

Shop Talk: Biophysics and Patch Dynamics in the Ecosystem Demography Model 2.2

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LBL

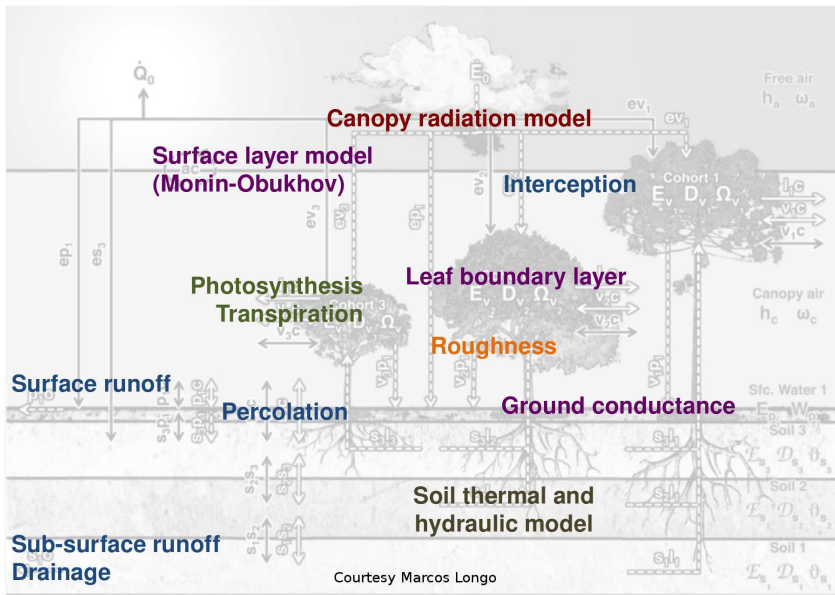
CESM Annual Workshop - Land Modeling Working Group
Breckenridge CO

June 19, 2013

ED?

Terrestrial Ecosystem Dynamics
Size-Age-Structure
Approximation
Photosynthesis
Growth & Allocation
Allometry
Mortality
Disturbance
Recruitment

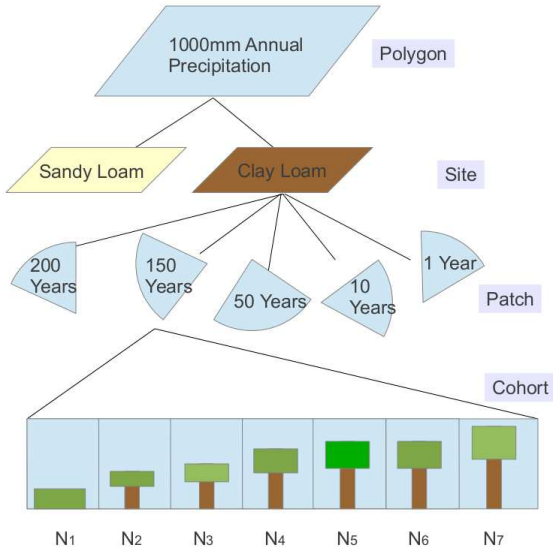
LSM/SVAT/Biophysics Stuff





"Polygon"

Climate

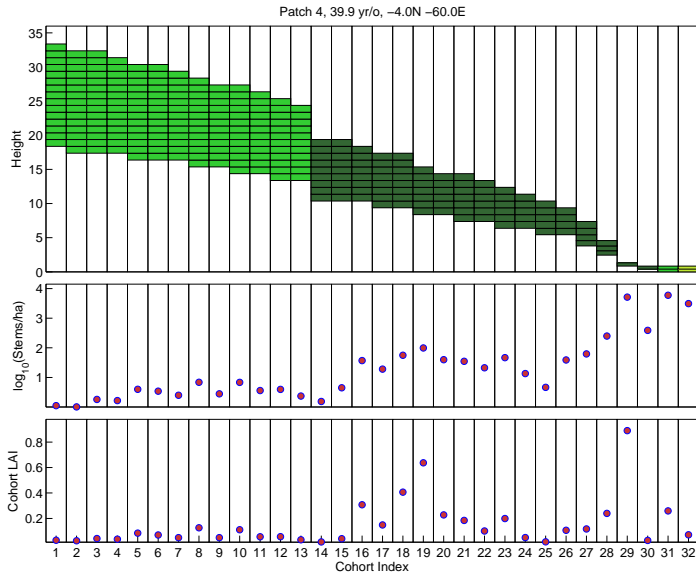


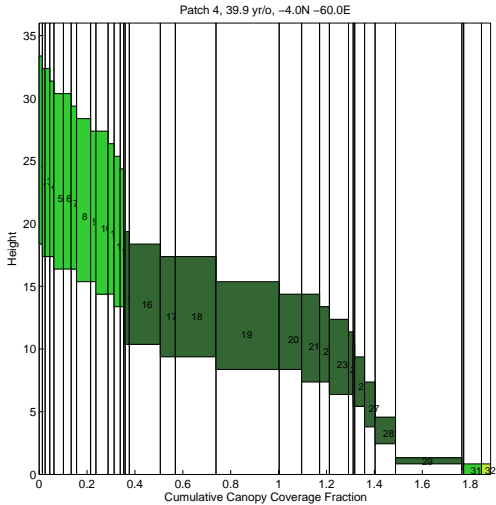
Meteorology

Soil Properties -
Terrain

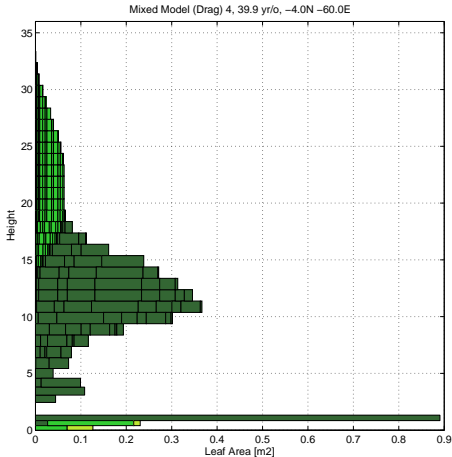
Disturbance -
Canopy Biophysics
Conservation of Mass and En

Plant Biophysics -
Mortality -
Recruitment -
Carbon Assimilation -
Phenology





Mixed Model



Wind-Speed Scaling
 Turbulent Transport

$$u(z)/u(z_c) = e^{-n(1-\zeta(z)/\zeta(z_c))}$$

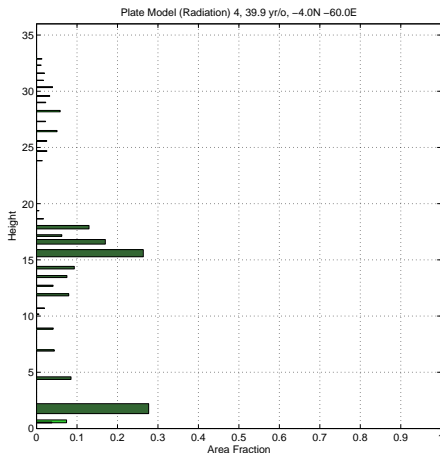
cumulative drag ζ

$$\zeta(z) = \int_0^z [C_d(z')a(z')/P_m(z')]dz'$$

fluid drag C_d
 frontal area of the drag elements a
 sheltering factor P_m

Massman and Weil,
 Boundary Layer Meteorology 91, 1999.

Plate Model



Two-Stream Canopy Radiation Scattering

$$\frac{dI_{du}}{dL} =$$

$$-f_1(\text{pft}, \theta, \text{LAI})I_{du}$$

$$+f_2(\text{pft}, \theta, \text{LAI})I_{dd}$$

$$+f_3(\text{pft}, \theta, \text{LAI})e^{-KL}I_{b0}$$

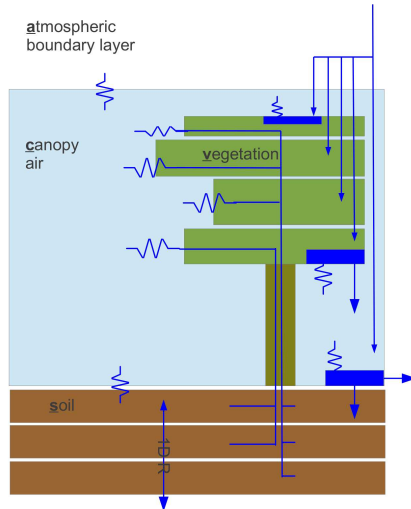
downwelling diffuse short-wave I_{dd}
 upwelling diffuse short-wave I_{du}
 direct short-wave incident on canopy I_{b0}
 cumulative leaf area L
 zenith angle θ

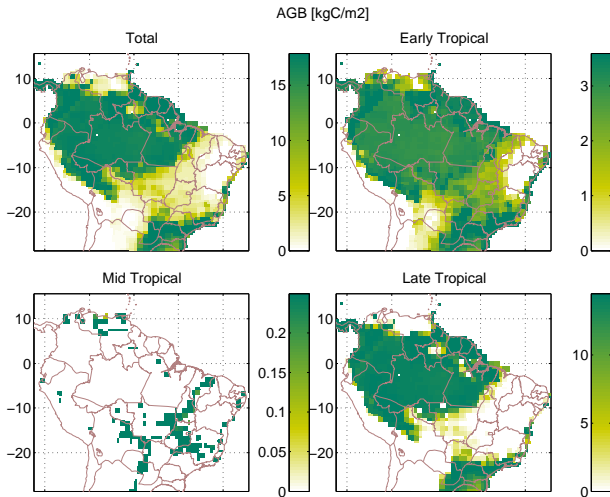
Sellers,
 Int. J. Remote Sensing, 6(8), 1985.

Amorphous

3 Conservative State
Groups:

Carbon
Water
Enthalpy
(Internal Energy)





Present Day (2008)
Above Ground Biomass
“Spun-Up” 500 years

- more axes for a probabilistic model?
- characterization of disturbance
- global scale PFT parameterizations
- coordinating with other communities like CESM-ED-CLM!

Thank you
Discussion? Comments?