SUBDROUGHT:

Subseasonal-to-seasonal drought and heatwave evolution via land-atmosphere interactions

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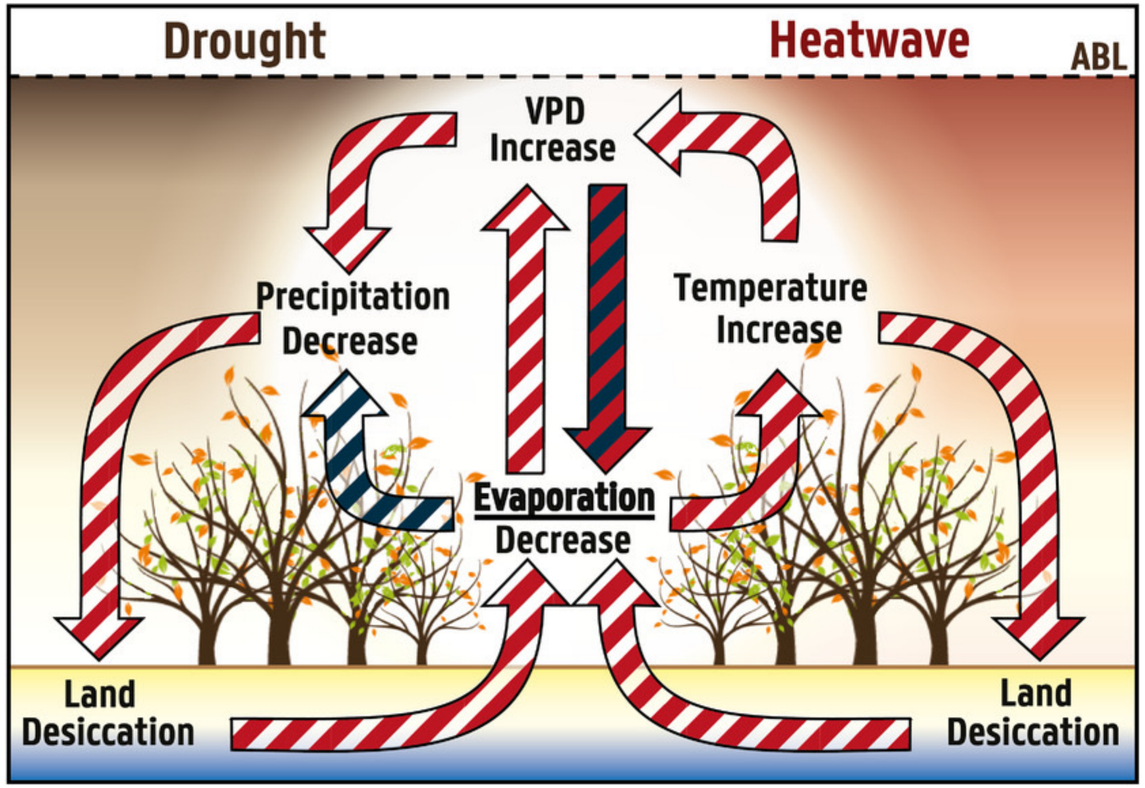
NATURAL ENVIRONMENT RESEARCH COUNCIL

Droughts, heatwaves and land-atmosphere coupling

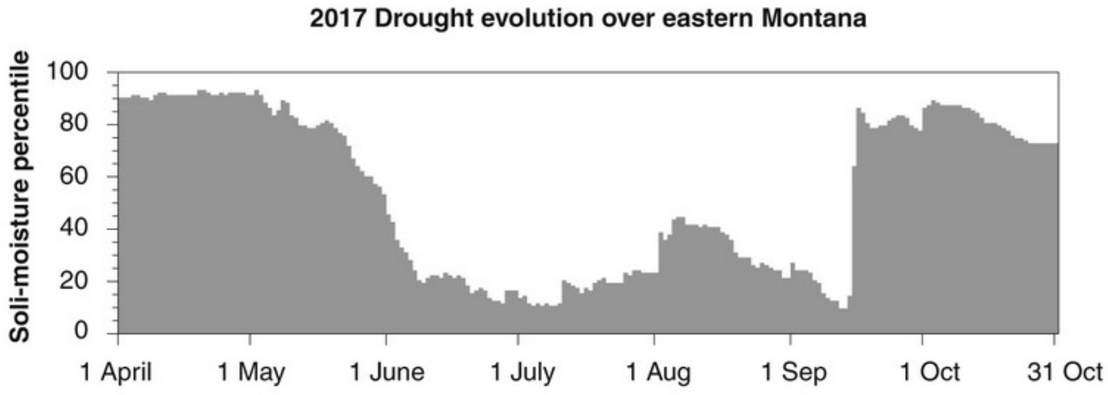


Miralles et al. (2018)

- Land-atmosphere feedbacks known to influence drought and heatwave development
- However, coupling processes are difficult to observe (e.g. evaporation)
- Unanswered questions remain, e.g. role of atmospheric circulation feedbacks for moisture changes (*Miralles et al., 2019*)

Subseasonal-to-seasonal (S2S) development

- S2S timescale = 2 weeks to 2 months
- Droughts developing on this timescale are increasing in frequency in many regions (*Christian et al., 2021*): have become known as **flash droughts**
- Critical timescale to predict for crop/water management
- Land surface is a key source of predictability



Pendergrass et al. (2020)

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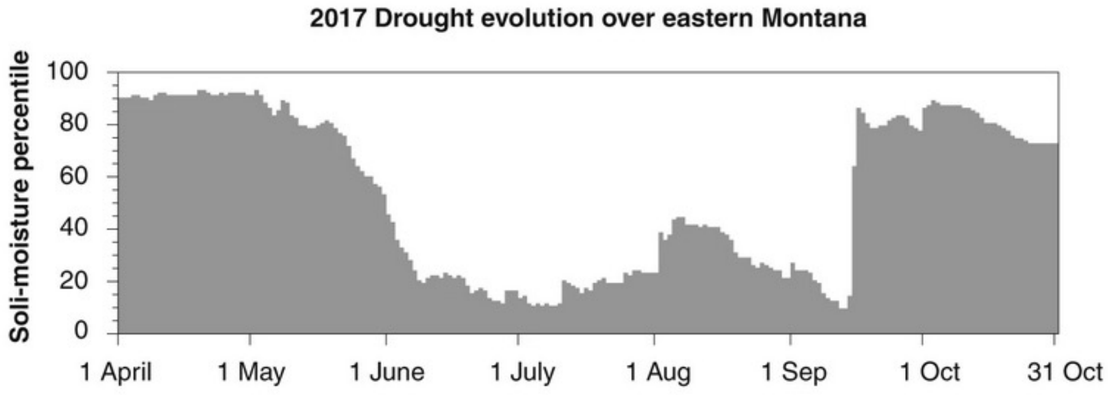

Pendergrass et al. (2020)

Combine CCI Soil Moisture and LST datasets to enable **first global, daily observational analysis** of land-atmosphere interactions during flash drought

Research plan

1) Composite analysis of land-atmosphere variables during flash drought development

- Identify events using anomalies from CCI Soil Moisture combined product
- Use LST-T2m as a proxy for sensible heat flux
- Importance of moisture convergence vs local surface flux changes?

Research plan

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2) Identify land surface sources of predictability for subseasonal-to-seasonal drought and heatwave forecasting

- Use spatial structures of land surface anomalies to identify where land influences atmosphere weeks later

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3) Evaluate land-atmosphere coupled variability in CMIP6 models during flash drought events