Blocking and its relationship to droughts

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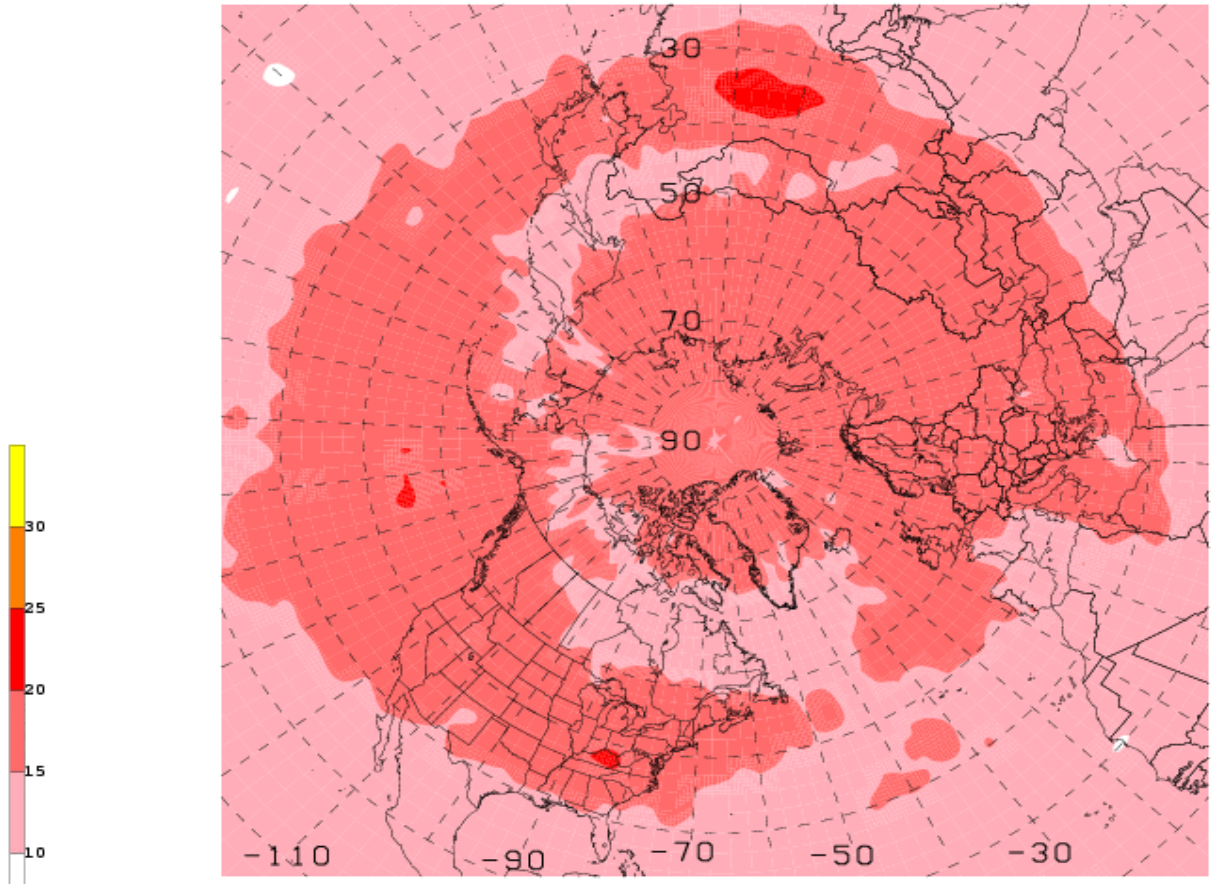
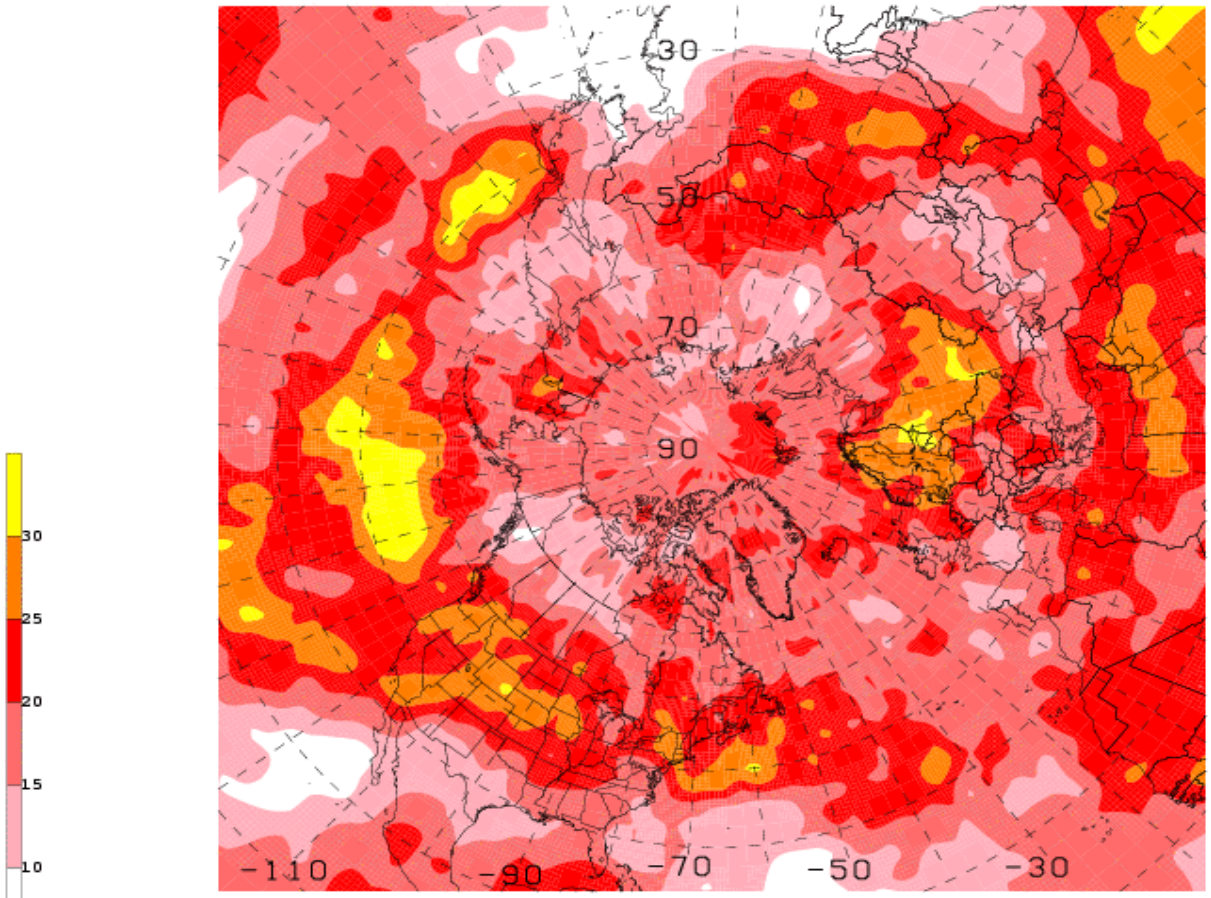
What is blocking?

- Persistent geopotential height anomaly (Dole 1982 used the 500-hPa pressure level)
- Many significant droughts are not well-related to known circulation indices (e.g., AO, NAO, ENSO, PNA, etc.)

Climatology of 250-hPa blocking (1950-2004); positive anomalies of at least one standard deviation persisting for at least 5 days



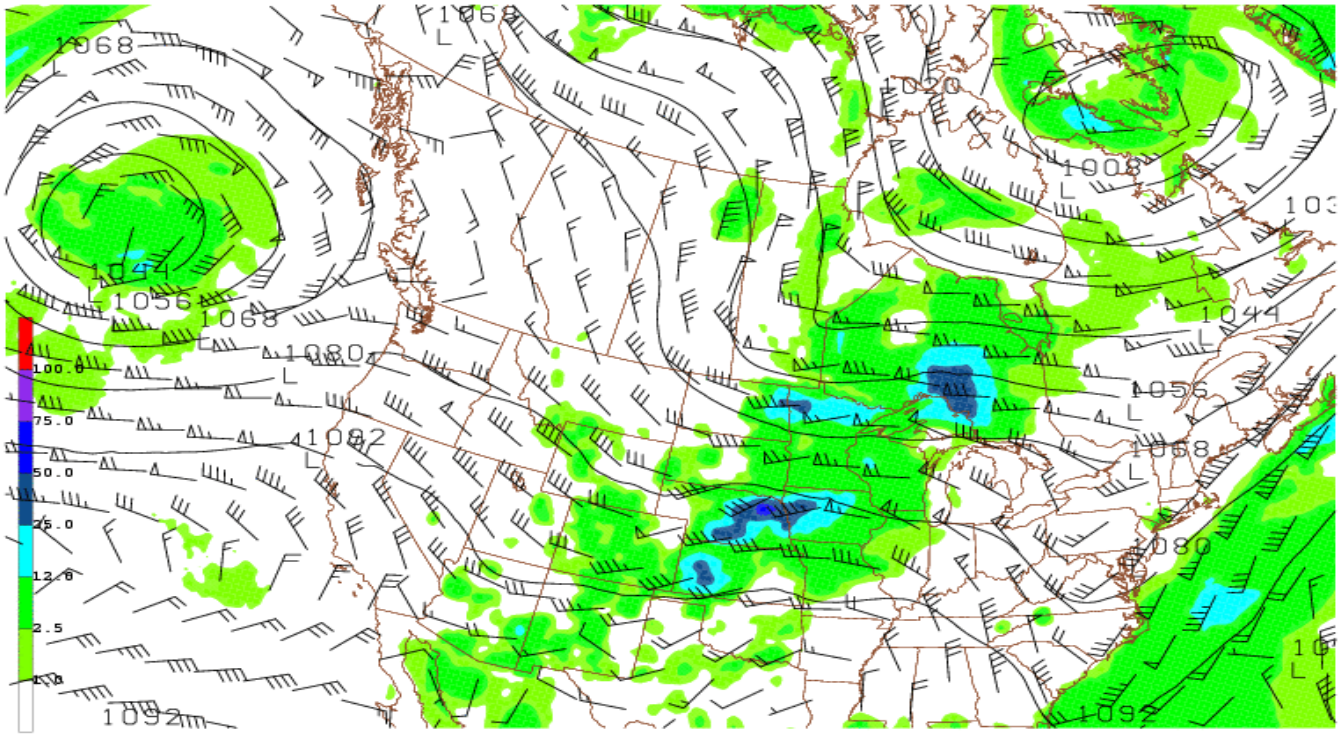
The more focused 1999-2004 period of blocking:



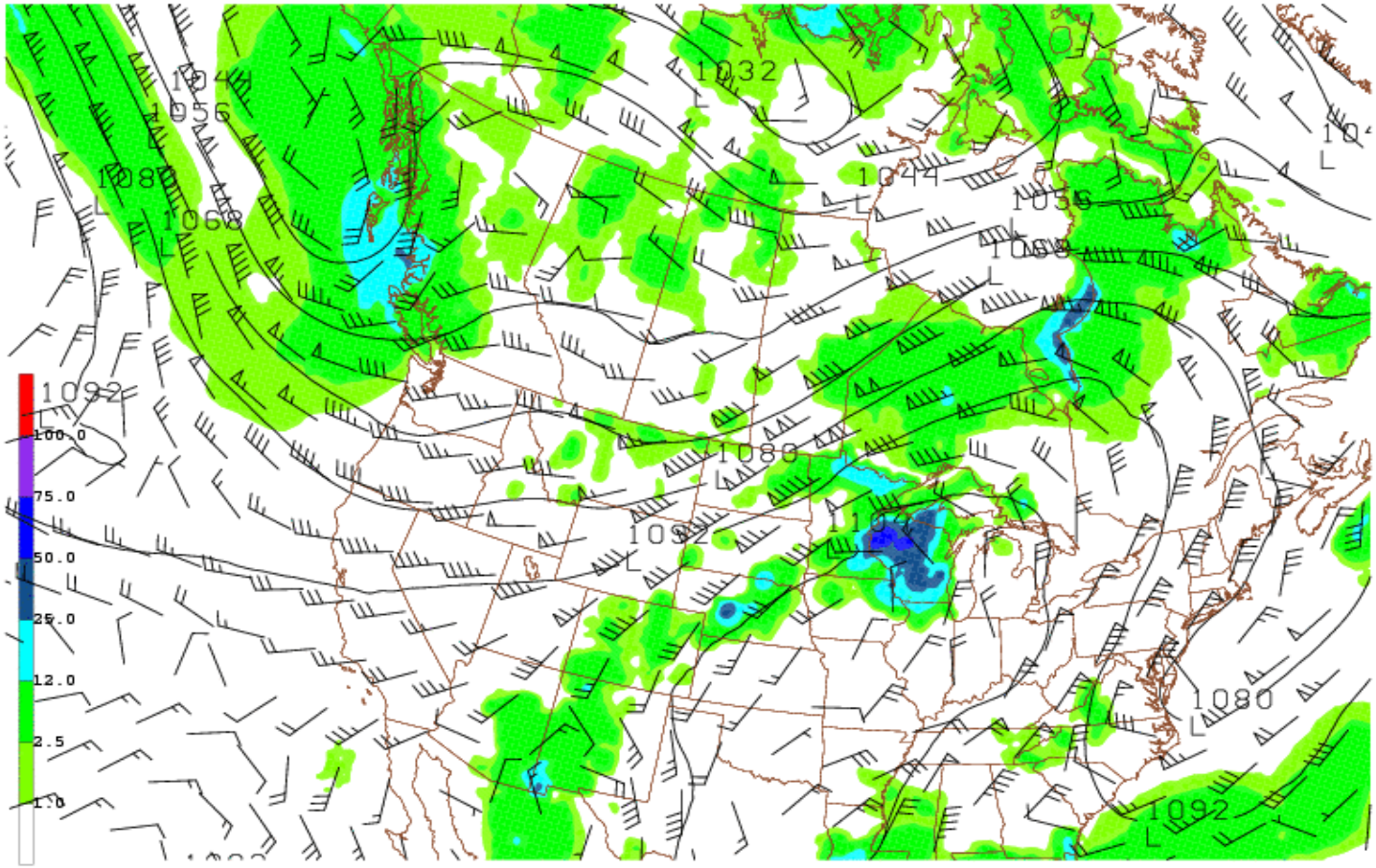
250 hPa PPAD [%] Summer (JAS) 1999-2004

What is the relevance to drought?

- **The persistence of an anomalously-strong upper-tropospheric anticyclone drives subsidence, which suppresses precipitation, including moist convection (summer)**



An animation of this 2001 case illustrates the crucial roles of persistence ridging:



Objectives

- Apply the blocking criteria to develop a long-term (55-year) North American blocking climatology
- Analyze blocking cases to understand their generation, maintenance, and decay

Detailed analyses of recent Canadian prairie droughts

- Many of our blocking cases are associated with the recent Canadian prairie drought

Theme 1: Quantify the physical features of the recent Canadian Prairie drought

- Identify the large-scale atmospheric circulation precursors, including three-dimensional potential vorticity structures, and flanking cyclonic systems
- Investigate dynamical structures associated with the generation, maintenance, and decay of drought regimes

Theme 2: Improve the understanding of processes and feedbacks associated with the recent Canadian Prairie drought

- Investigate the thermodynamic precursors, including the role of upstream convective diabatic outflows in generating synoptic-scale downstream ridging

4.3 Theme 3: Assess and reduce uncertainties in the prediction of drought

- Our analyses of drought cases may shed new insight into predictability issues (initialization, flanking precipitation regions/structures, and fluxes)