Warm-season blocking over North America and its relationship to Canadian Prairie droughts

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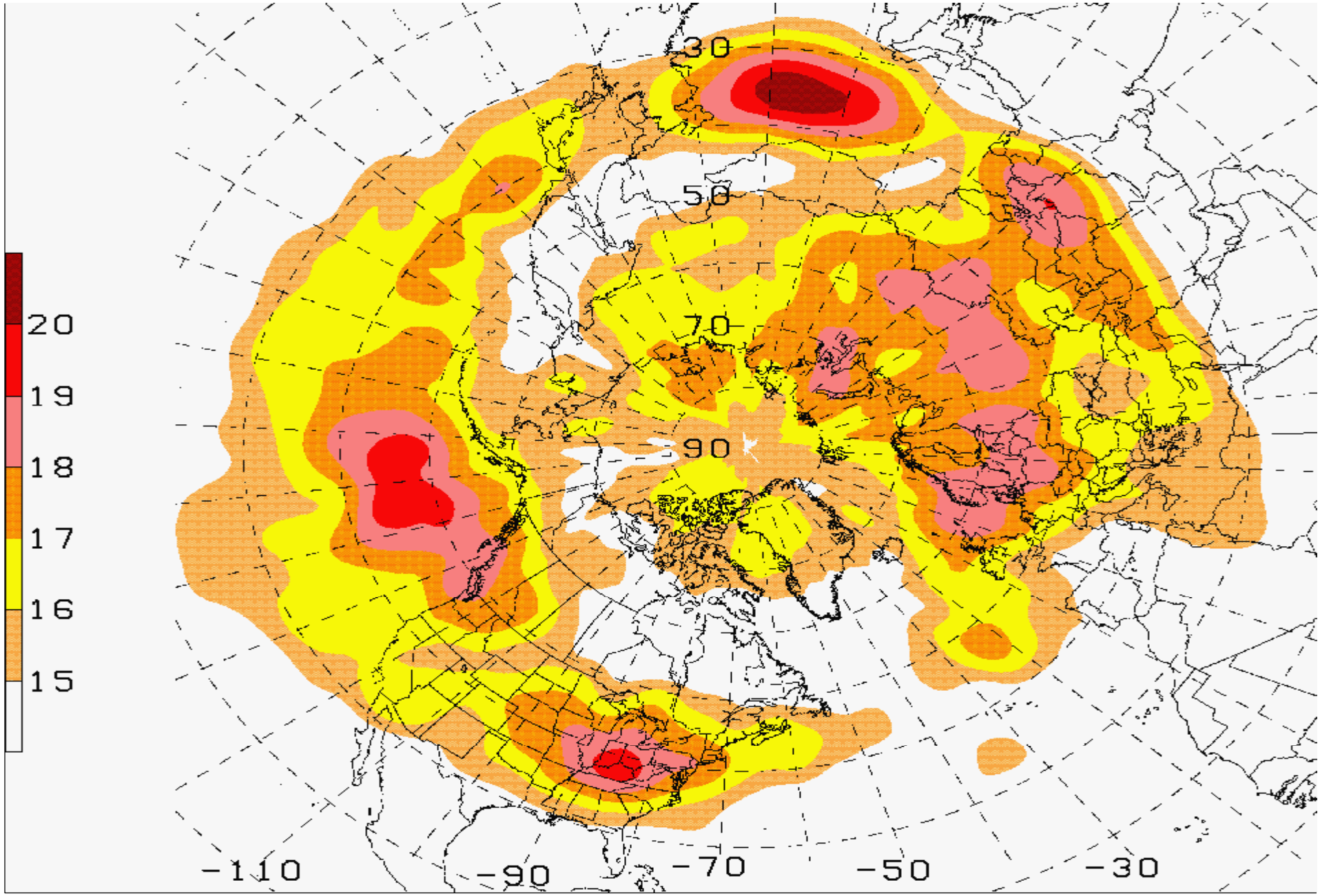
What is blocking?

- 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.)

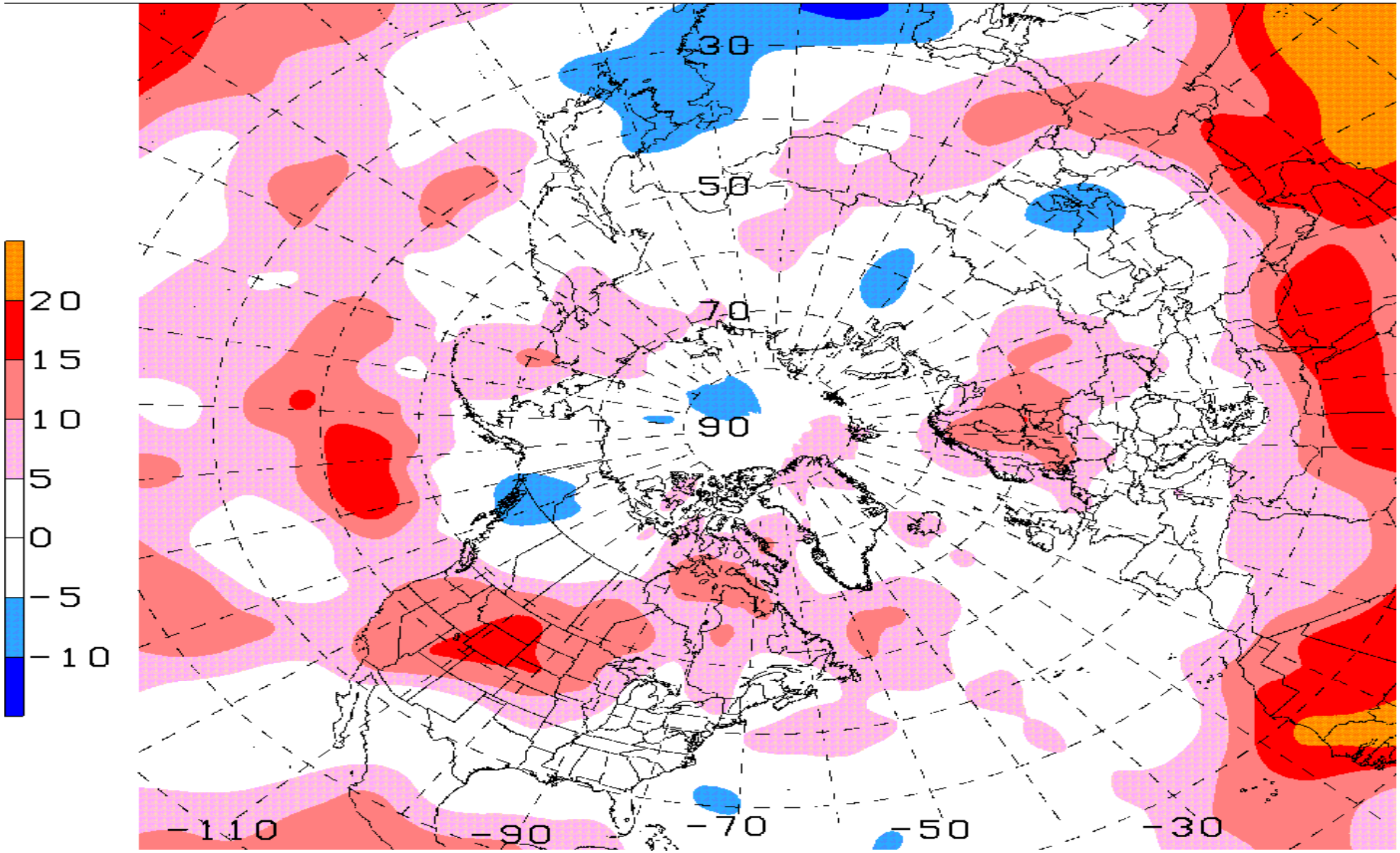
Research Objectives

- **develop a simple warm-season blocking index**
- **identify and analyse significant warm-season blocking events**
- **examine links between blocking and droughts, heat waves, and flooding events**



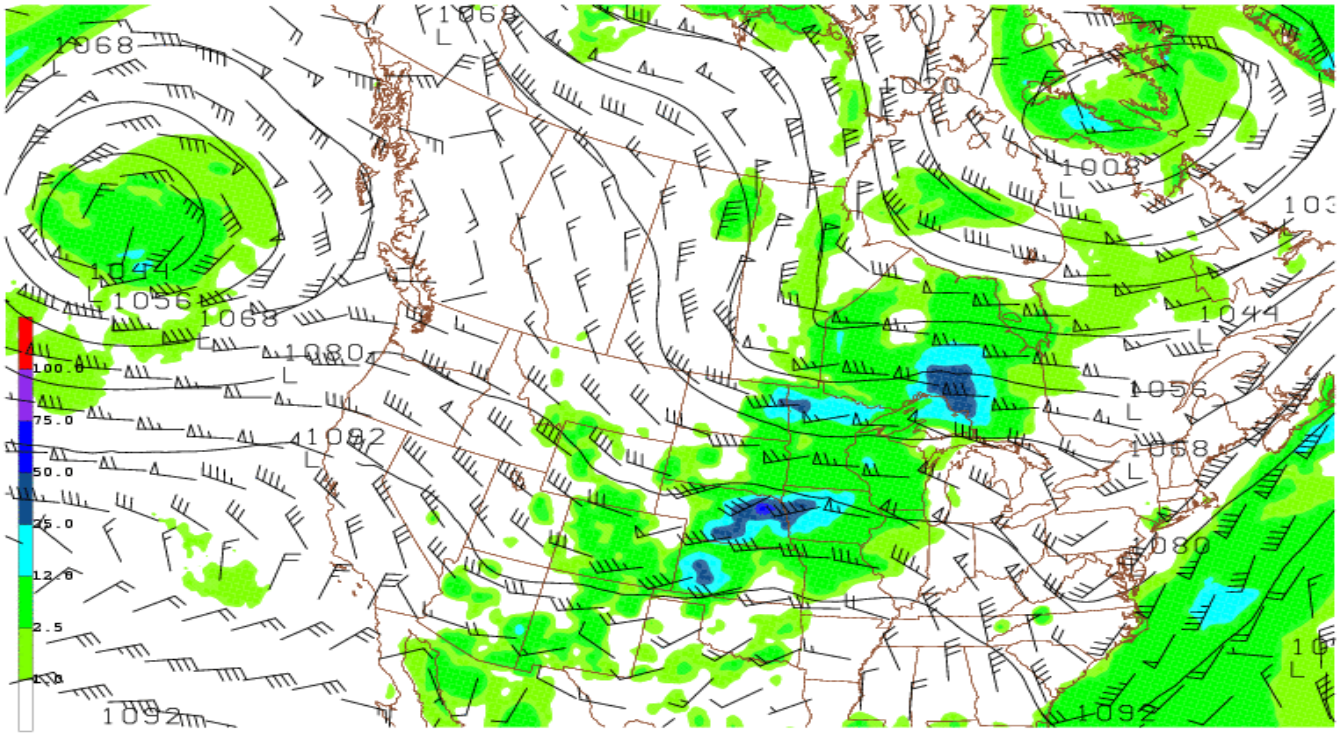
Summer-season (JAS) mean event frequency of persistent positive anomalies; Units: [% of “blocked” days per season]

Anomaly of the summer event frequency 2000-2003 (Canadian prairie drought). Units: [% days / season]



What is the relevance to drought?

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



Detailed analyses of recent Canadian prairie droughts

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

Summary

- **warm-season blocking has high importance owing to potential impacts on extreme events**
- **simple, objective criterion is proposed here to detect especially warm-season blocks**
- **implications for links between blocking frequency and 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