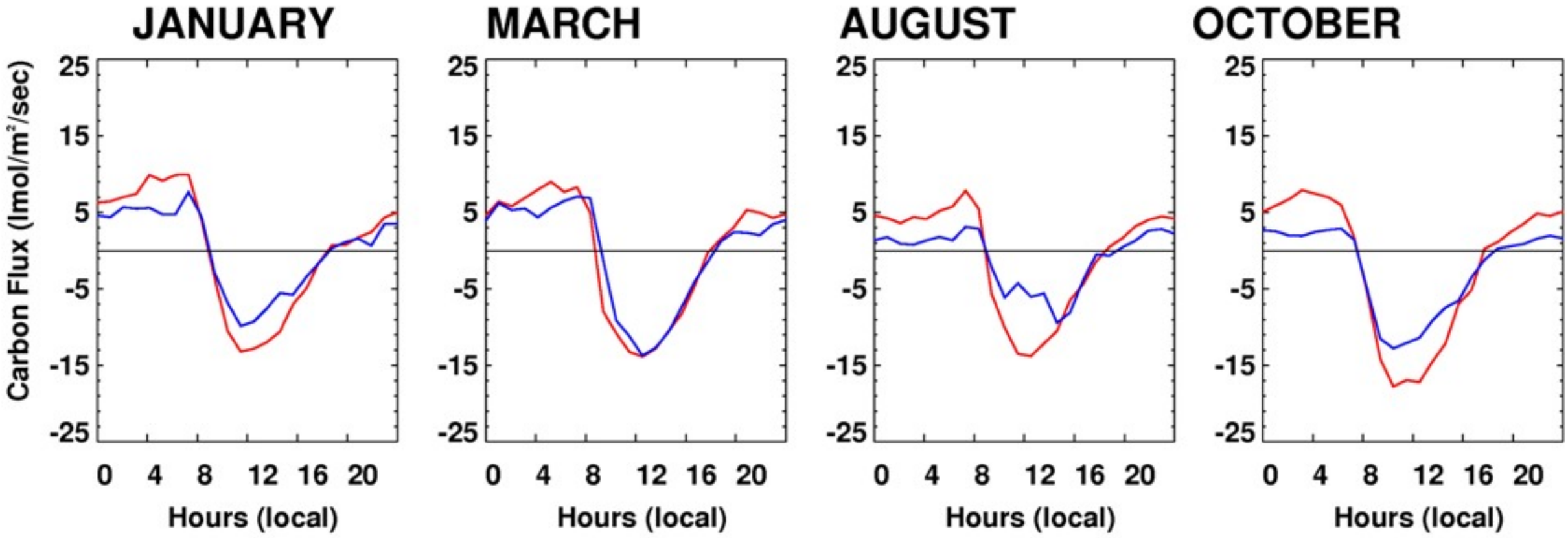
And water vapor...



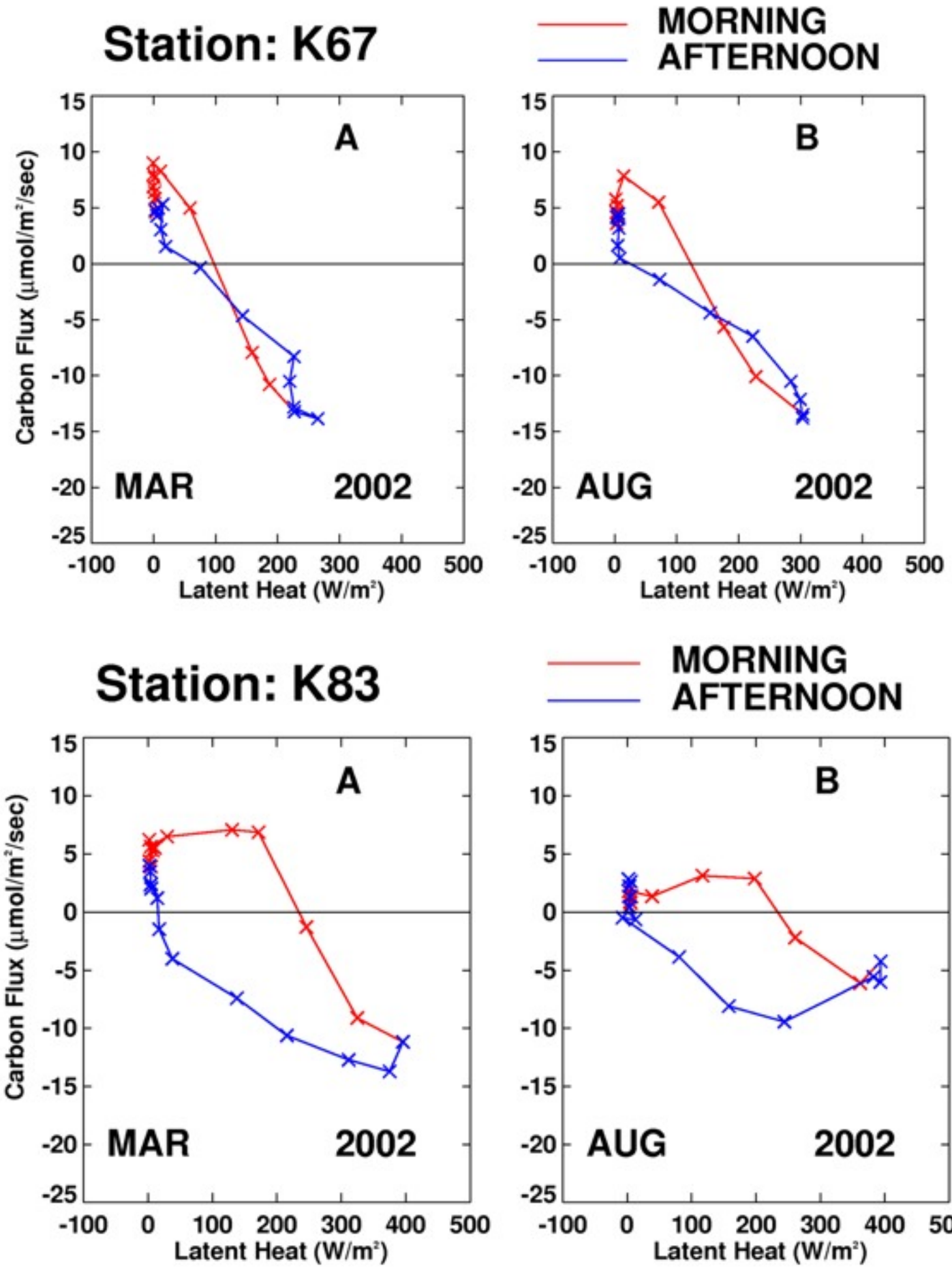
Are these differences due to physiology, tower configuration/topography, or a combination?

Observed Carbon Flux

All 2002



these two sites behave identically in March, right?



- K67: looks more like a 'light response' curve
- Quasi-linear response, C-flux and LE
- K83: More hysteresis (hysterical?)
- Morning: K83, greater increase in LE
- Afternoon: similar between two stns

This is an opportunity, on multiple levels:

- Evaluate differences observed between sites
- Radiation: Beam vs. Diffuse: Can we quantify?
- Models: How are they similar and different between the sites?
- How do models treat radiation?
- MUCH MORE THAN A BEAUTY CONTEST: Use models to help tease out details in the physics.