Seasonal Predictability of North American Coastal Storm Activity during the Cold Months in CanSIPS

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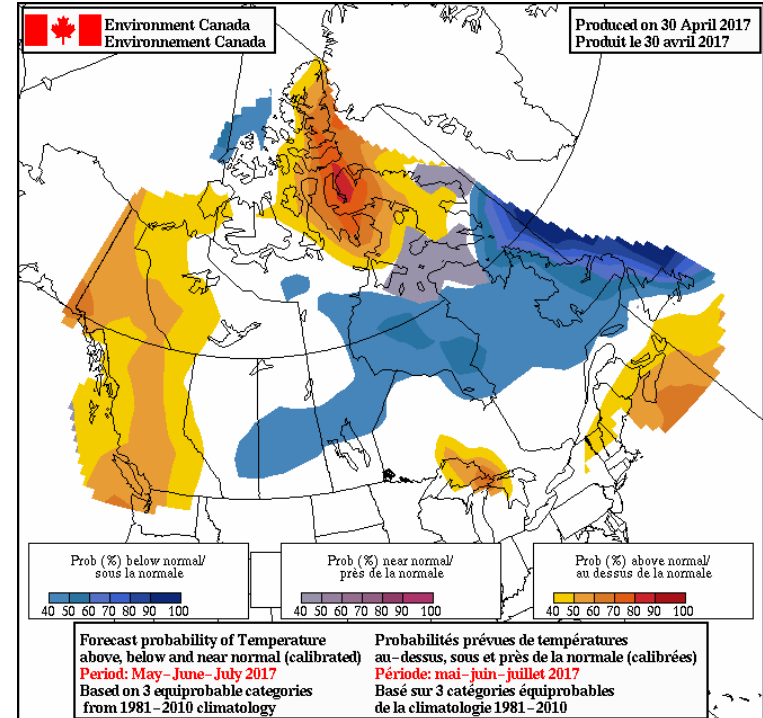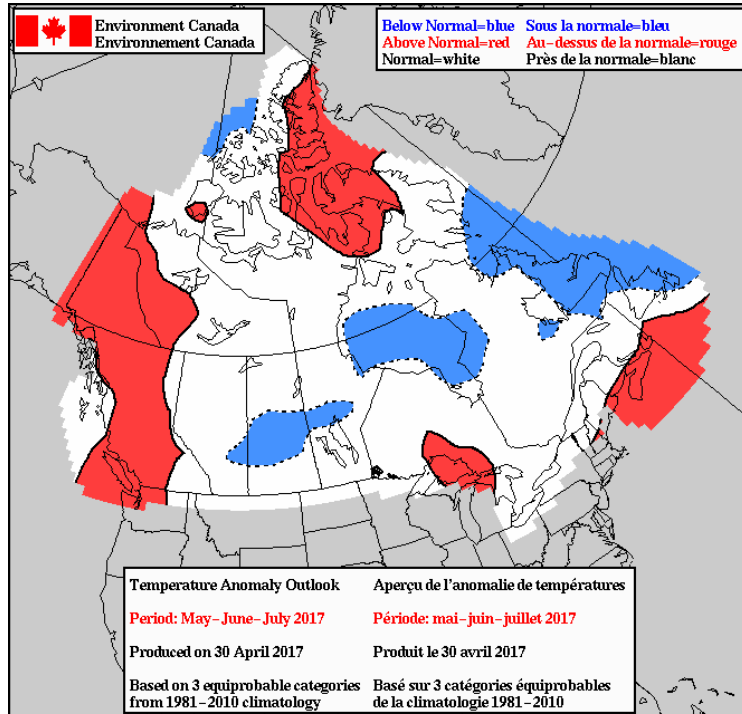
PACIFIC CLIMATE IMPACTS CONSORTIUM

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Current Operational Seasonal Prediction

Methods

- Canadian Seasonal to Interannual Prediction System (CanSIPS) 1981-2010 hindcasts
  - Multi-model ensemble forecast
    - unweighted averaging of models (CanCM3 and CanCM4)
  - Equiprobable categorical deterministic and probabilistic forecasts
    - parametric Gaussian method
- ETC proxies: 6-hrly MSLP and square root of absolute pressure tendency, daily mean 10-m wind speed
- Forecasts produced for OND, NDJ, DJF, JFM
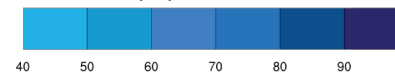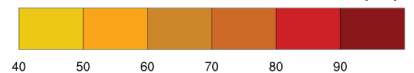
Example Forecasts

MSLP JFM 1983
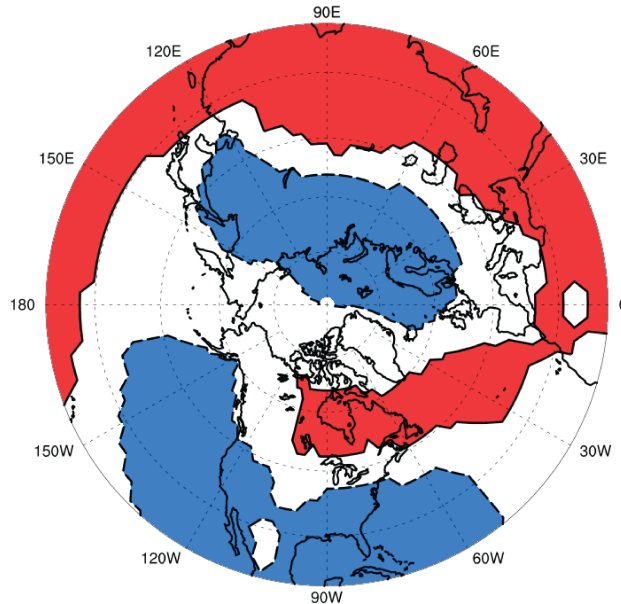
Below-normal = blue (increased storm activity)
Above-normal = red (decreased storm activity)
Near-normal = white (normal storm activity)
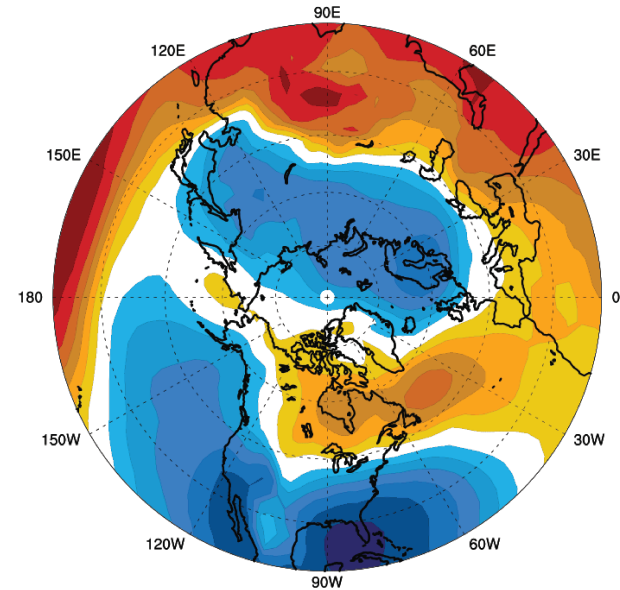
BN Prob (%)

AN Prob (%)

Example Forecasts

Square root of absolute pressure tendency JFM 1983

Below-normal = blue (decreased storm activity)
Above-normal = red (increased storm activity)
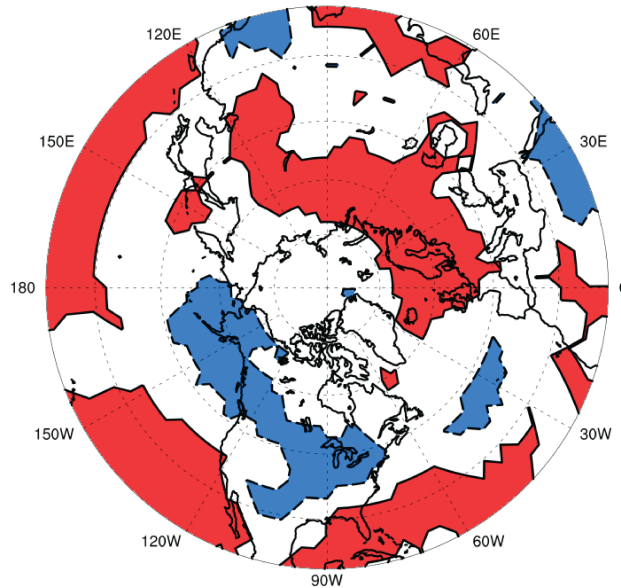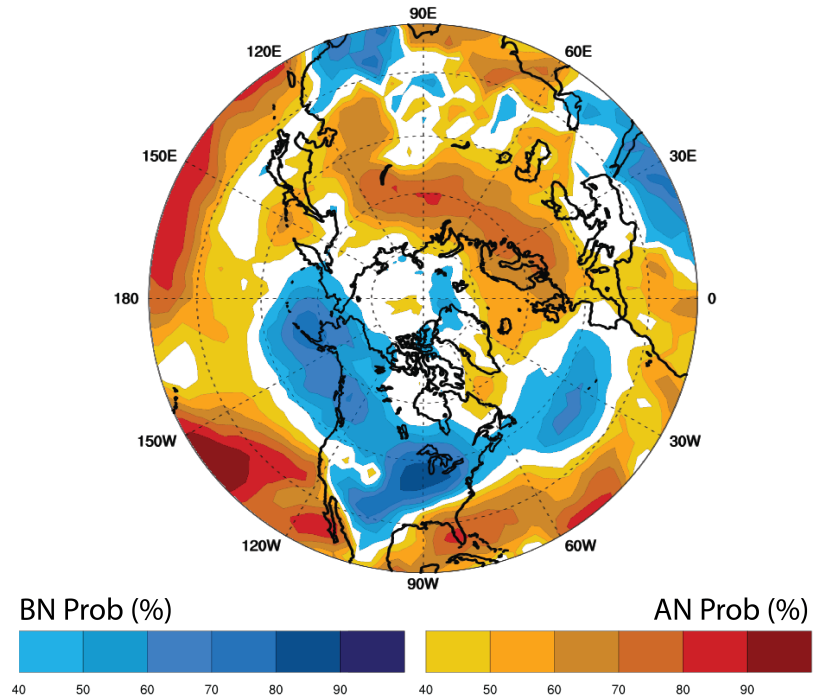Near-normal = white (normal storm activity)

BN Prob (%)
AN Prob (%)

40 50 60 70 80 90
40 50 60 70 80 90

Deterministic Forecast Skill Evaluation
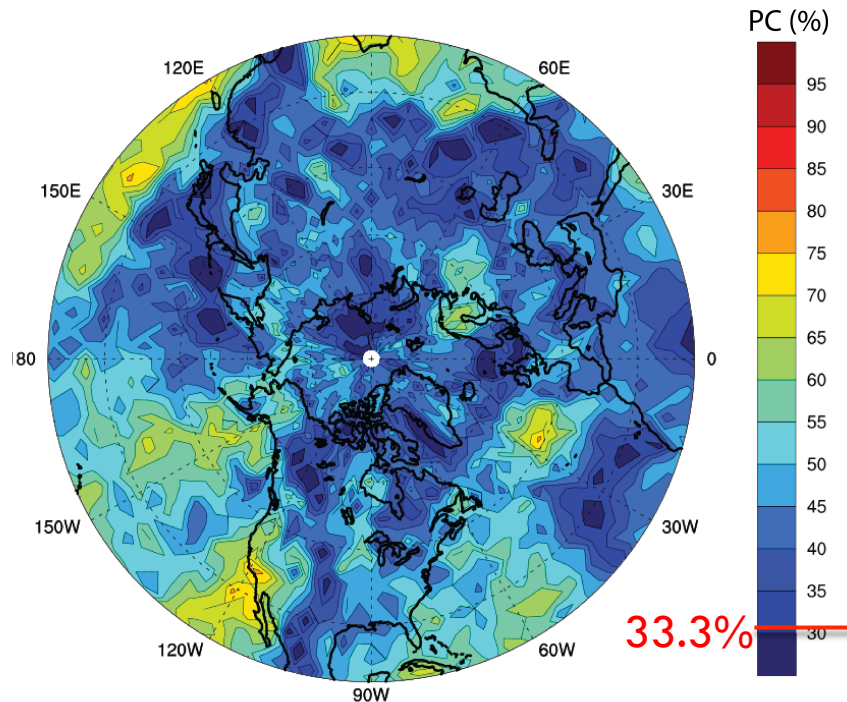
□ Percent Correct Score

  ◘ Verification dataset: ERA-Interim

  ◘ Skill: PCS > 33.3% (climatological forecast)

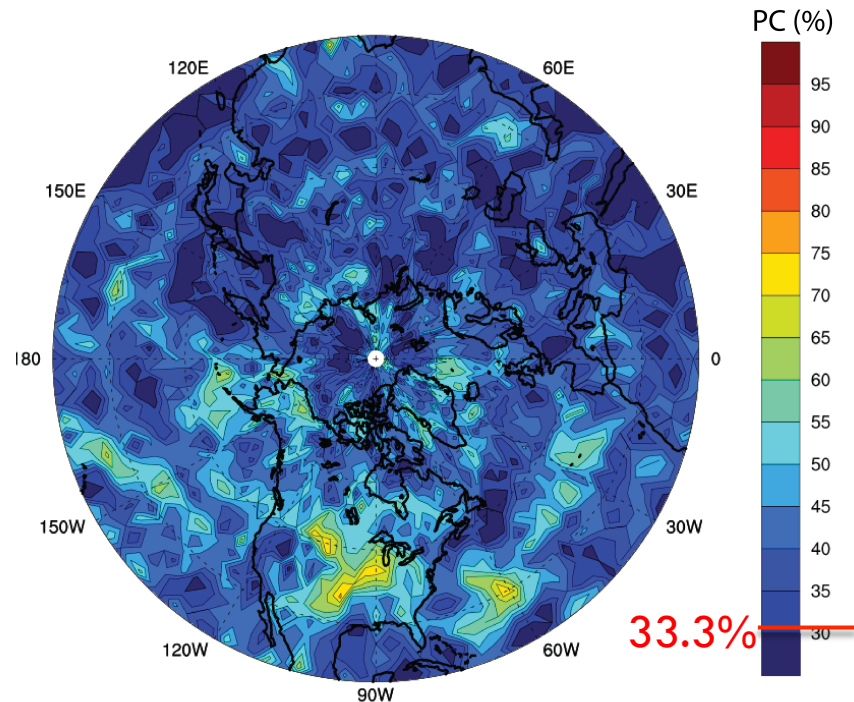| CONTINGENCY TABLE		FORECASTS			weather.gc.ca
		BELOW	NORMAL	ABOVE	TOTAL
OBSERVATIONS	BELOW	A	B	C	D
	NORMAL	E	F	G	H
	ABOVE	I	J	K	L
TOTAL		M	N	O	P

Percent correct = 100*(A+F+K)/P

Deterministic Forecast Skill Evaluation

MSLP JFM

$\sqrt{|\Delta MSLP|}$ JFM

Probabilistic Forecast Skill Evaluation

- Brier Skill Score (via Brier Score)
  - Temporal and spatial averaging
  - Verification dataset: ERA-Interim
  - Skill: BSS > 0

$$BS = \overline{(P\text{-}O)^2}$$

P = forecast probability
O = binary (1 = forecast verified;
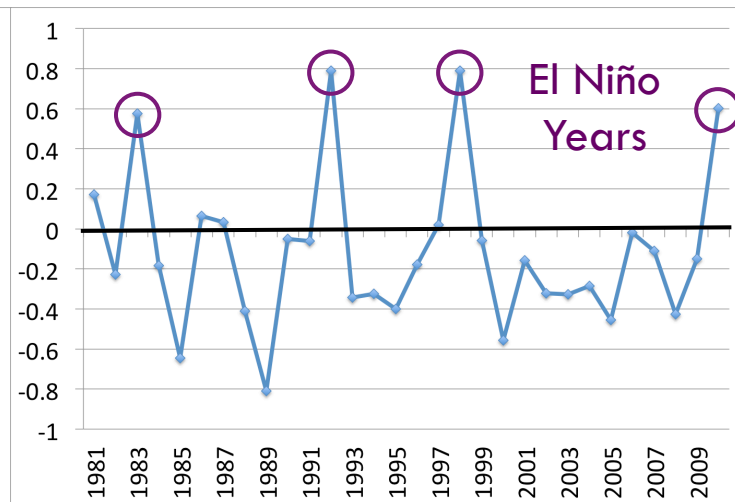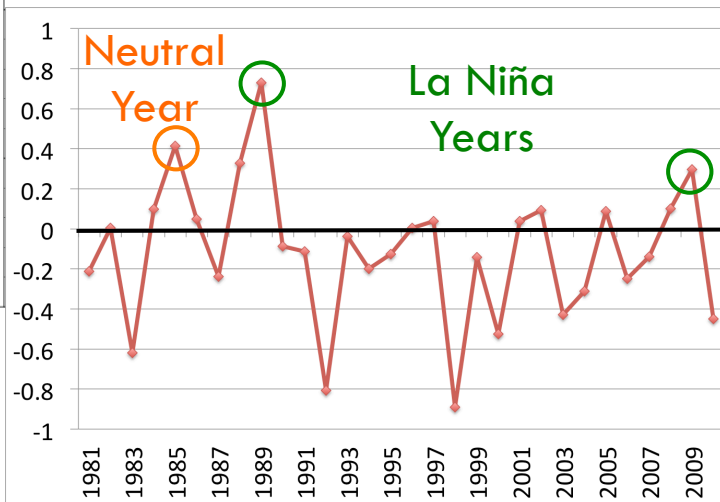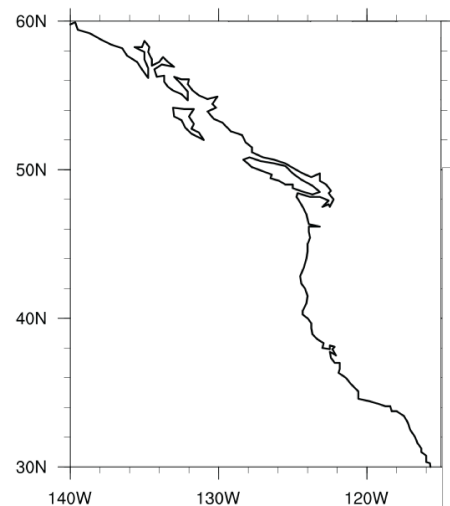0 = otherwise)

$$BSS = 1 - BS/BSref$$

BSref calculated using probability value of 33.3% (climatological forecast)

Probabilistic Forecast Skill Evaluation

MSLP JFM Spatial Avg BSS
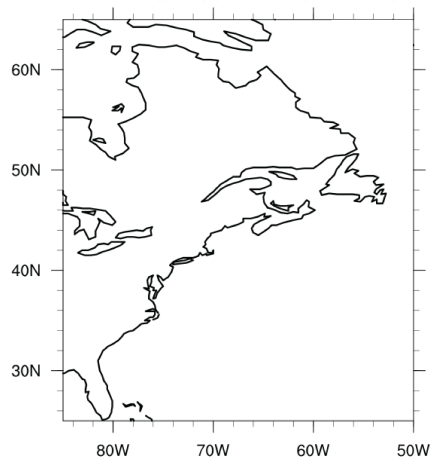North American West Coast

Probabilistic Forecast Skill Evaluation

MSLP JFM Spatial Avg BSS
North American East Coast
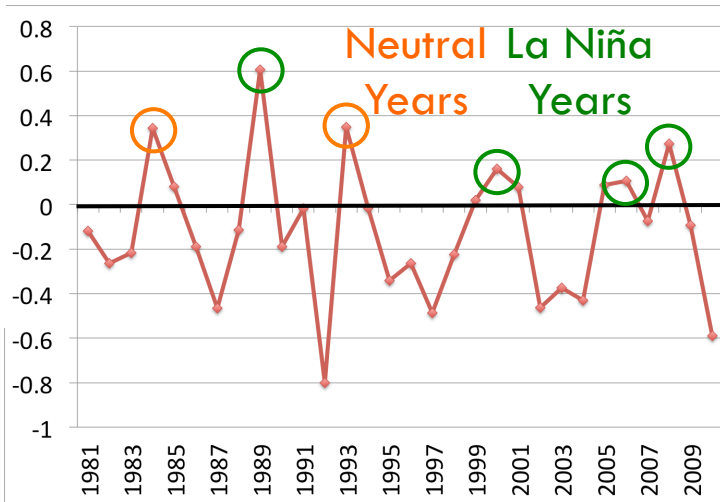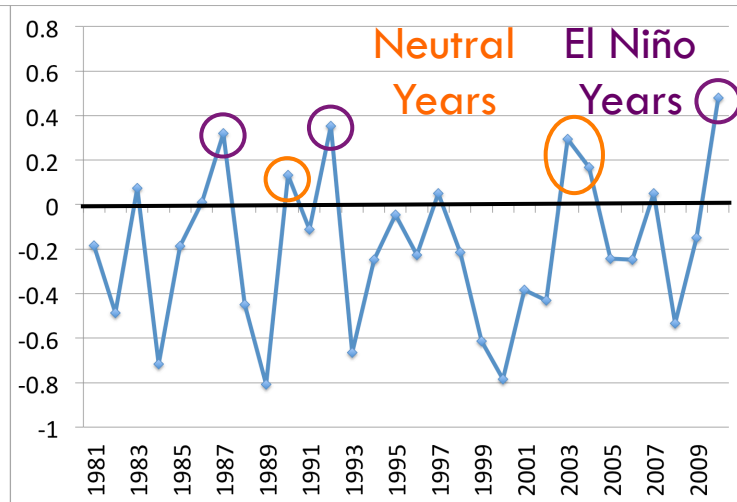
Findings

- CanSIPS-MME seasonal forecasts of extratropical cyclone proxies during the cold months (Oct-March)
  - MSLP, $\sqrt{|\Delta\text{MSLP}|}$, 10-m winds
  - Skill exceeding climatological forecasts for North American coastal regions
    - Deterministic (percent correct score) and probabilistic (Brier skill score) forecasting
      - E.g., often notable skill during ENSO events
    - Baseline skill of CanSIPS-MME

Next Steps

- Calibration of forecasts/post-processing
- Additional skill evaluations:
  - Correlation skill score
  - Continuous ranked probability skill score
  - Relative Operating Characteristic (ROC) score
  - Attributes diagrams

Thank you

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