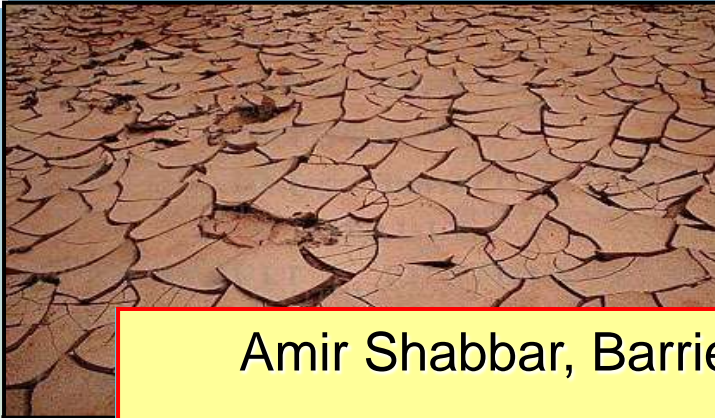


Atmospheric and Oceanic Variability associated with Prairie Droughts



Amir Shabbar, Barrie Bonsal and Kit Szeto
Environment Canada





Objectives

- Analyze inter-relationships among large scale to synoptic scale atmospheric circulation leading to droughts and pluvials during May-August on the Prairies
 - moisture transport, moisture flux convergence, column precipitable water, large-scale vertical motion, cyclone frequency
- Dynamical and statistical relationship between slow varying winter global SSTs and following summer moisture

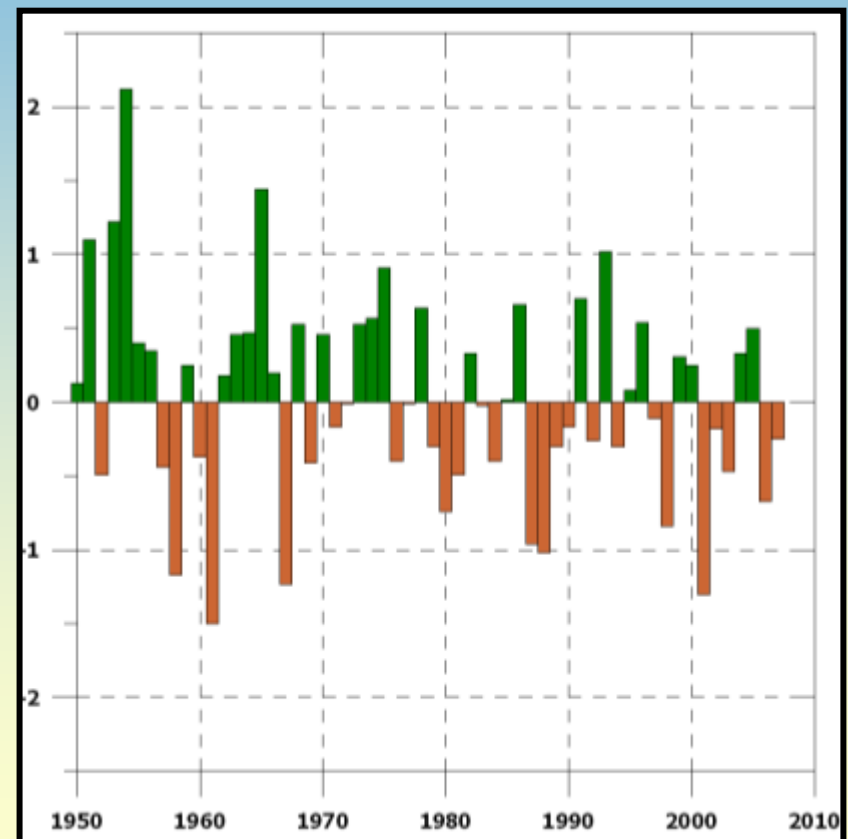
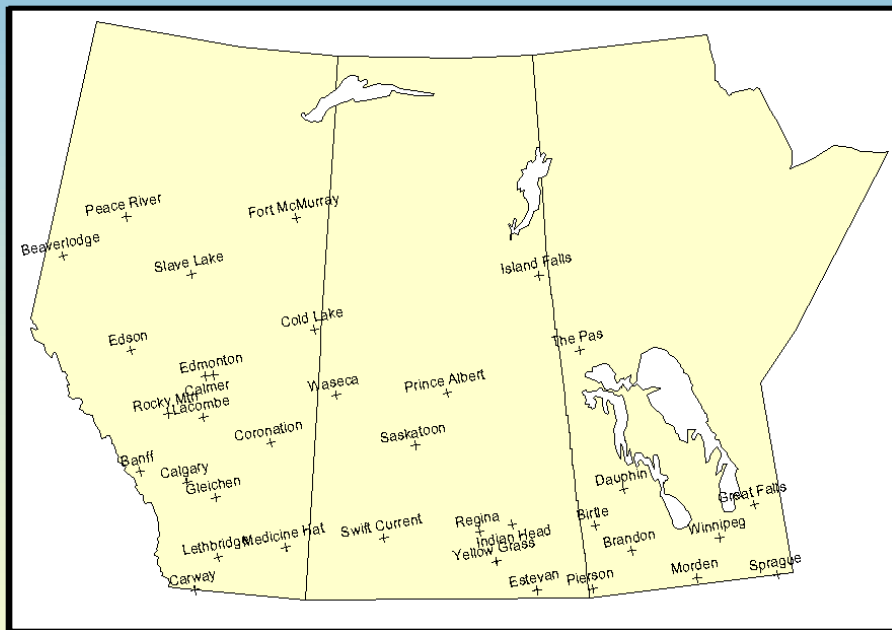




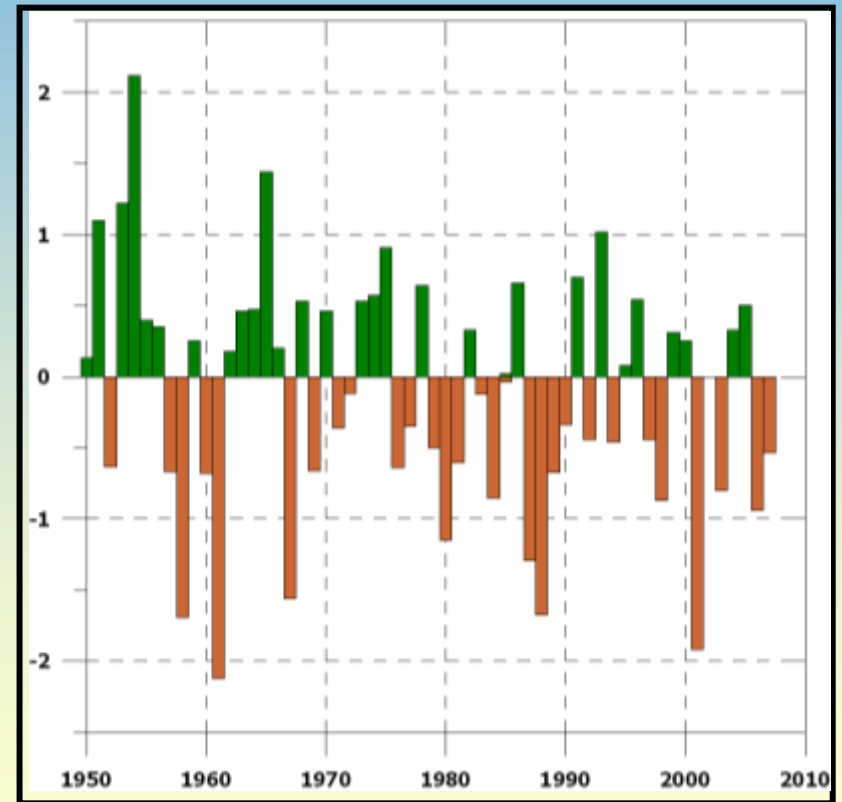
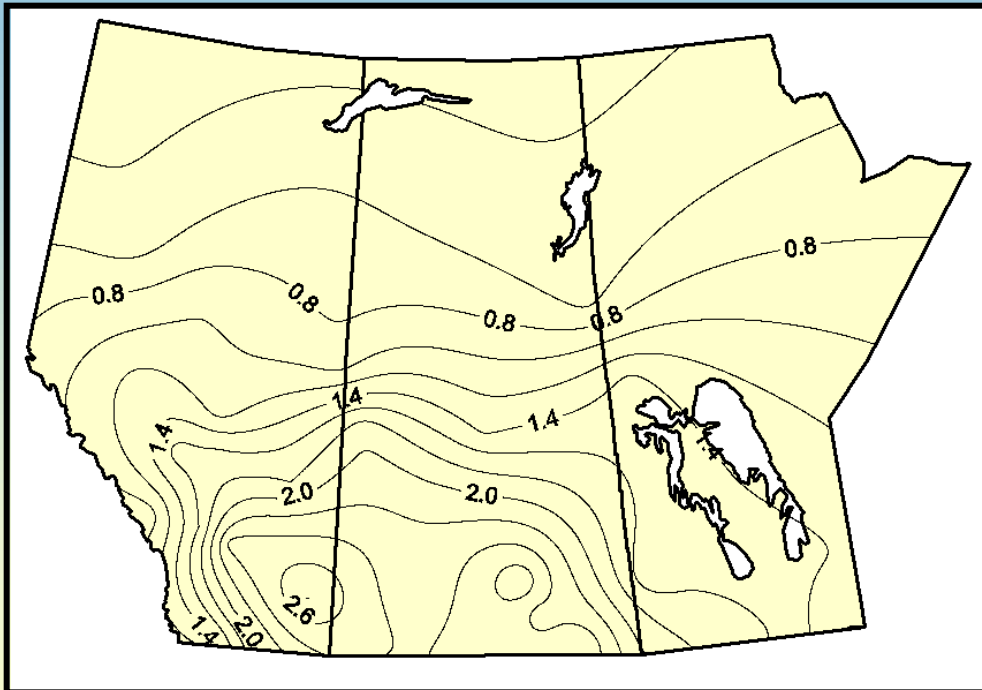
Summary

- Ridging to the south and west of the Prairies helps to divert moisture away from the region
- GPLLJ in conjunction with cyclonic systems over the mid-western U.S. relay moisture into the region
- Long-term warming trend in the global oceans favours dryness over the Prairies
- Summer circulation following moderate to strong El Nino resembles circulation that characterize drought season

Palmer Z-index (May-August)



Leading EOF – Var Expl. 35%

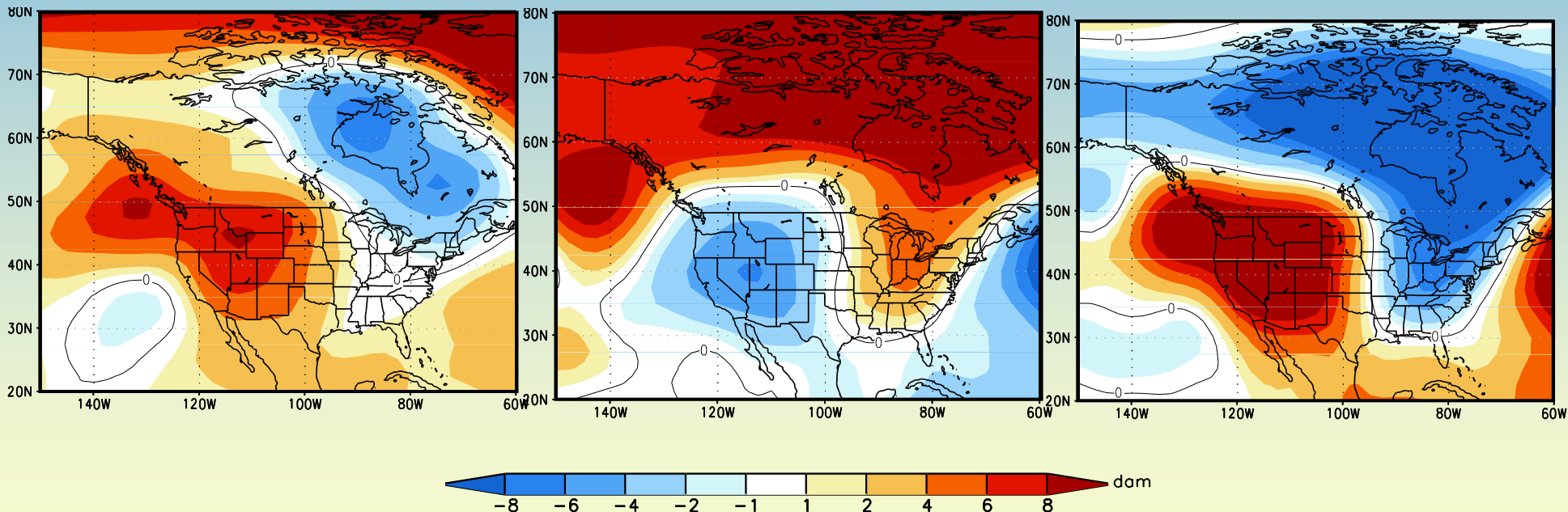


Composite 500-1000 hPa Circulation Anomaly

< 1SD PC1(drought)

> 1SD PC1 (pluvial)

Difference (dry-wet)



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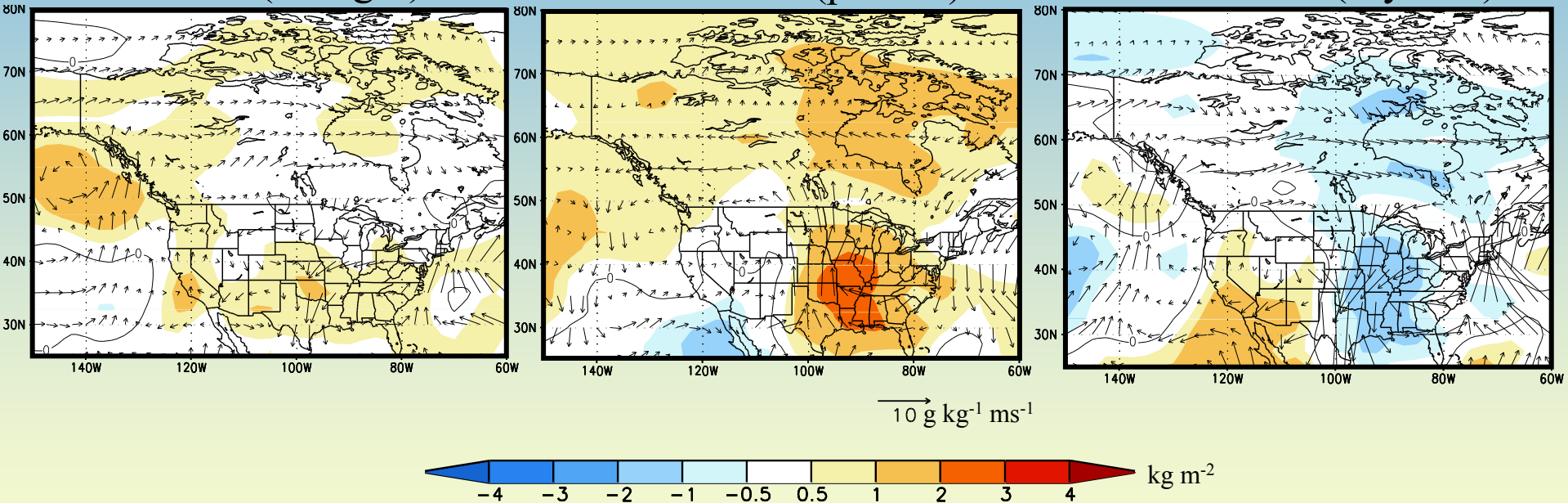
Canada

Composite Moisture Flux (850 hPa) and Column Precipitable Water

< 1SD PC1(drought)

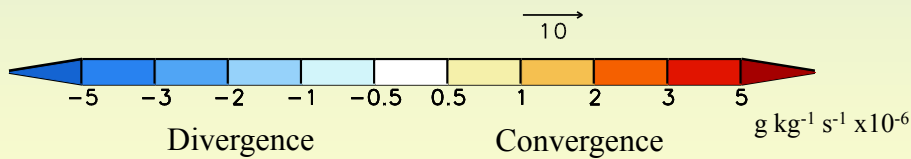
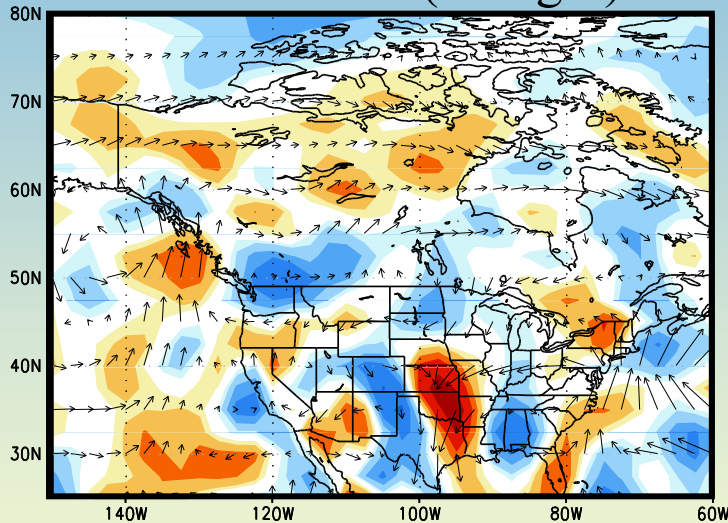
> 1SD PC1 (pluvial)

Difference (dry-wet)

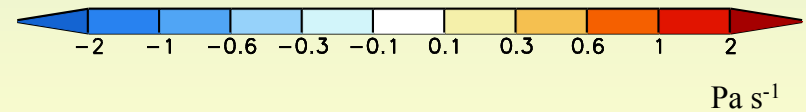
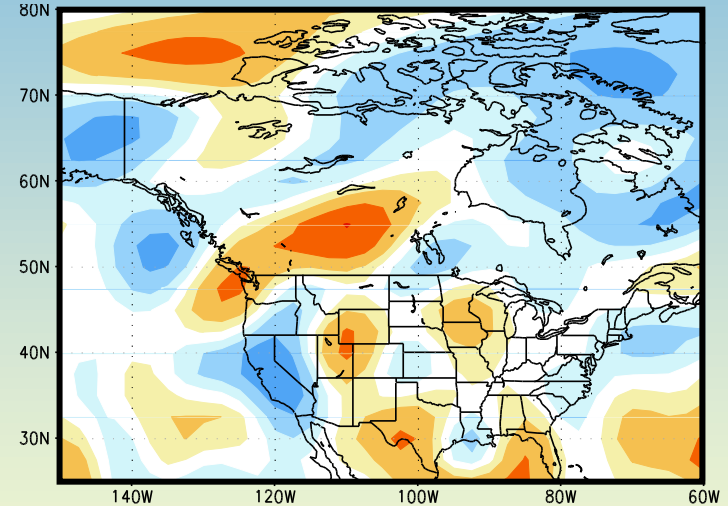


Composite Moisture Flux Divergence and Vertical Motion

< 1SD PC1(drought)

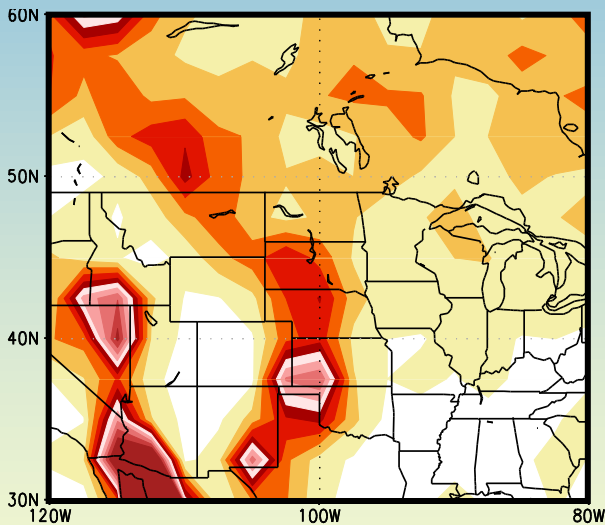


< 1SD PC1(drought)

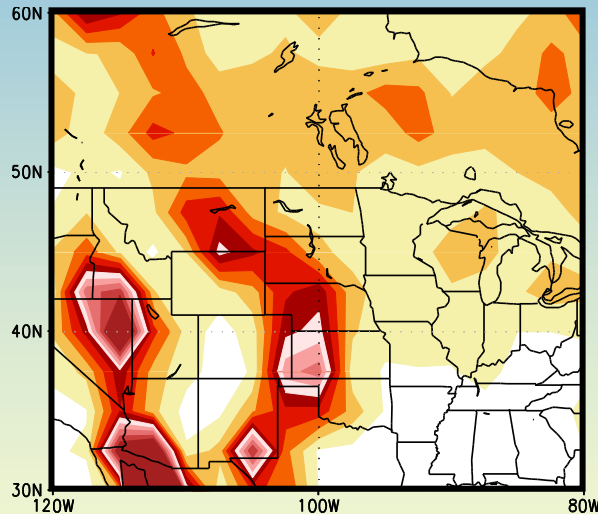


Composite Cyclone Frequency

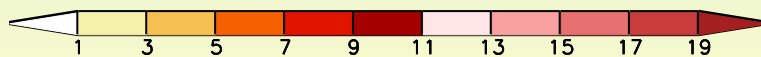
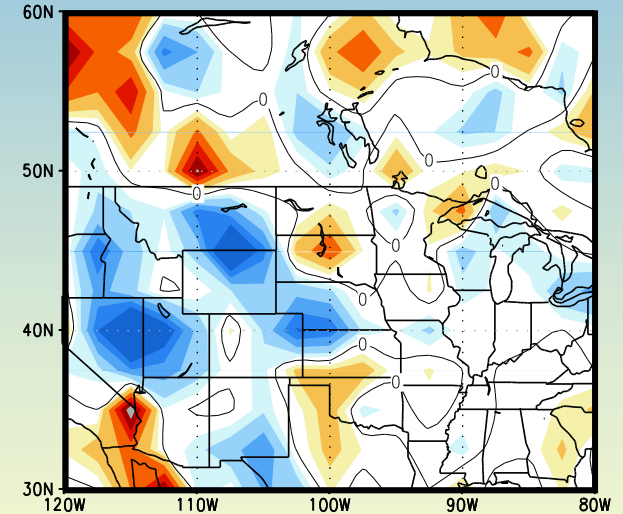
< 1SD PC1(drought)



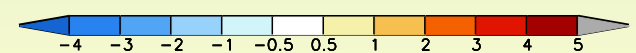
> 1SD PC1 (pluvial)



Difference (dry-wet)



count



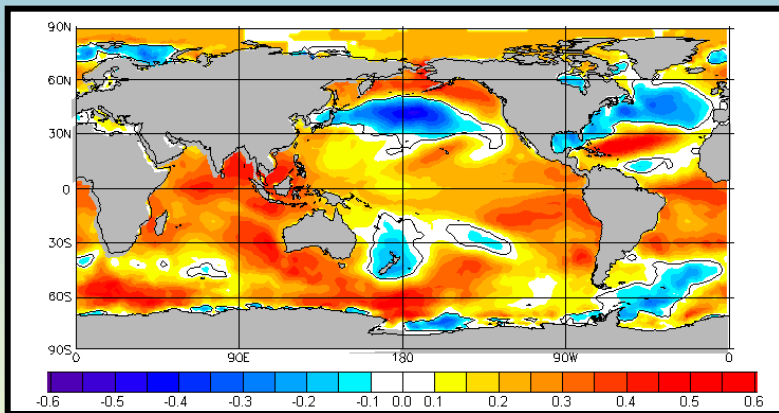
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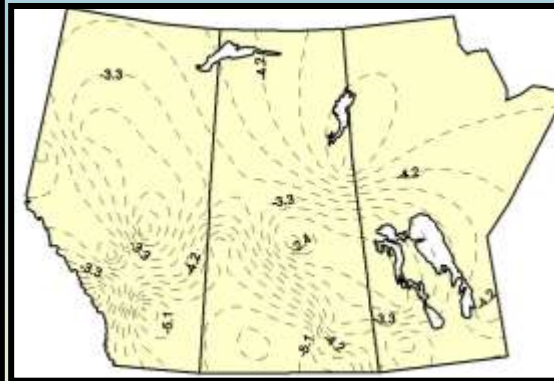
Canada

1st Spatiotemporal Coupled Pattern (Maximum Covariance)

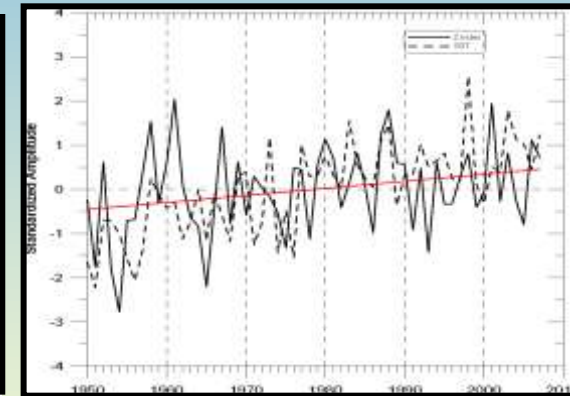
SST pattern



Z-index pattern



Time Component

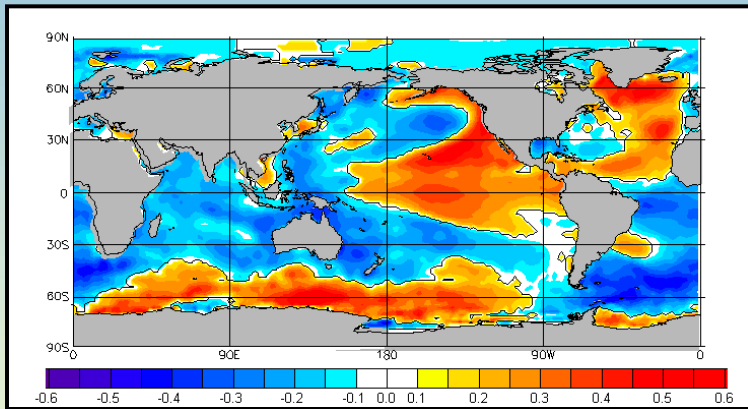


Squared Covariance Fraction = 70.2%

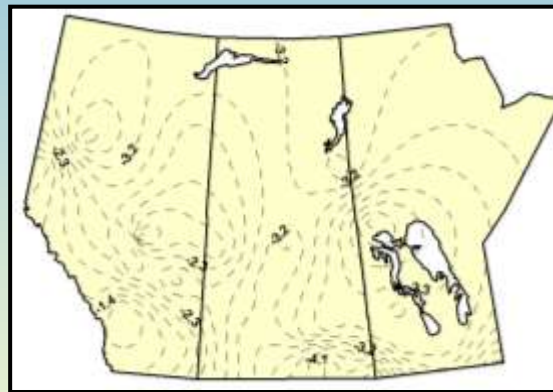


2nd Spatiotemporal Coupled Pattern (Maximum Covariance)

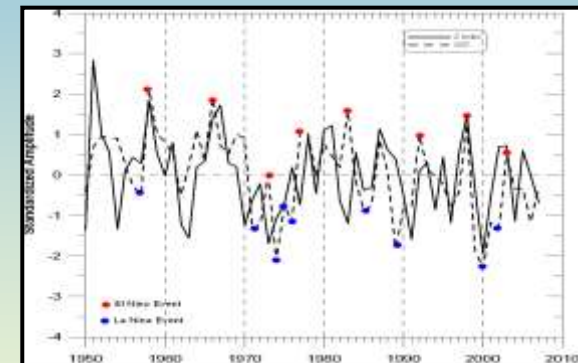
SST pattern



Z-index pattern



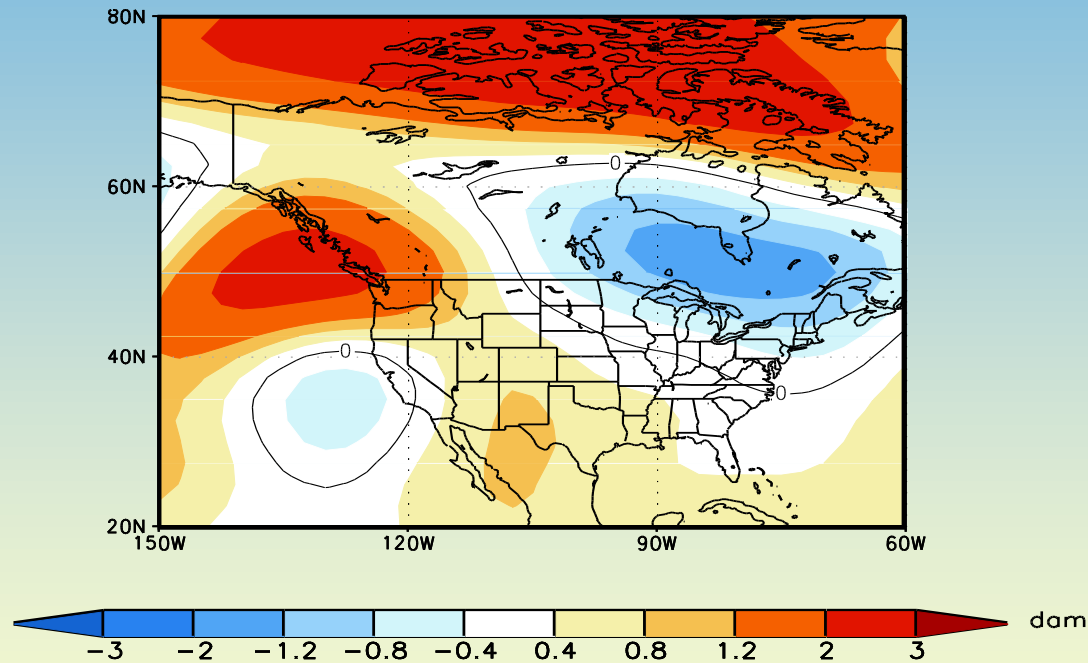
Time Component



Squared Covariance Fraction = 12.1%



Composite 500 hPa Heights (PC2 above 1 standard deviation)



Contribution comes mainly from May-June period





Summary

- Ridging to the south and west of the Prairies helps to divert moisture away from the region
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