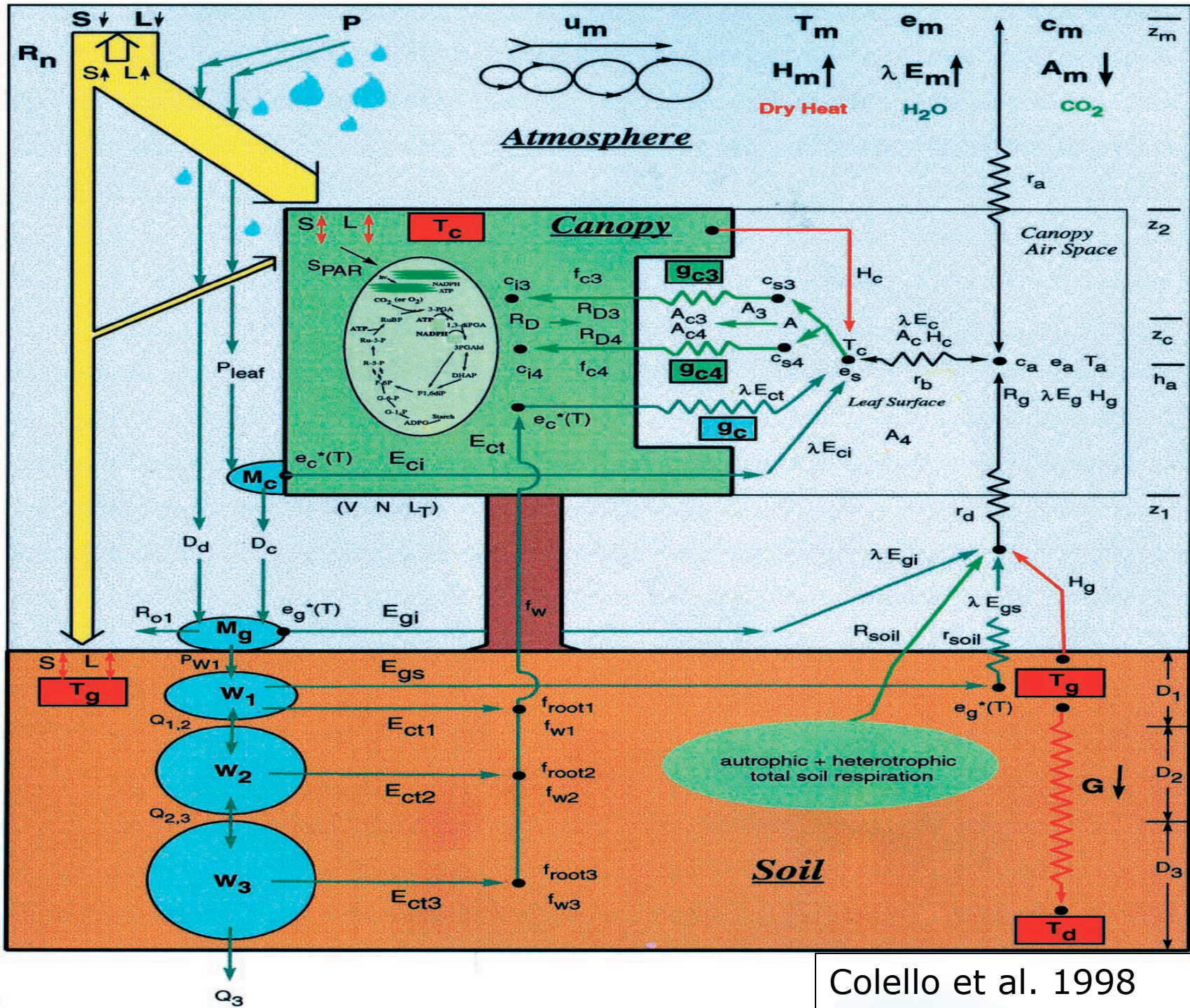


The spatial variability of soil hydrology

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Colello et al. 1998

Problem

- Soil wetness is variable over length scales of GCM grid areas
- Stress functions relating surface evaporation and soil wetness are highly nonlinear
- Using a finer GCM spatial resolution may never resolve variability in surface conditions

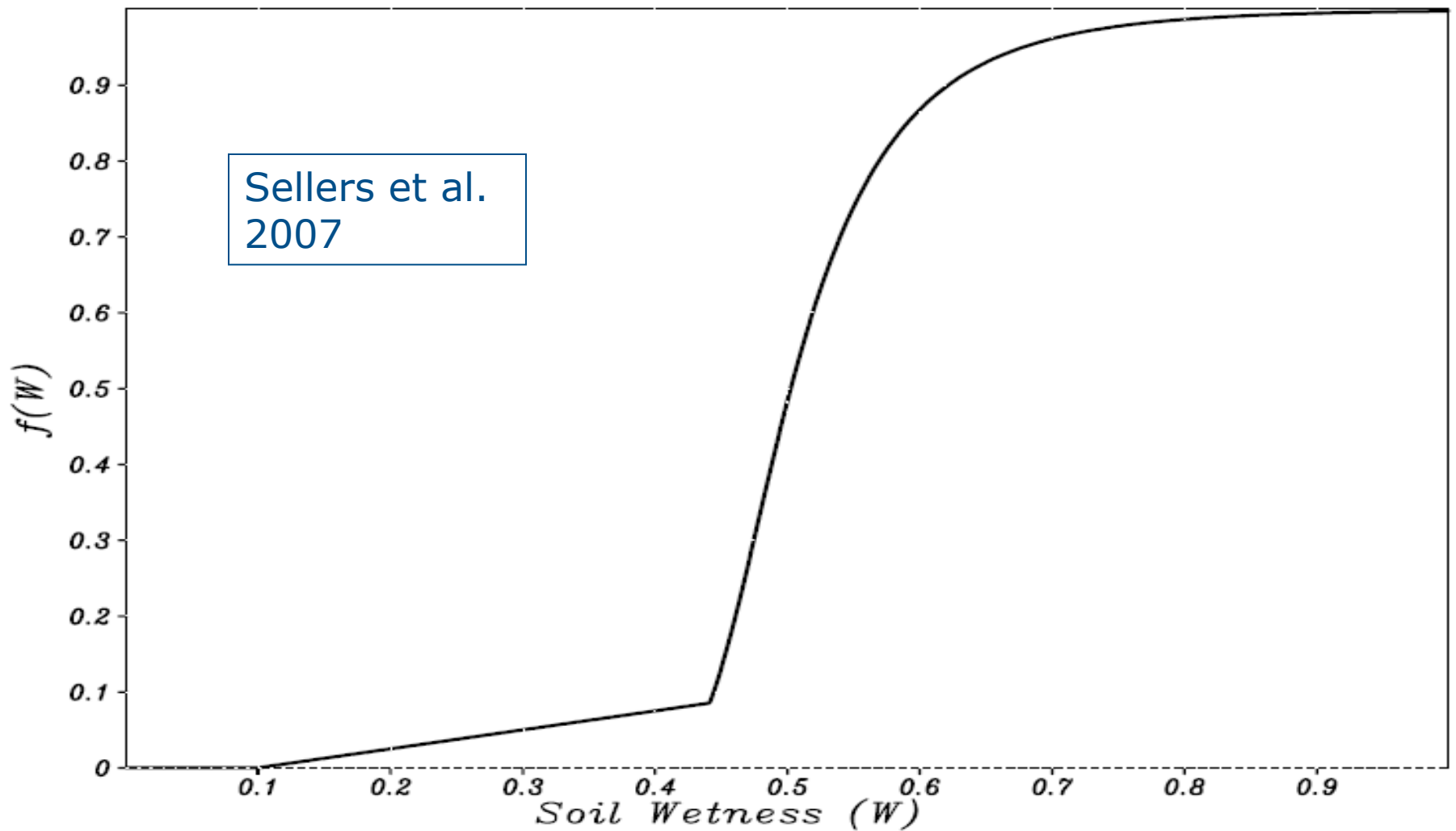


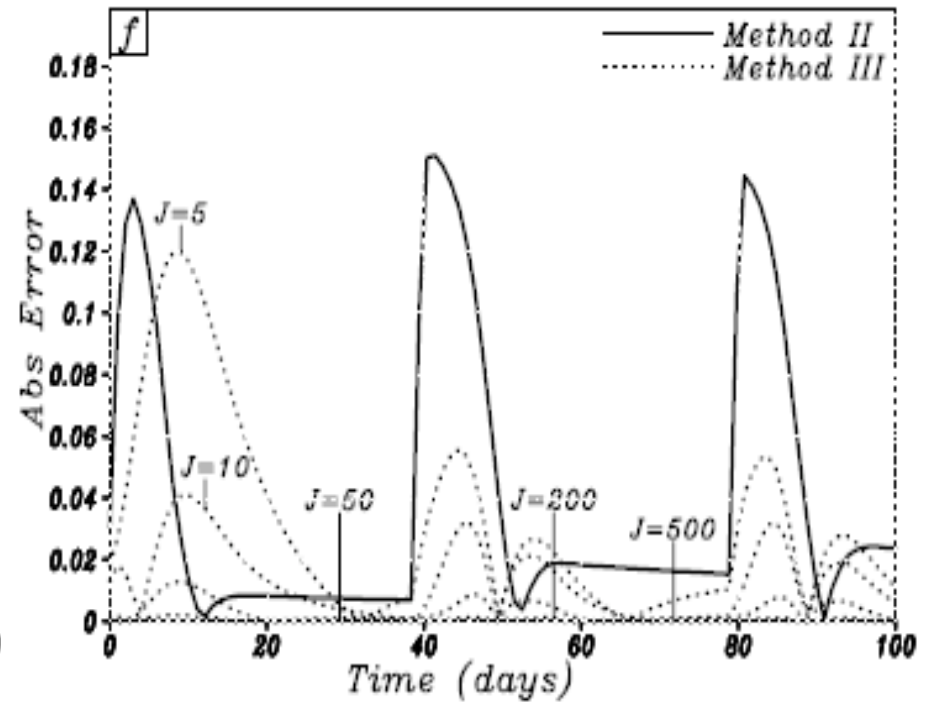
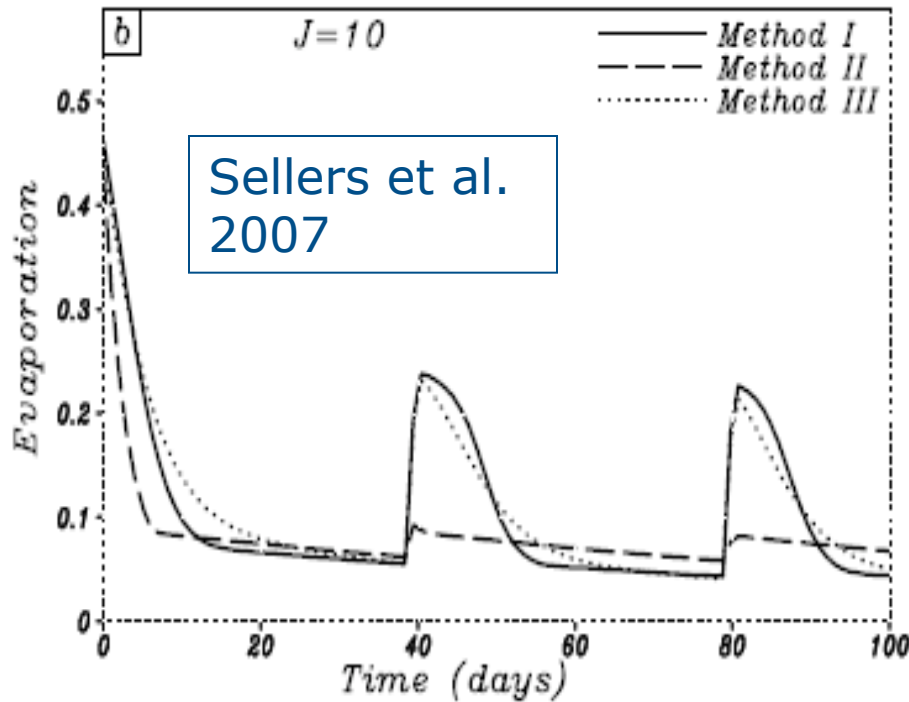
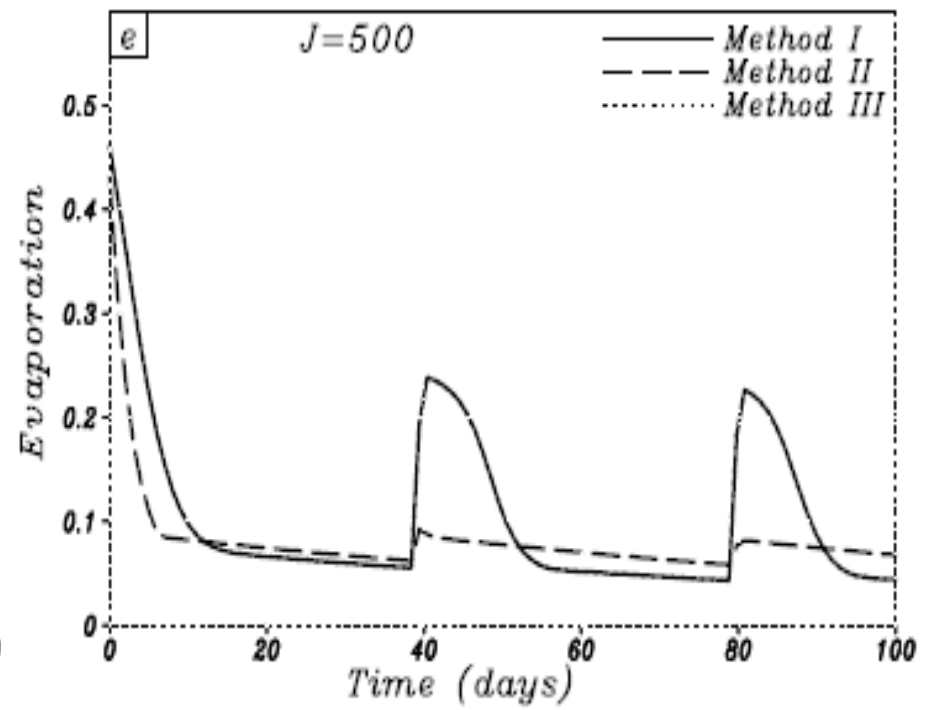
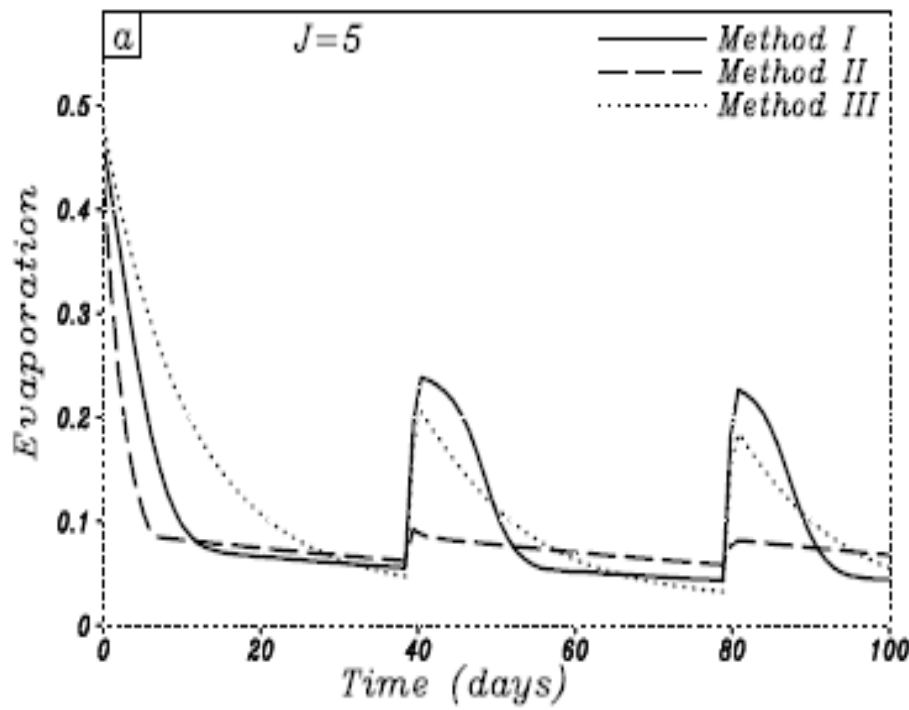
Figure 1. Relationship between the soil moisture stress function $f(W)$ and soil moisture W as used in this study (see equation (2)). This function is based on data presented by *Colello et al.* [1998] for the FIFE prairie grassland site in Kansas, USA.

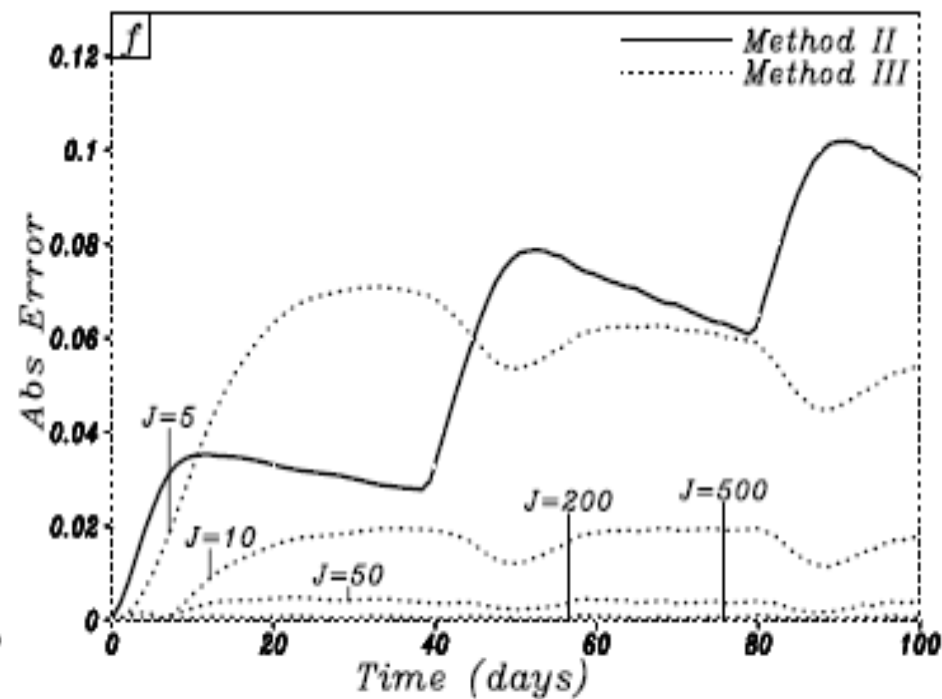
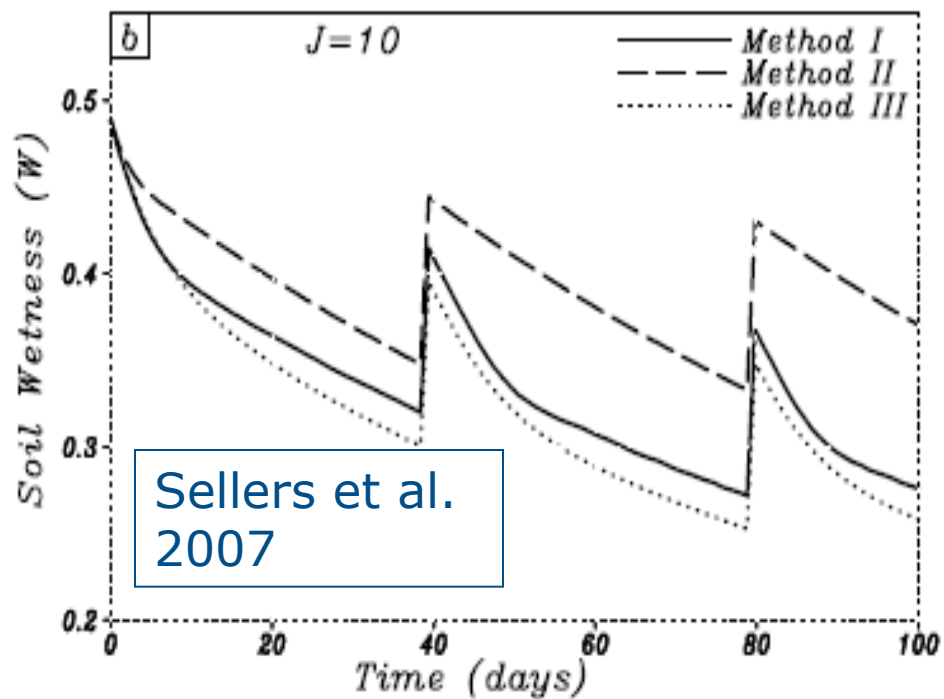
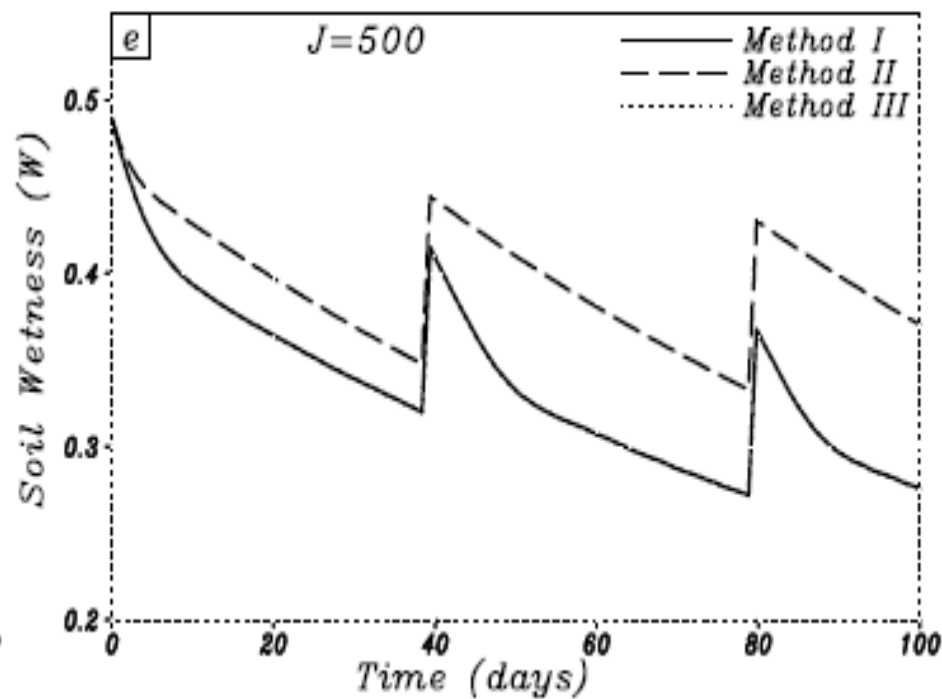
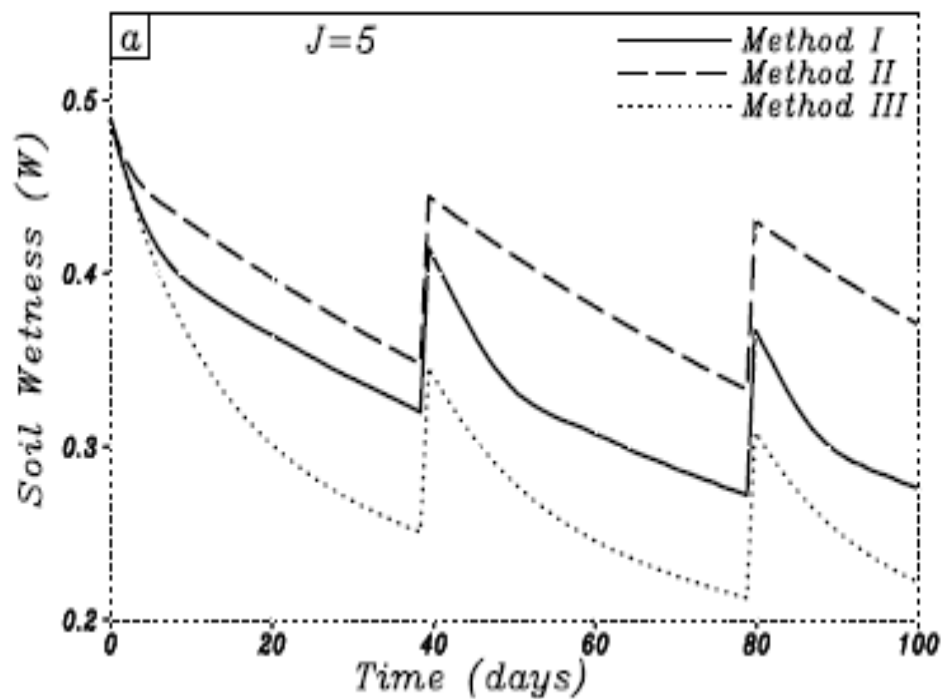
Methodology

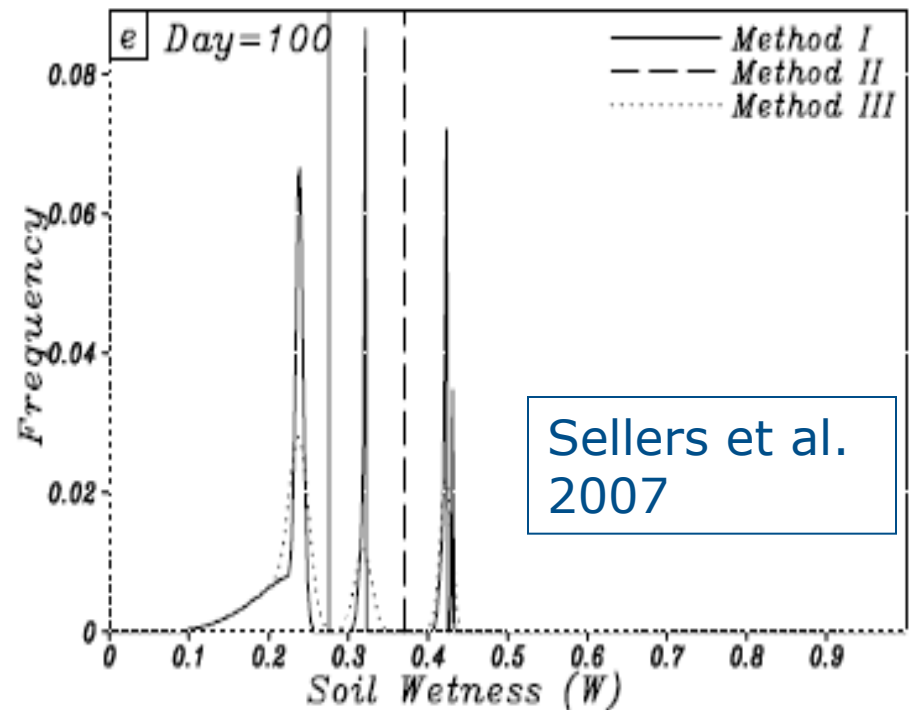
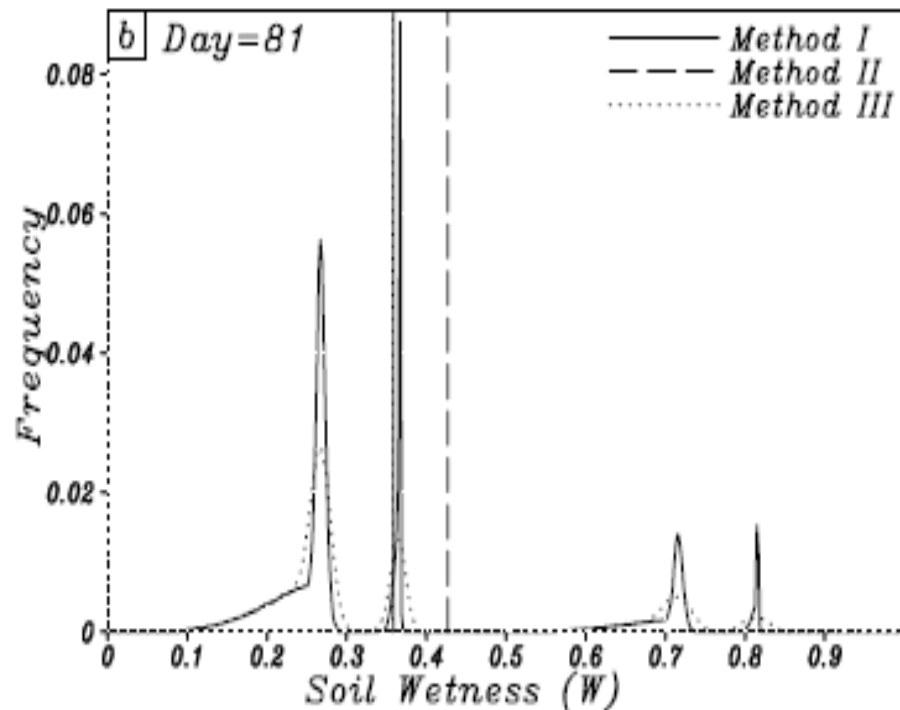
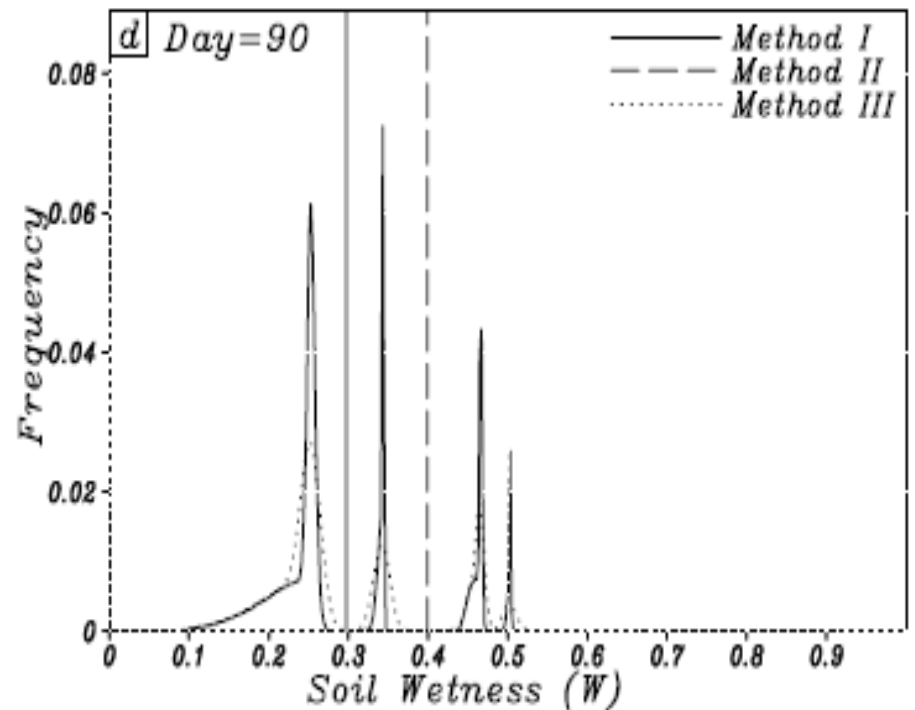
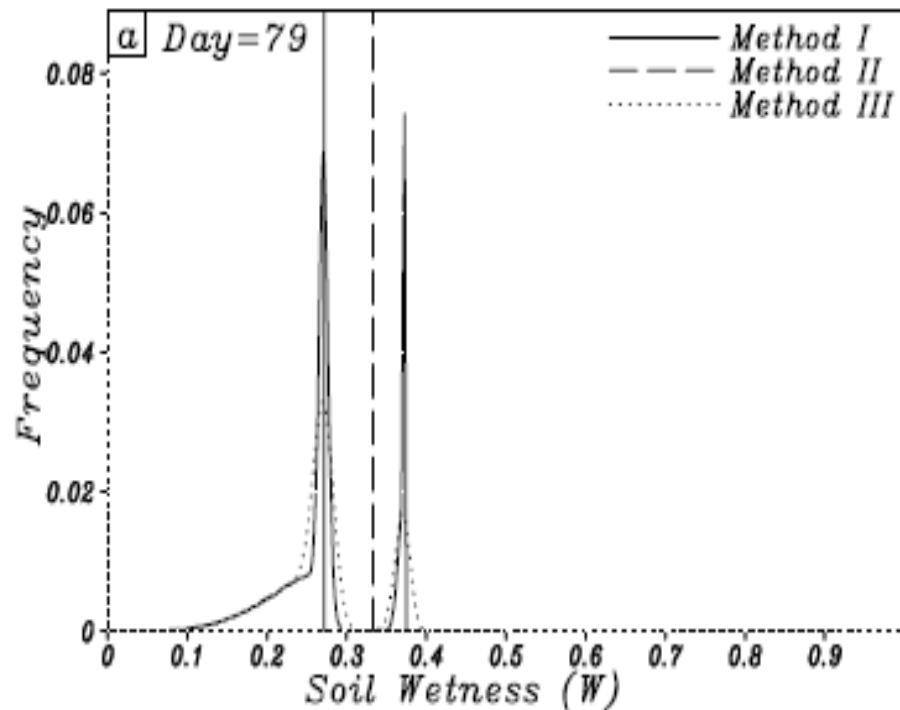
- Sellers et al. 2007 Toy model binning method
- Represent soil wetness as a distribution function
- Represent distribution function with binning method
- Soil wetness values are binned
- Fractional areas are assigned to each bin
- We only care about fractional area and not the geographic location
- Fractional areas are updated for the next time step to account for evaporation and precipitation

Methodology

- Sellers presents three methods for comparison (area integrated, area averaged and binned)
- With increasing bin number, results approach those of method I
- 10 bins are sufficient
- Toy model can be used in more complex models







Sellers et al.
2007

Importance

- Binning method eliminates costly (method I) calculations or unreliable (method II) calculations
- Allow SiB to deal realistically with spatially variable precipitation
- Improve subgrid-scale variability
- Improve climate models