

# Modeling Savanna: Some Thoughts

Ian Baker  
Colorado State University

Land Model Working Group Meeting  
NCAR  
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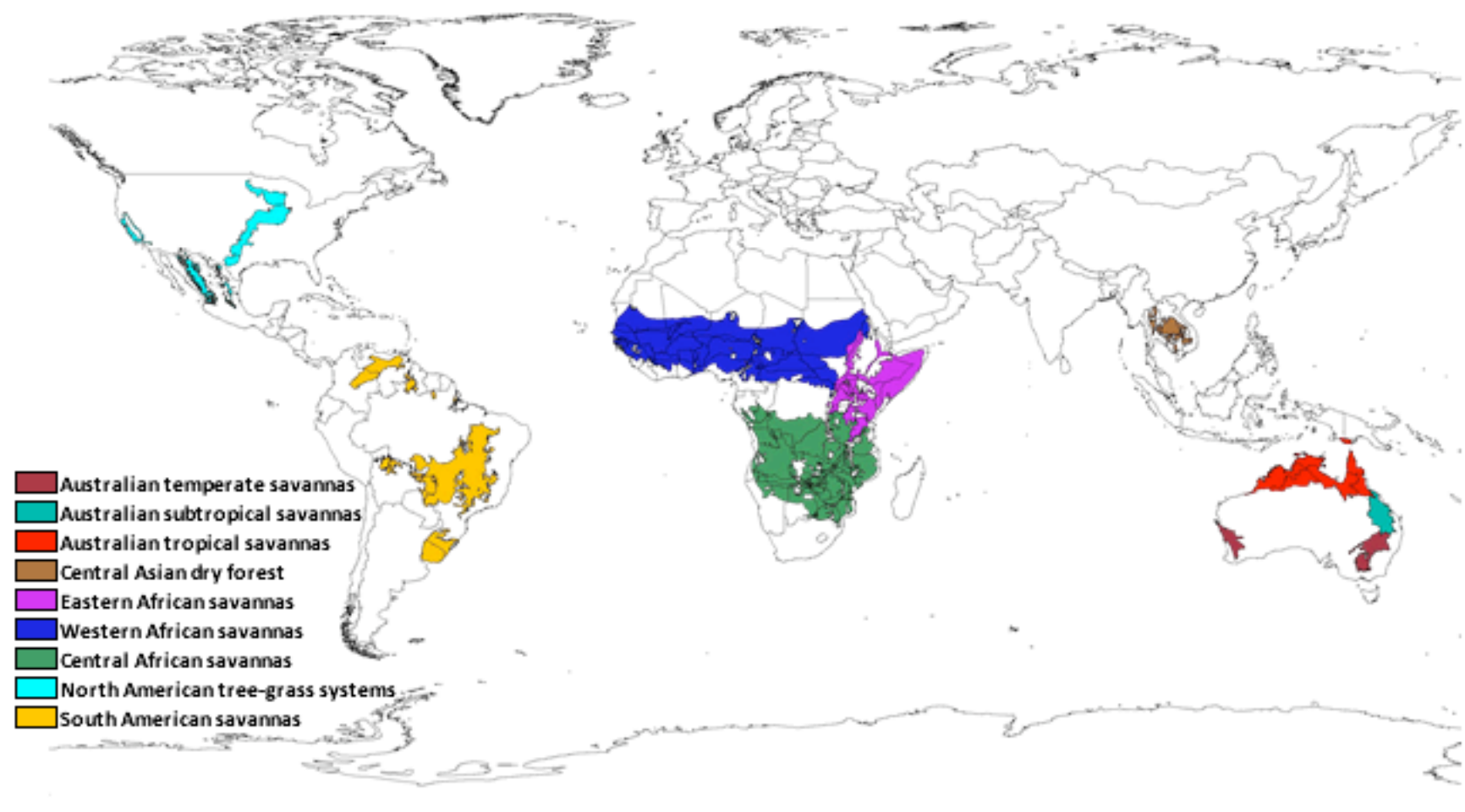




# Goals:

- **Summarize** present-day thinking on how we model savanna
- Get **input** on new work (who/what)
- DISCUSS: **How can we improve** current parameterizations?
- DISCUSS: What **information** do we need?

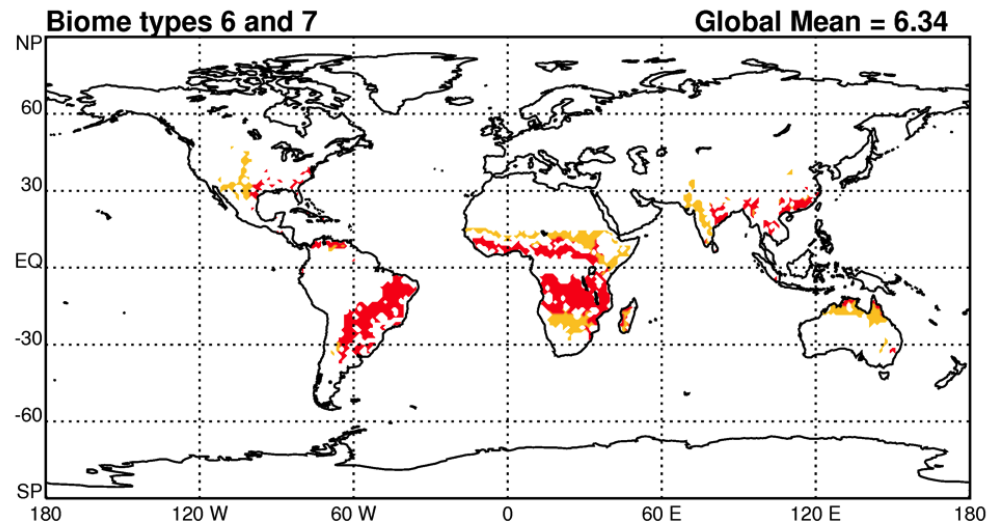
# Location



# Location in models

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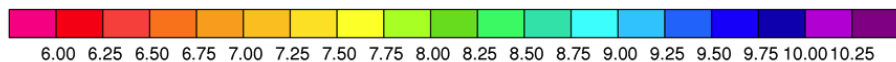
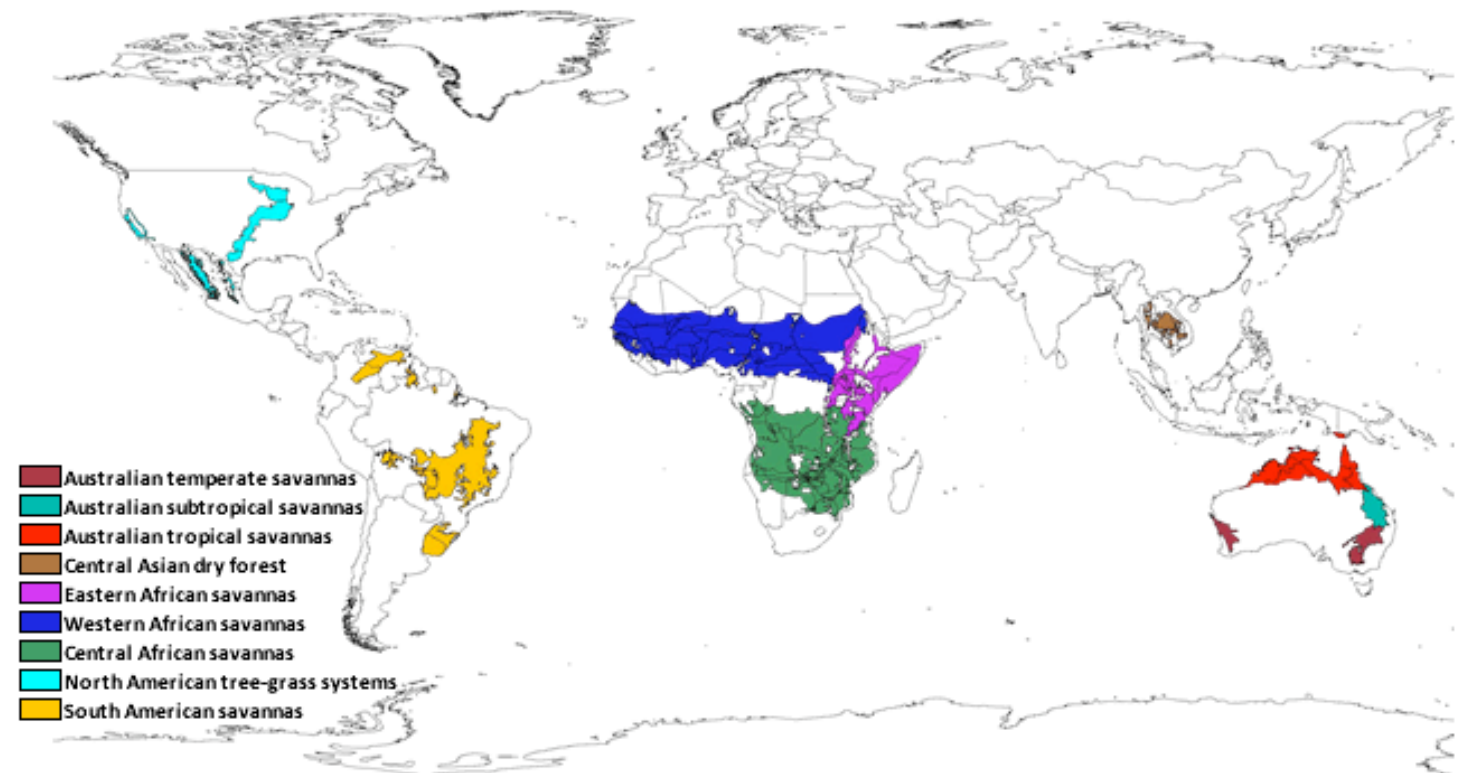
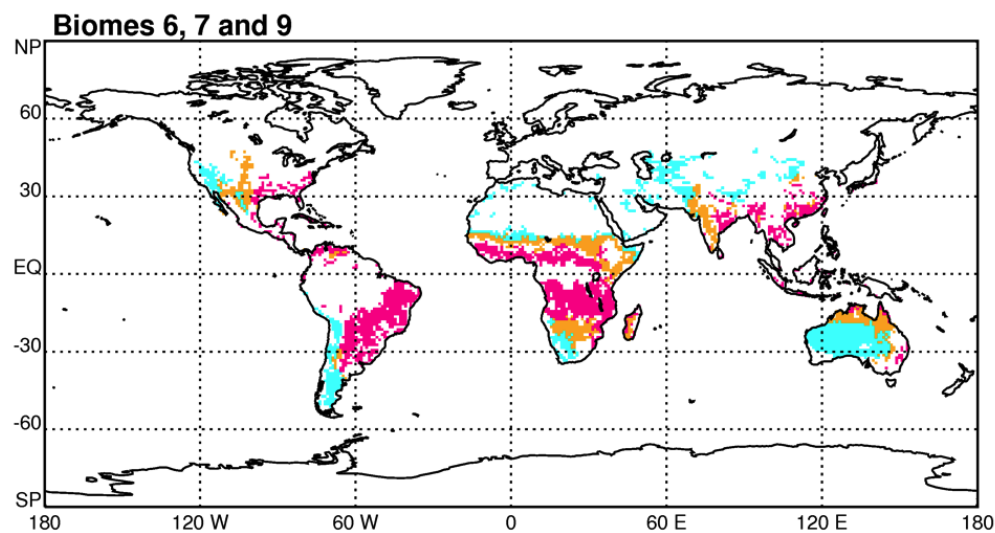
## SiB 1x1 Savanna Pixels



Feb 1, 2010

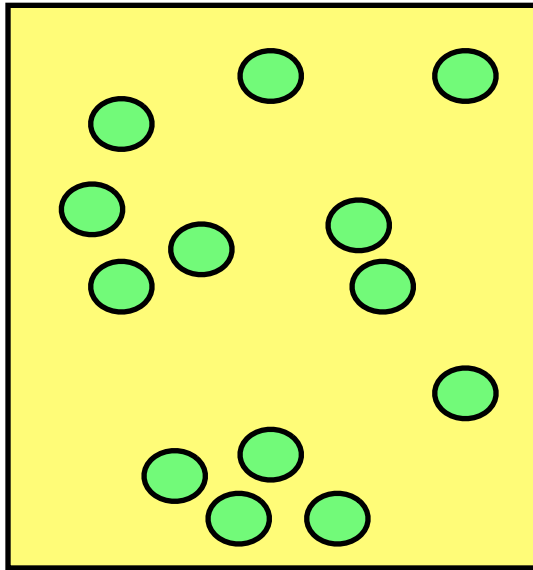


## SiB 1x1 Savanna Pixels

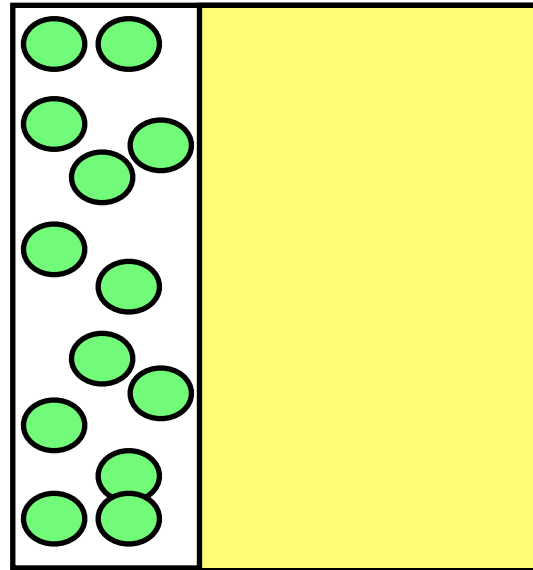


# How do we model savanna?

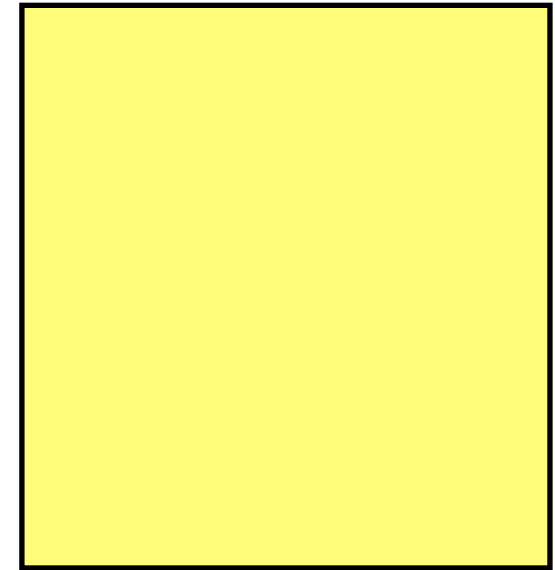
Reality



Plant  
Functional  
Type



Dominant  
Vegetation  
Class



# How do we model savanna?

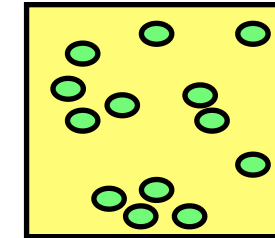
## Model Shortcomings:

- Turbulent exchange (roughness length)
- Soilwater removal
- Surface fluxes
- Trace gas exchange ( $^{13}\text{C}/^{12}\text{C}$ , OCS)
- Radiative characteristics

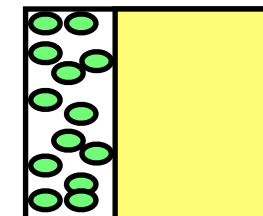
## Model Needs:

- Vegetation type distribution (%tree/%grass)
- 'Clumpiness'
- Phenology/Green-ness
- C3/C4 distribution

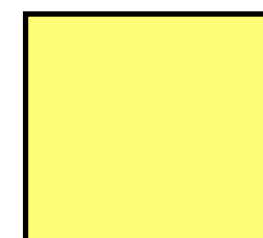
Reality



Plant  
Functional  
Type



Dominant  
Vegetation Class



# MODEL (SiB) Savanna Types

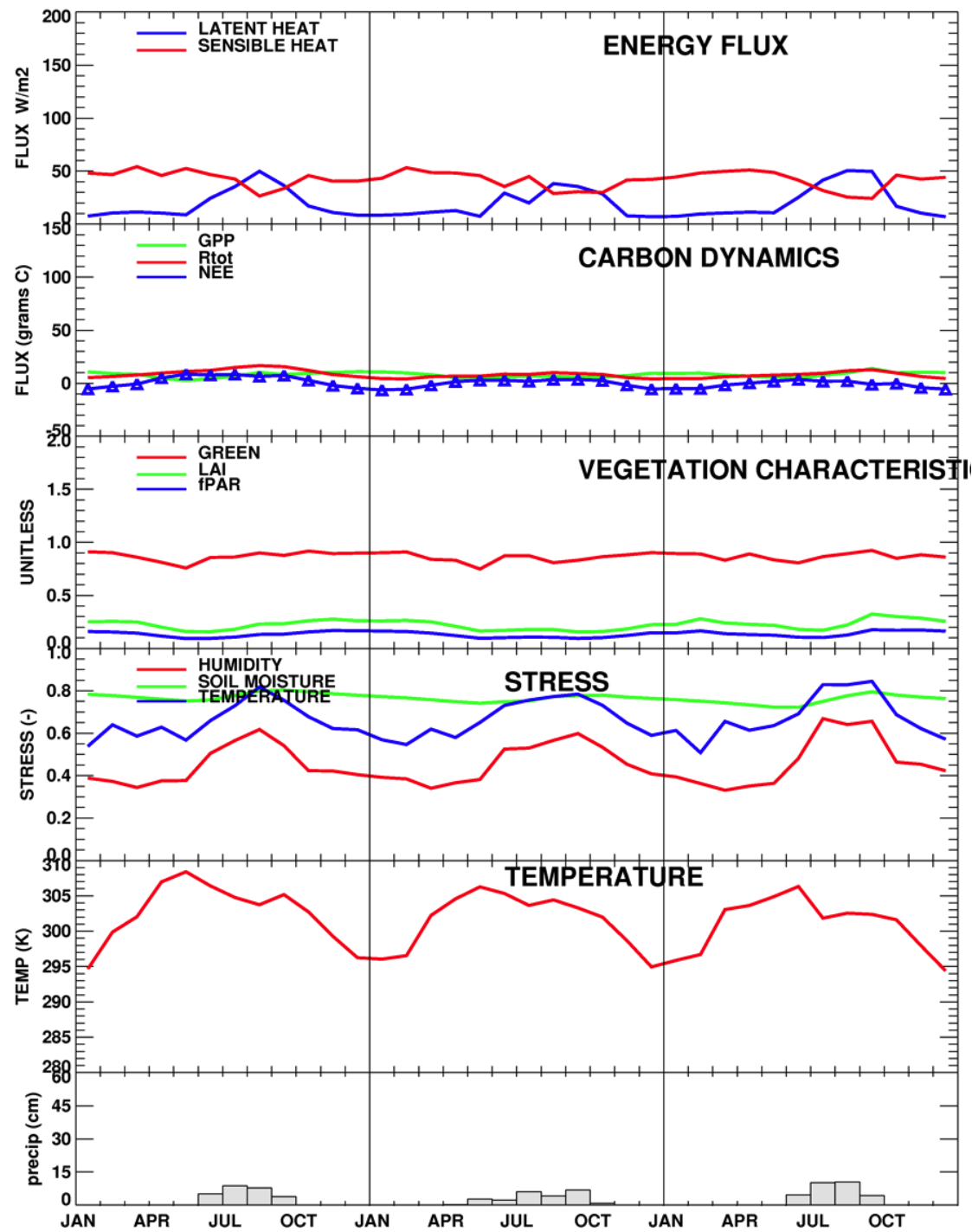
| # |    | description                    | Vmax<br>( $\mu\text{mol}$ ) | height<br>(m) | fvcover | Lo-Temp<br>half | Hi-Temp<br>half |
|---|----|--------------------------------|-----------------------------|---------------|---------|-----------------|-----------------|
| 6 | C4 | Broadleaf w/<br>ground cover   | 30                          | 1.0           | 0.776   | 288             | 313             |
| 7 | C4 | Ground cover/<br>Maize Optical | 30                          | 1.0           | 0.343   | 288             | 313             |
| 9 | C3 | Shrubs w/ ground<br>cover      | 60                          | 0.5           | 0.136   | 283             | 313             |



# Examples: SiB

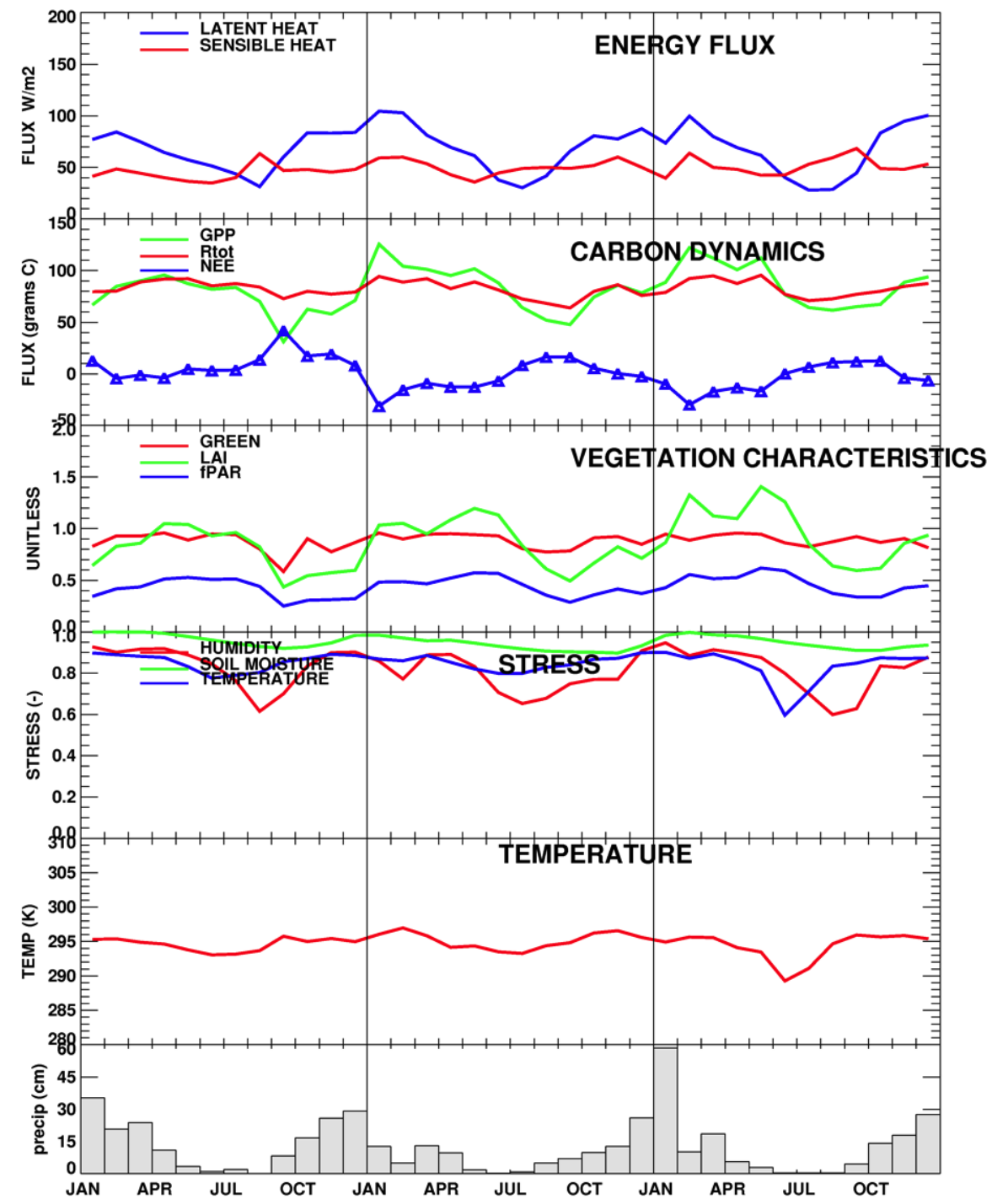
Agoufou MALI

Biome=7



Pe de Gigante BRASIL

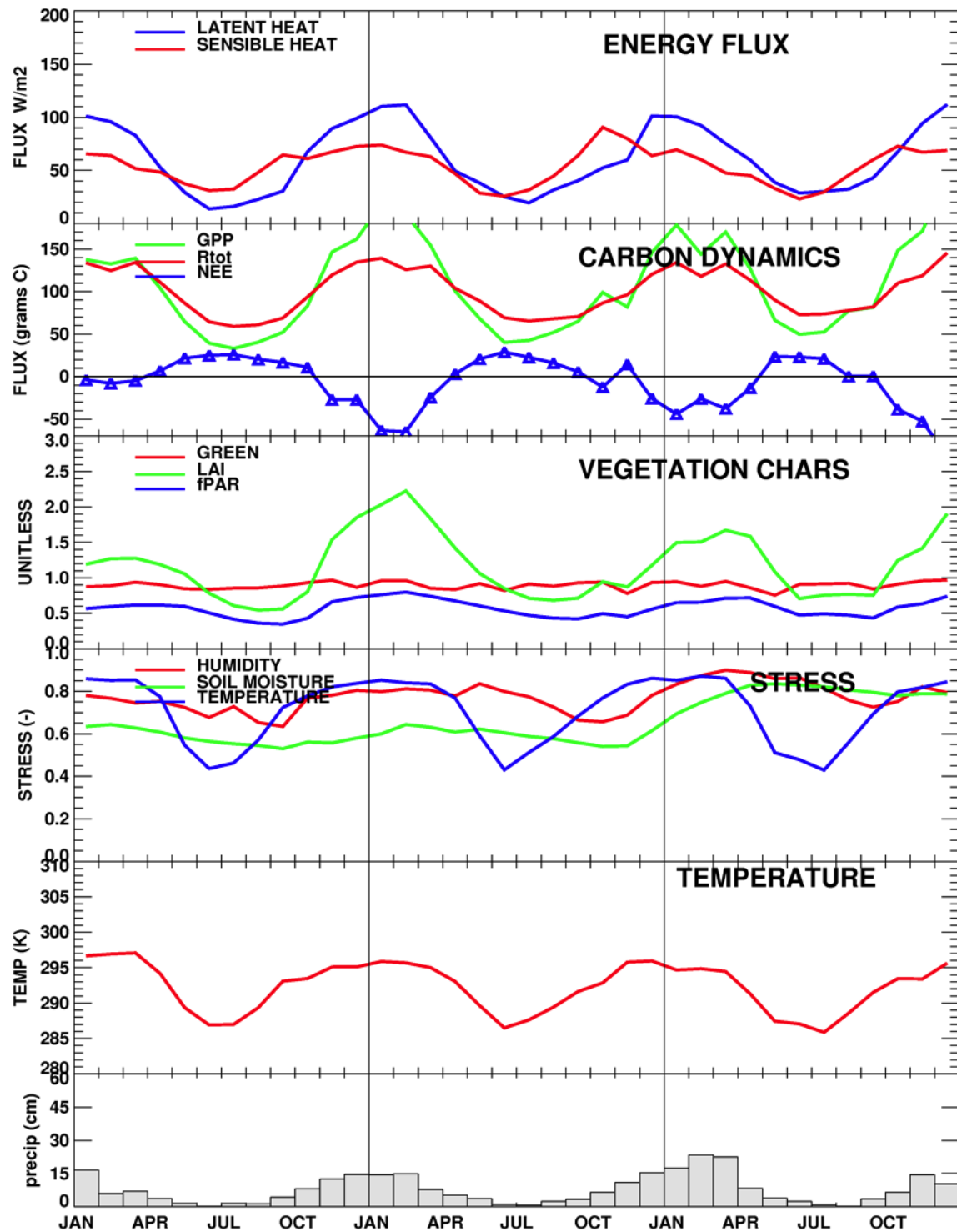
Biome=6



# Examples: SiB

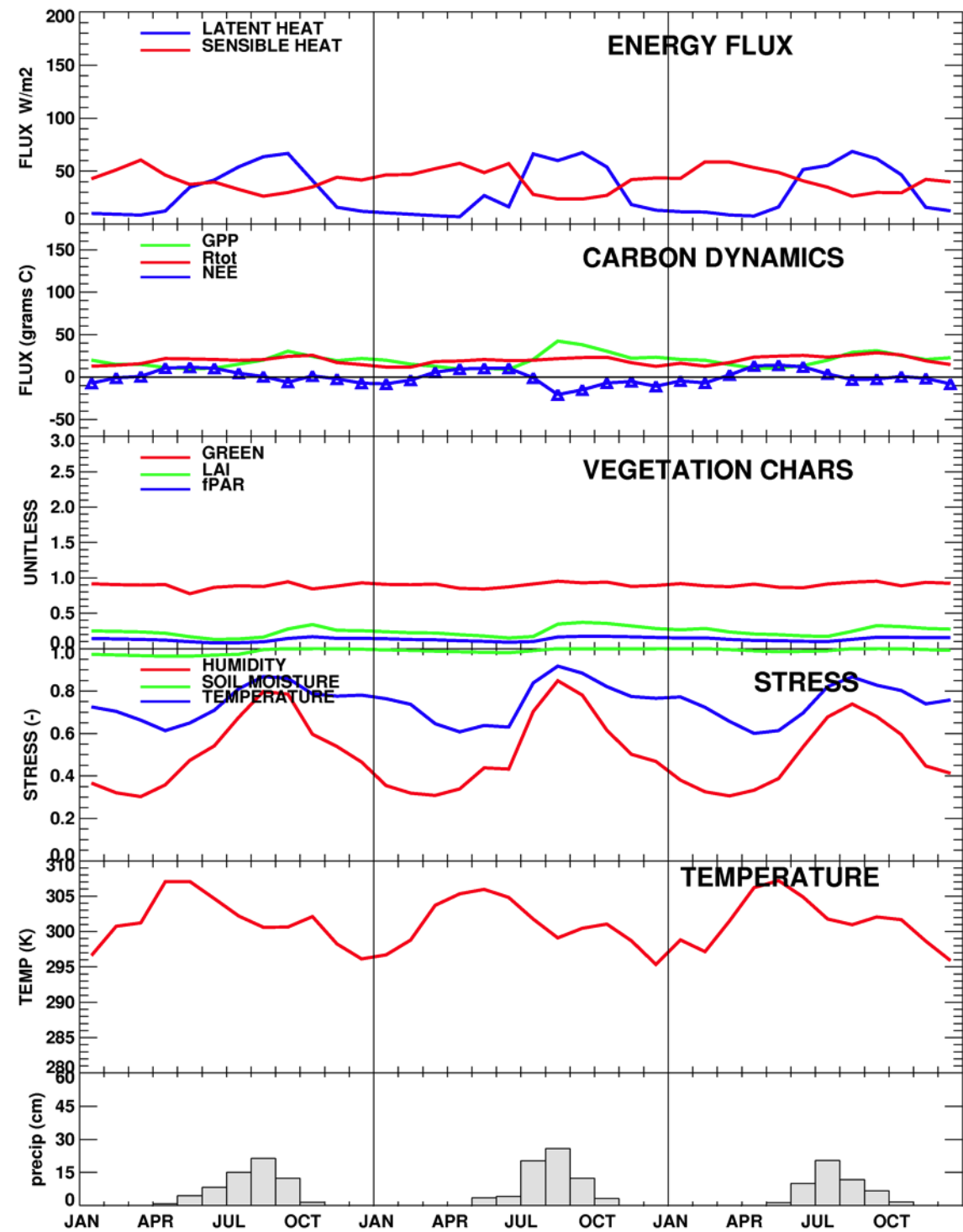
Skukuza RSA

Biome=7



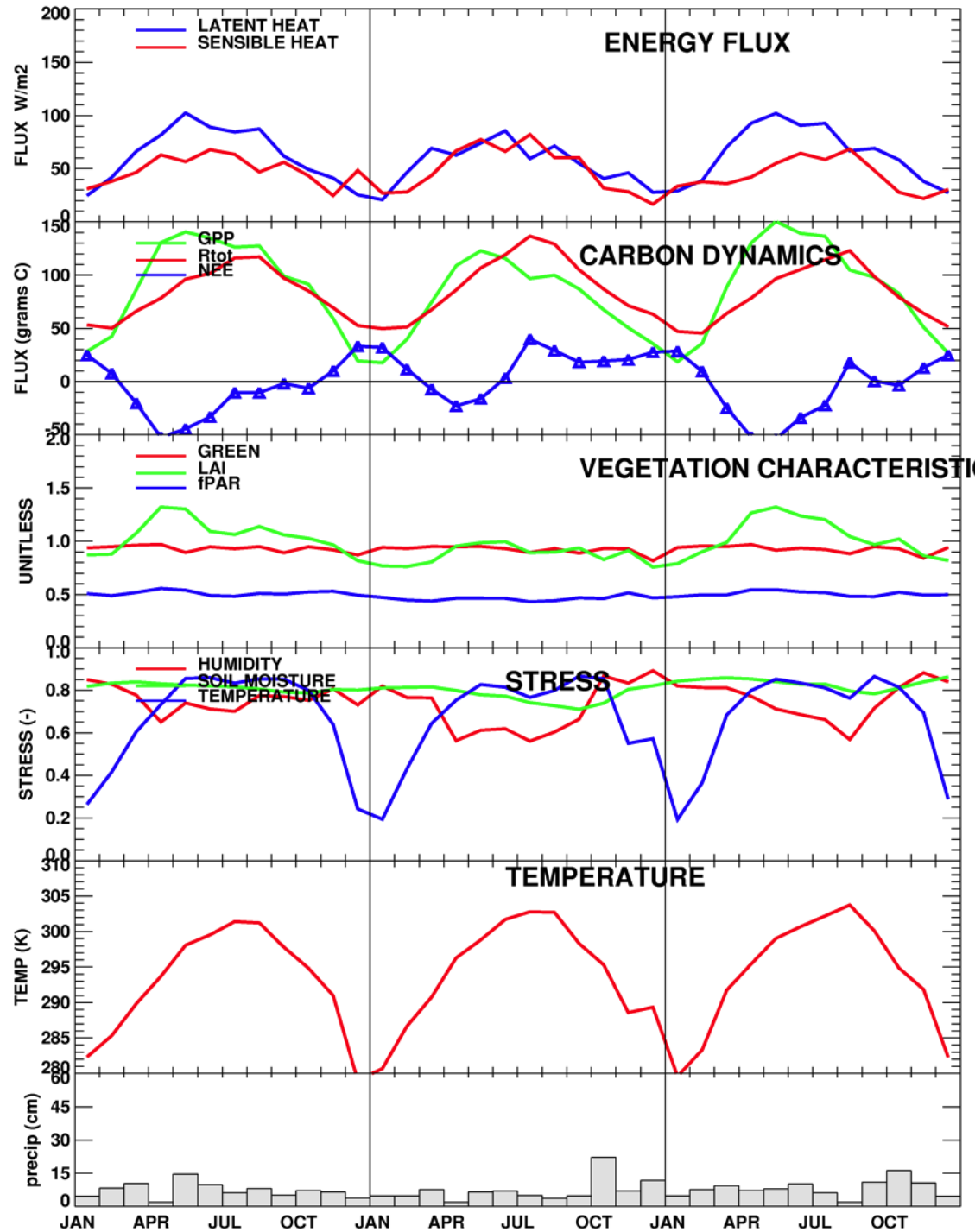
Wankama Niger

Biome=9 (C3)

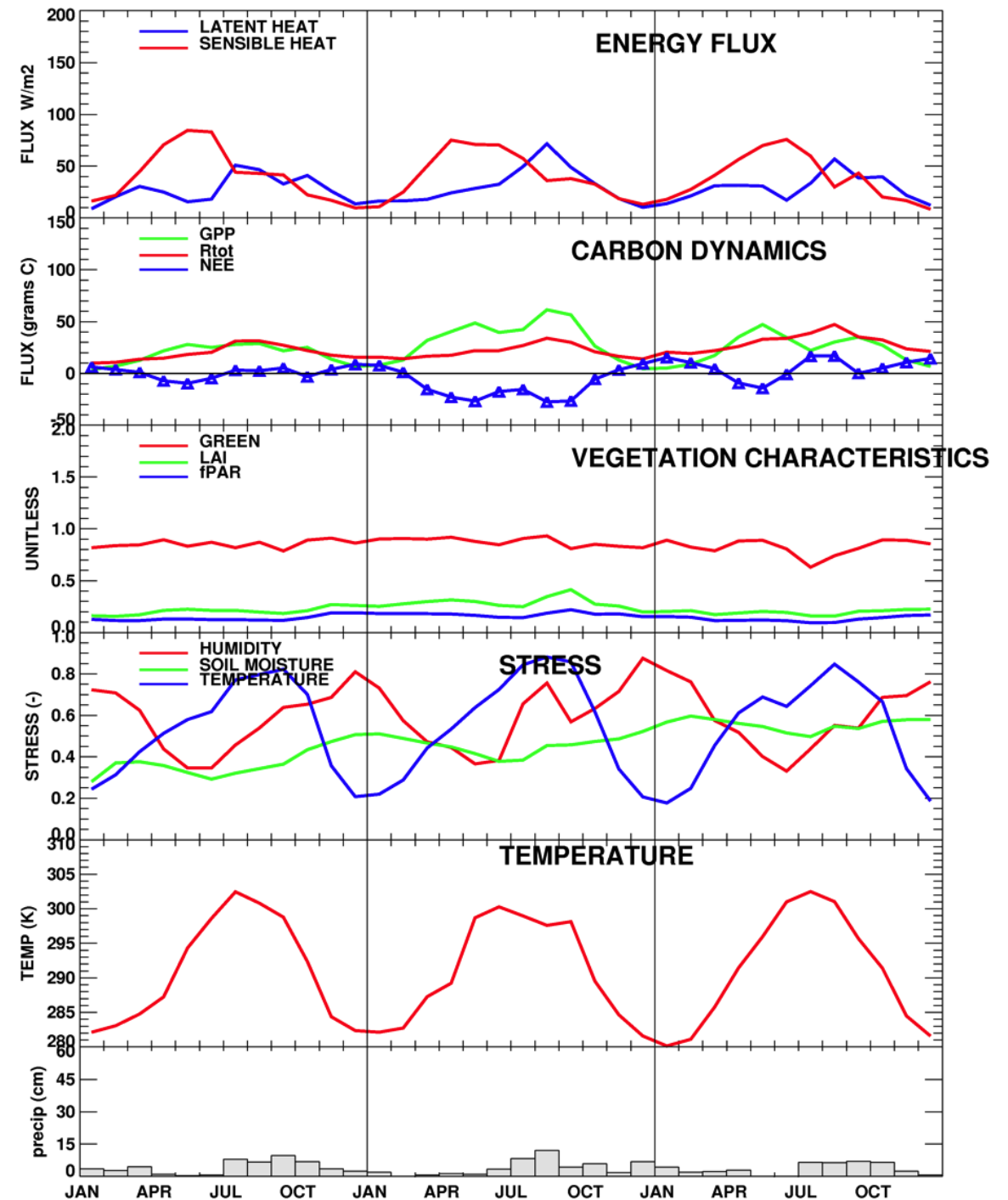


# Examples: SiB

Freeman TX, USA Biome=6

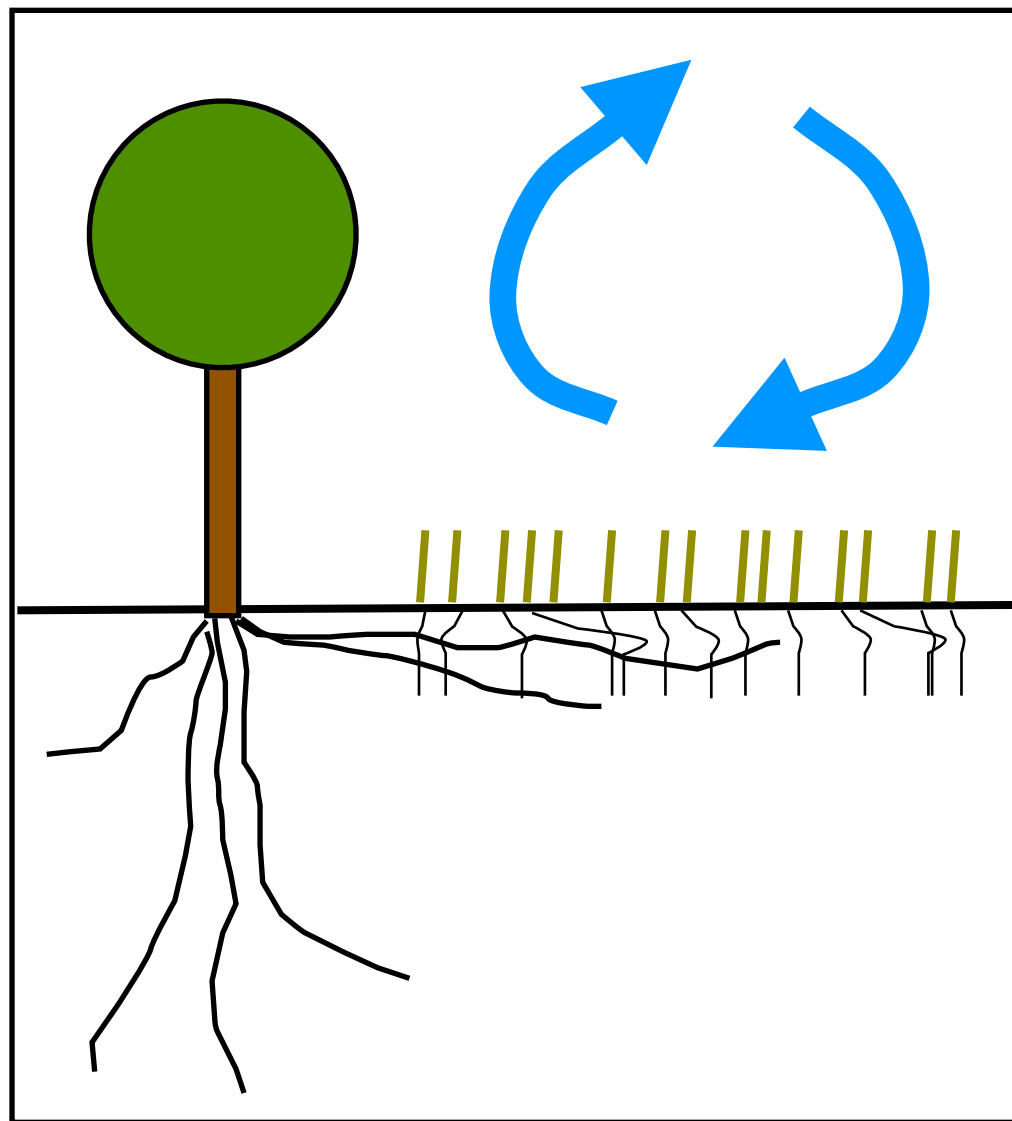


Kendall AZ, USA Biome=7





# Improvements, going forward



1. Common Soil/Air, multiple species
2. Turbulent Exchange
3. Phenology

# Hybrid Phenology

- Archibald & Scholes (2007)
  - Skukuza RSA; Environmental Cues to leaf out
    - Trees: Photoperiod
    - Grass: Soil Moisture
  - Use Phenology model to decompose individual contributions to NDVI obs

# Our (tentative) Idea

- Multiple Physiology/Prognostic CAS
- MODIS Tree fraction product
- Prognostic Phenology or Hybrid  
(prognostic phenology and Satellite)
- New exchange calculations (aerodynamic resistance)