

Vegetated Coupling (Little Omega)

- References:

- Ek, M., C. Tassone, J. Meng, B. Holtslag, and C. Jacobs, 2015: Assessing local land-atmosphere coupling from a global land data assimilation (GLDAS) reanalysis. American Geophysical Union Fall Meeting, A311-02.
- Ek, M. et al., 2016: On the nature of local land-atmosphere coupling strength for vegetated surfaces. [Monograph](#).
- Jacobs, C. M. J., and co-authors, 2008: Evaluation of European Land Data Assimilation System (ELDAS) products using in situ observations. *Tellus*, **60A**(5), 1023-1037, doi: [10.1111/j.1600-0870.2008.00351.x](#).
- Jarvis, P. G., and K. G. McNaughton, 1986: Stomatal control of transpiration: scaling up from leaf to region. *Adv. Ecol. Res.*, **15**, 1-49, doi: [10.1016/S0065-2504\(08\)60119-1](#).

- Principle:

- A “decoupling parameter” based on the ratio of canopy conductance (g_c) versus aerodynamic conductance (g_a) scaled by moisture holding capacity of the atmosphere:

$$W = \left[\left(\frac{g}{m+g} \right) \frac{g_a}{g_c} + 1 \right]^{-1}$$

indicates strong/weak coupling over vegetated surfaces as $W \rightarrow 0, 1$. g is the psychrometric constant, m is the slope of saturation vapor pressure with temperature.

- More intuitive is a scale where 1 indicates strong and 0 indicates weak coupling, an actual “coupling parameter”:

$$W = \left[\left(\frac{m+g}{g} \right) \frac{g_c}{g_a} + 1 \right]^{-1}$$

- An additional term can be defined for soil heat flux modulation of coupling (see Ek et al. [2016](#)).

- Data needs:

- LSM and/or GCM output often has all needed terms for model diagnosis. From a theoretical viewpoint, it is easy to plot distributions as a function of varying conductances, or the terms that determine those conductances.

- Observational data sources:

- g_c is very difficult to measure or estimate in the field, largely restricting this metric to LSM output or laboratory situations unless special instrumentation is deployed.

- Caveats:

- See Ek et al. ([2016](#)) for a full discussion including the derivation and relationship to evaporative fraction for transpiration.