Conditional Correlations

- References:
  - Mei, R., and G. Wang, 2011: Impact of sea surface temperature and soil moisture on summer precipitation in the United States based on observational data. *J. Hydrometeor.*, **12**, 1086–1099, doi: 10.1175/2011JHM1312.1.
  - Mei, R., and G. Wang, 2012: Summer land–atmosphere coupling strength in the United States: Comparison among observations, reanalysis data and numerical models. *J. Hydrometeor.*, **13**, 1010–1022, doi: 10.1175/JHM-D-11-075.1.

  - Originally focused on interannual variations – looks at how a 2-category (or more) contingency affects correlation between day 1 soil moisture and days 2-22 total precipitation (or any variable SM is expected to affect) – same date each year.
  - Bootstrap sample-with-replacement is used to build a PDF of expected correlations to determine whether categories have significant impacts on changing correlation.
  - Categories could be:
    - Extremes (two outer quartiles) vs nominal years (two middle quartiles)
    - ENSO (or another climate index) phases or strengths… etc.

- Data needs:
  - Daily or instantaneous land surface (e.g., soil moisture) states, daily, pentad or similar totals for the lagged variable
  - Well suited to model output.

- Observational data sources:
  - Here is where occasional instantaneous soil moisture data could be used, but still need enough to define anomalies well.
  - Co-location of lagged variable needed.
  - Could apply to area averages to reduce data uncertainties.

- Caveats:
  - As with Koster's lagged correlations, cannot assume cause-effect just because of lag. It could be effect-effect with some third (remote) cause. Mei and Wang (2011) looked at SST also for that reason.

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