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

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Current Operational Seasonal Prediction

Temperature Anomaly Outlook

- Period: May–June–July 2017
- Produced on 30 April 2017
- Based on 3 equiprobable categories from 1981–2010 climatology

Forecast probability of Temperature above, below and near normal (calibrated)

- Period: May–June–July 2017
- Based on 3 equiprobable categories from 1981–2010 climatology
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)
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)
Deterministic Forecast Skill Evaluation

- **Percent Correct Score**
  - Verification dataset: ERA-Interim
  - Skill: PCS > 33.3% (climatological forecast)

\[
\text{Percent correct} = 100\frac{(A+F+K)}{P}
\]
Deterministic Forecast Skill Evaluation

\[ \sqrt{| \Delta \text{MSLP} |} \]

\[
\begin{array}{c}
\text{MSLP JFM} \\
\end{array}
\]

\[
\begin{array}{c}
\sqrt{| \Delta \text{MSLP} |} \text{ JFM}
\end{array}
\]

33.3%
Probabilistic Forecast Skill Evaluation

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

$$BS = (P - O)^2$$

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

$$BSS = 1 - BS/BS_{ref}$$

$BS_{ref}$ calculated using probability value of 33.3% (climatological forecast)
Probabilistic Forecast Skill Evaluation

MSLP JFM Spatial Avg BSS
North American West Coast

Above-normal
(decreased storm activity)

Below-normal
(increased storm activity)

Neutral Year
La Niña Years

El Niño Years
Probabilistic Forecast Skill Evaluation

MSLP JFM Spatial Avg BSS
North American East Coast

Above-normal
(decreased storm activity)

Below-normal
(increased storm activity)
Findings

- CanSIPS-MME seasonal forecasts of extratropical cyclone proxies during the cold months (Oct-March)
  - MSLP, $\sqrt{|\Delta MSLP|}$, 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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