[Coupling metrics to diagnose land-atmosphere interactions]

Precipitation-Temperature Metrics

- References:
  - Koster, R. D., S. D. Schubert, and M. J. Suarez, 2009: Analyzing the concurrence of meteorological droughts and warm periods, with implications for the determination of evaporative regime. *J. Climate*, **22**, 3331-3341, doi: 10.1175/2008JCLI2718.1.

- Principle:
  - Observational data on temperature and precipitation are much more readily available than for soil moisture, evaporation, etc. Using output from weather and climate models, characteristics of (and relationships between) temperature and precipitation may be associated with characteristics of (and relationships between) soil moisture, surface fluxes, temperature and precipitation.
  - Koster et al. (2009) use such associations to map between temperature/precipitation space and soil moisture/evaporation space.

- Data needs:
  - Observed precipitation and temperature, model precipitation and temperature (and other variables we associate by theoretical considerations with land-atmosphere coupling) on similar space and time scales.

- Observational data sources:
  - Gridded precipitation and temperature data at global or near global coverage over land are readily available.

- Caveats:
  - The presumption here is that models represent the relationships between soil moisture, surface fluxes, precipitation and temperature correctly. There is much evidence that they do not, but there is also controverting evidence that model response to realistic soil moisture initialization or boundary conditions improves simulation and forecast skill (e.g., Koster et al. 2011), suggesting they must be doing something right.
    - Koster, R. D., and co-authors, 2011: The second phase of the Global Land-Atmosphere Coupling Experiment: Soil moisture contributions to subseasonal forecast skill. *J. Hydrometeor.*, **12**, 805–822, doi: 10.1175/2011JHM1365.1.

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