Update of Plant Hydraulics Implementation

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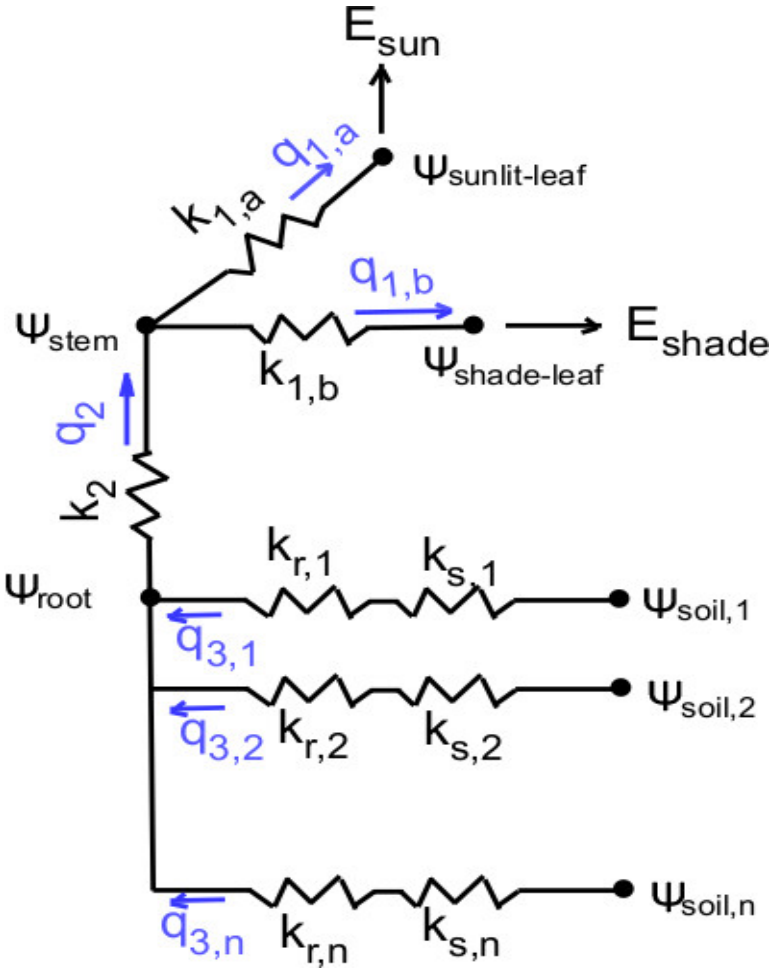
Schematics of plant hydraulics model

- CLM5 PHS (Kennedy et al., 2019) have been implemented in ELM to evaluate how soil water stress affects surface water and energy fluxes:
  - Conforms to ELM big-leaf model
  - Plant is treated as a porous media
  - Use a resistance network approach
  - Hydraulic redistribution included
  - Osmotic potential and water capacity are neglected
  - Steady-state



Circuit diagram of PHS scheme
(adapted from *CLM5 Technical Note*)

BTRAN formulation

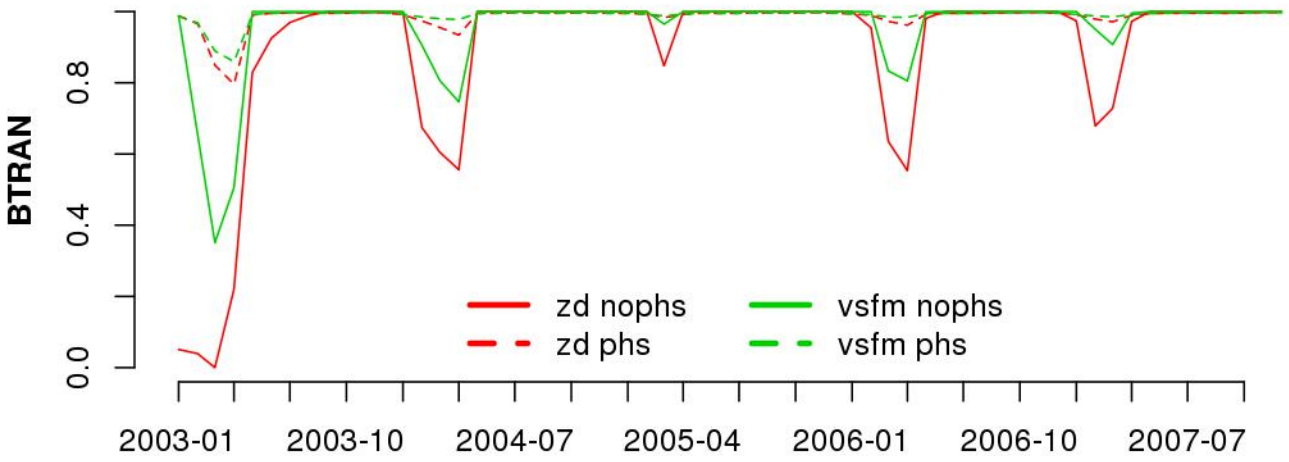
- Old

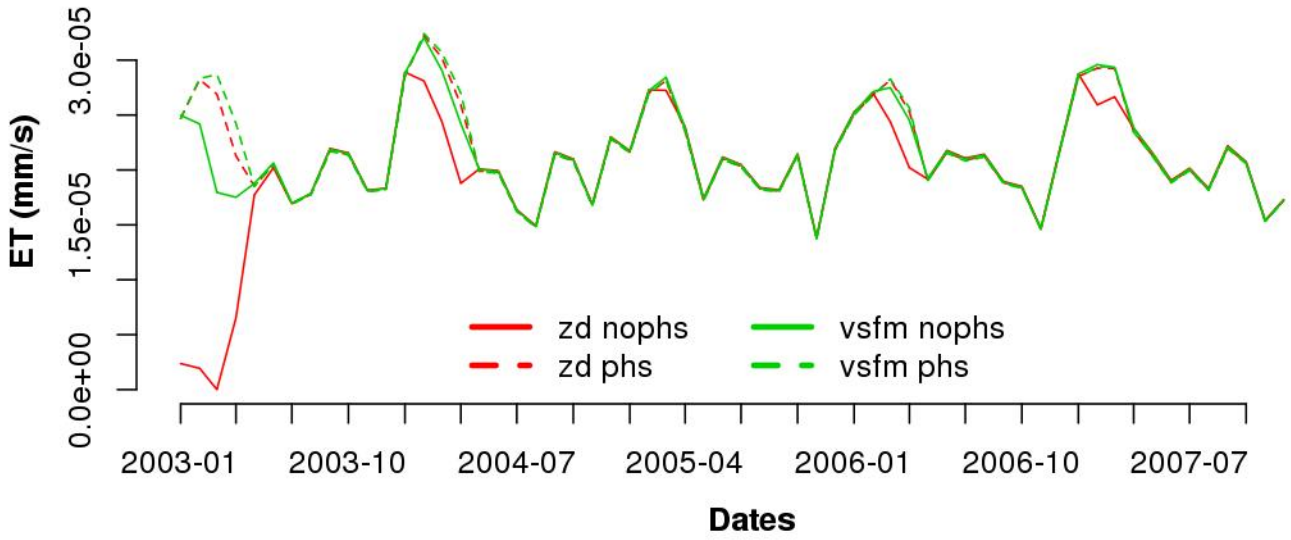
$$\beta = \frac{\psi_C - \psi_S}{\psi_C - \psi_O}$$

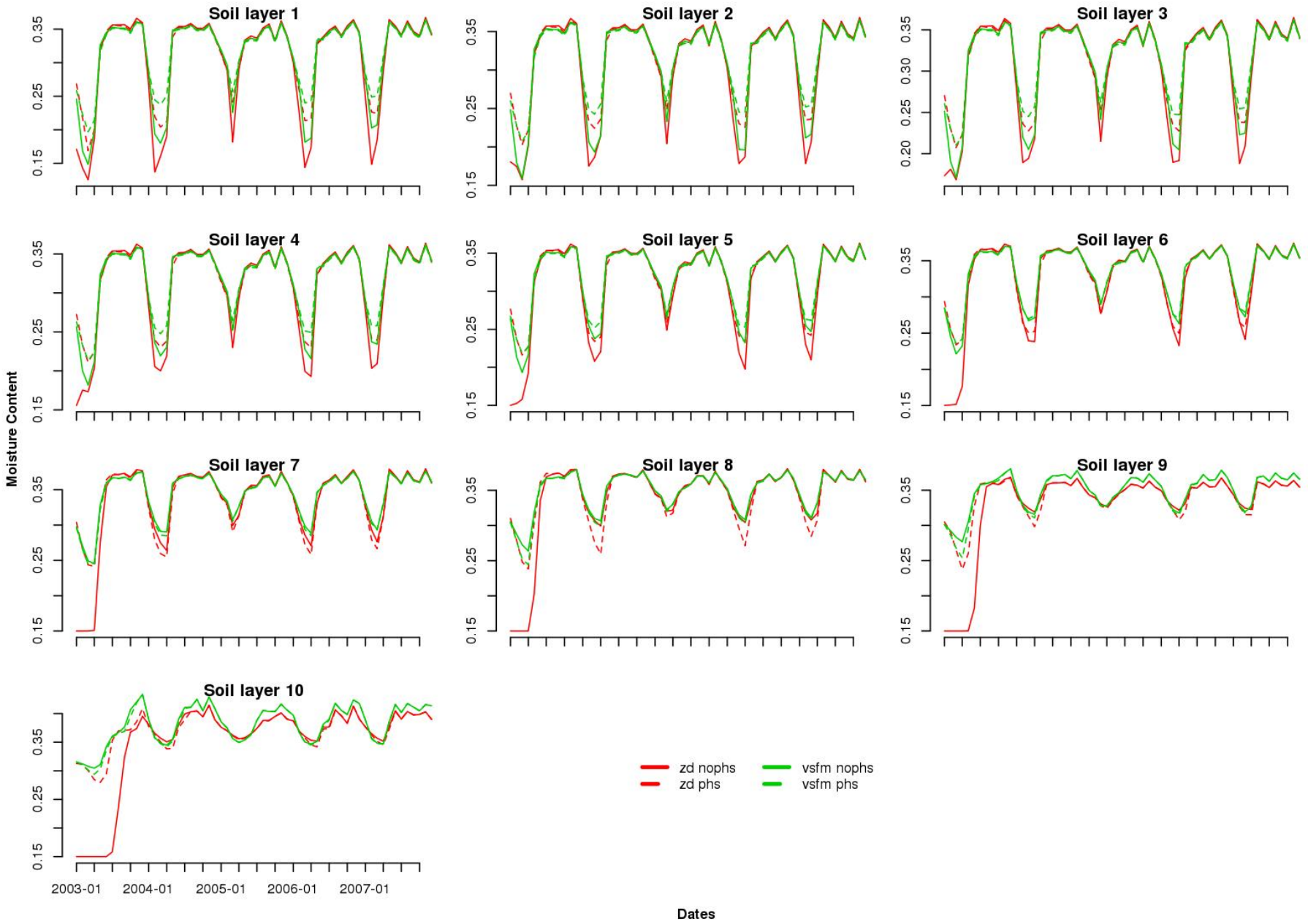
- New

$$\beta = \left[1 + \left(\frac{\psi_l}{P_{50,gs}}\right)^a\right]^{-1}$$

Single-Point






Soil layer 1
Soil layer 2
Soil layer 3
Soil layer 4
Soil layer 5
Soil layer 6
Soil layer 7
Soil layer 8
Soil layer 9
Soil layer 10
Moisture Content
Dates
2003-01
2004-01
2005-01
2006-01
2007-01
zd nophs
zd phs
vsfm nophs
vsfm phs