Global impact of seasonal to inter-annual LAI: fluxes of moisture and heat.

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Land-surface atmosphere coupling strength.

Koster et al 2002
Forcing data.

1. **GSWP2**
   - 1 degree global coverage. Time step of 3 hours.
   - Covers the years 1986-1995.
   - Short wave radiation, long wave radiation, liquid precipitation, solid precipitation, surface temperature and surface pressure. [http://www.iges.org/gswp2/](http://www.iges.org/gswp2/)

2. **fAPAR**
   - 1 degree/8km global coverage. Time step of 10 days.
   - Covers the years 1982-1999. [http://www.neodc.rl.ac.uk/](http://www.neodc.rl.ac.uk/)
European case

Moisture flux components
Lat 45 to 55 Lon 15 to 25

- Vary LAI. CNTRL LAI.
- Vary M flux. CNTRL M flux.

- Vary surface. CNTRL surface.
- Vary canopy. CNTRL canopy

- Vary soil. CNTRL soil.
- Vary stomatal. CNTRL stomatal.
African case

Moisture flux components
Lat -13.5 to -4.5 Lon 17.5 to 28.5

Vary LAI. CNTRL LAI. Vary M flux. CNTRL M flux.

Vary surface. CNTRL surface. Vary canopy. CNTRL canopy

Vary soil. CNTRL soil. Vary stomatal. CNTRL stomatal.
\[ R_{\text{soil}} = 100/g_{\text{soil}} \]

So a change in \( g_{\text{soil}} \) from 0.25 to 0.2, results in an increase in resistance 100ms\(^{-1}\) (400 to 500).
Influences of moisture fluxes in the model.

With no atmospheric interaction i.e. with one way meteorological forcing, the factors that influence the moisture flux are:

• Radiation interception,
• Soil moisture,
• LAI.

So LAI will only have an impact if the radiation and soil moisture are not dominant.
Improving land surface representation in the GCM.

• Use satellite data to identify regions of soil stress.
• Does the model show stress in these regions?
• If not why not?
Sum of absolute differences $VARY\_LAI - CNTRL\_LAI$

$$\Sigma \ ABS(\text{SHF}_{VARY\_LAI} - \text{SHF}_{CNTRL})$$