

Developing an Experimental Week 3-4 Storm Track Outlook over North Pacific, North America, and North Atlantic

Yutong Pan^{1,2}, Wanqiu Wang¹, Edmund K.M. Chang³, Hui Wang¹, David DeWitt¹

¹NOAA Climate Prediction Center, College Park, Maryland

²Innovim, Greenbelt, Maryland

³School of Marine and Atmospheric Sciences, Stony Brook University, NY

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Objectives

- To develop a set of week 3-4 storm track forecast products to support the NWS Alaska and other regional centers for storm track monitoring and long-lead forecast
- To verify week 3-4 forecast, and
- To assess week 3-4 forecast skill

Data

- Model forecasts (35-day, 6-hourly):
 - GEFSv12 operational fcst: 00Z, everyday; 31 mbrs
 - GEFSv12 hindcast: 00Z, once a week; 11 mbrs
 - Hindcast period: 1999-2019 (21 years)
- Observations:
 - Verification: CFSR real time
 - Skill assessment: CFSR archive (1999-2019)

Methods

- **Storm detecting and tracking** are based on the algorithm developed by Serreze (1995):
 - Using 6-h SLP data on $2.5^\circ \times 2.5^\circ$ grid
 - Center SLP ≤ 1000 hPa
 - Center SLP at least 1 hPa lower than surrounding grid points
 - Maximum distance a storm can move is 800 km/6 hr
- **Storm track density:** total number of storm centers within a 250-km radius for each grid point divided by ensemble members
- **Storm intensity:** mean storm center SLP within a 250-km radius for each grid point
- **Storm duration:** mean lifetime of storms passing through a domain of 250-km radius for each grid point

Week 3-4 Outlook

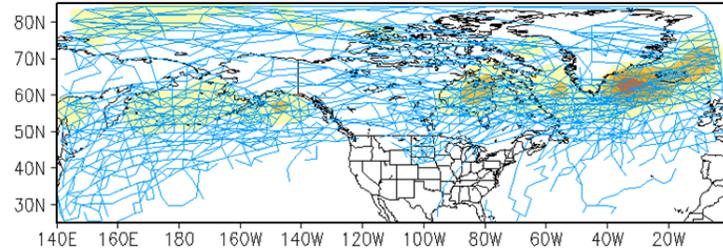
- Storm tracks and track density, storm intensity and duration
- Precipitation, SLP and 10-m winds
- Probability forecast (based on distribution of the 31-member forecasts)
 - Precipitation and 10-m wind speed: exceeding 75th and 90th percentiles
 - Storm intensity: lower than 990, 980, 970, and 960 hPa
- Day-to-day variance of SLP
- Sub-regional maps: Alaska/Arctic, N. Pacific, N. America, and N. Atlantic
- Real-time storm track outlook and verification are available at:
<https://ftp.cpc.ncep.noaa.gov/hwang/YP/week2/>

Week 3-4 Outlook

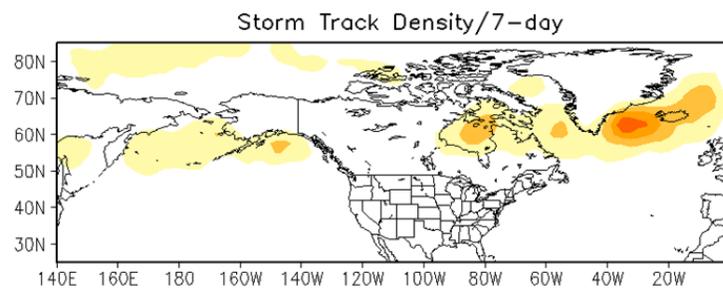
Storm Track, Track Density, Storm Intensity and Duration

FCST Date: 2021.09.09 GEFS Week 3-4 Forecast for 2021.09.23.12Z-2021.10.07.06Z
Total (Center SLP < 1000 hPa) Anomaly

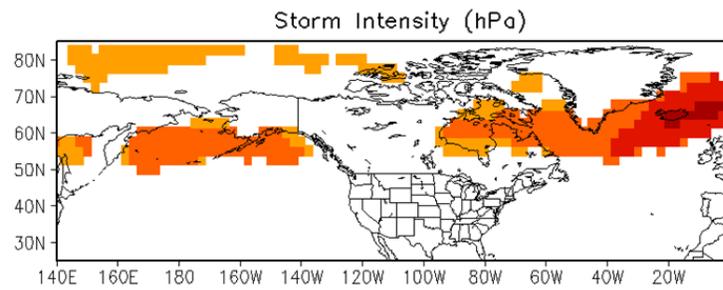
Storm Track



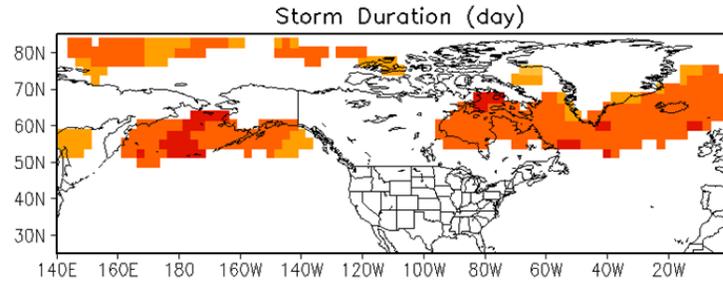
Track Density



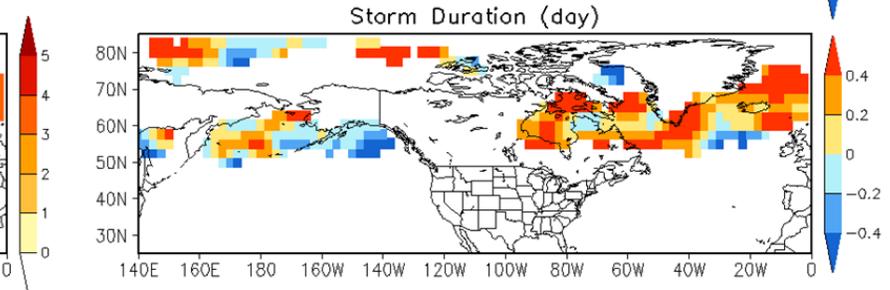
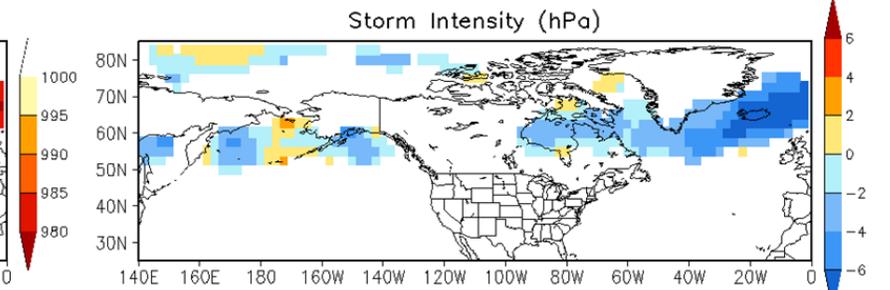
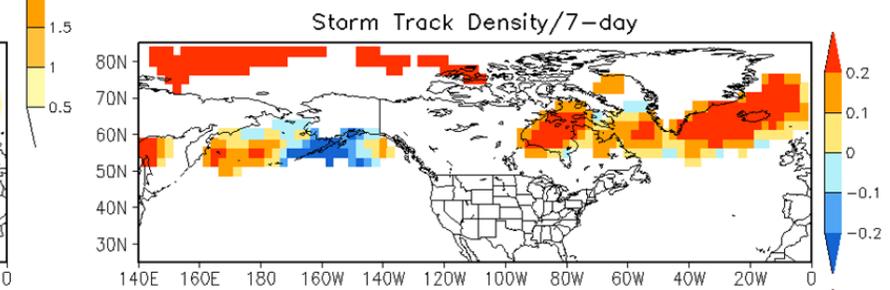
Storm Intensity



Storm Duration



Total



Anomaly

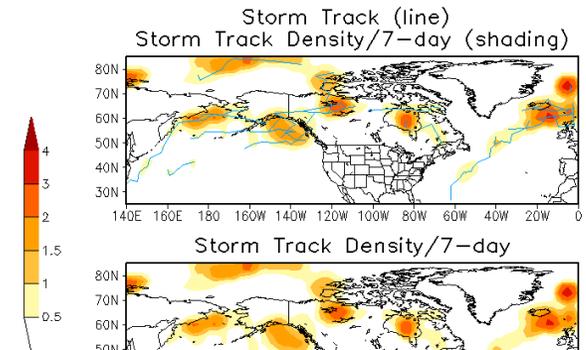
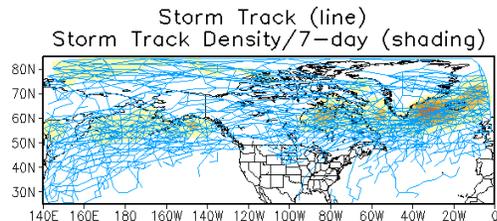
Storm Track, Track Density, Storm Intensity and Duration

Verification

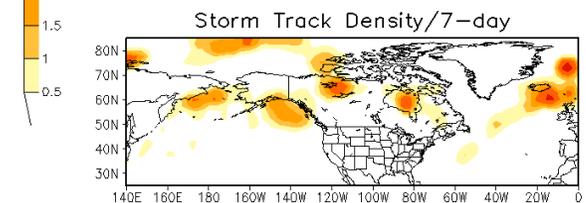
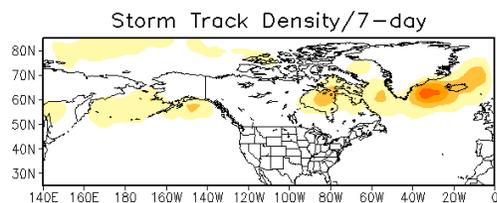
2021.09.23.12Z–2021.10.07.06Z

FCST Date: 2021.09.09 GEFS Week 3–4 Forecast (Center SLP < 1000 hPa) Verification: CFSR
 Total Total

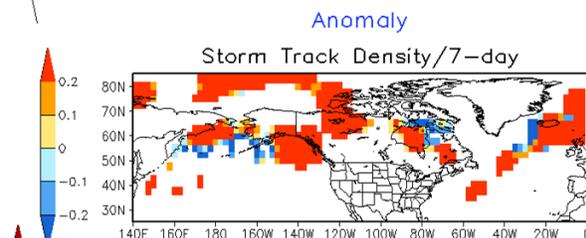
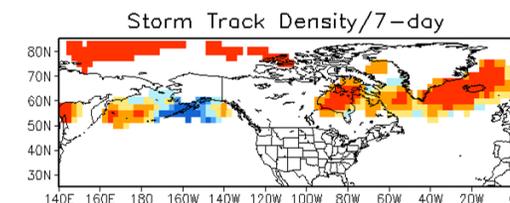
Storm
Track



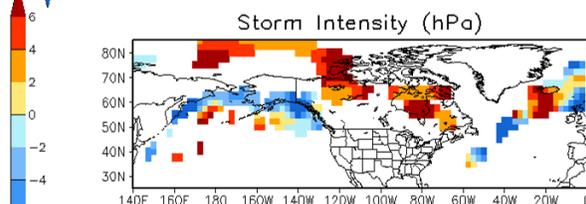
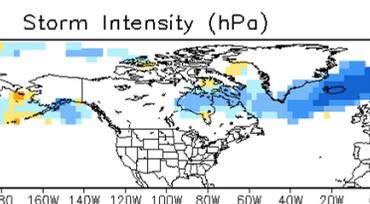
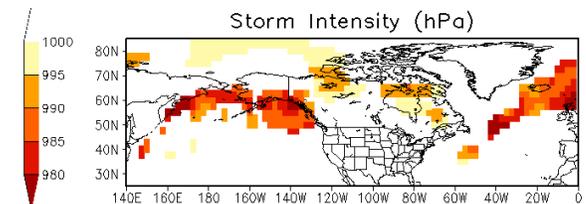
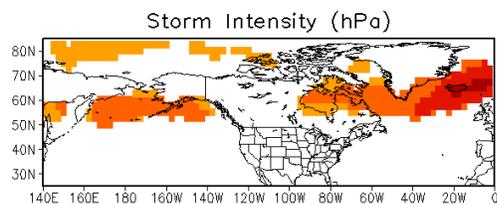
Track
Density



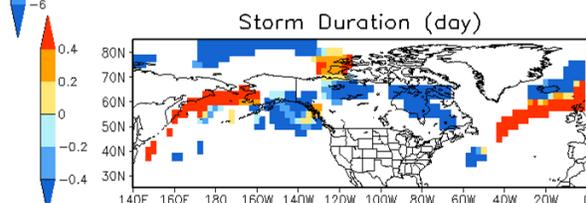
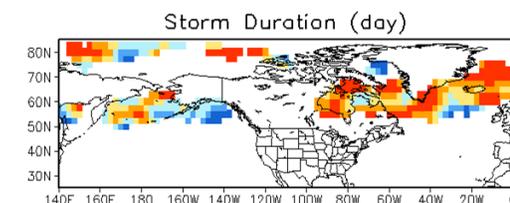
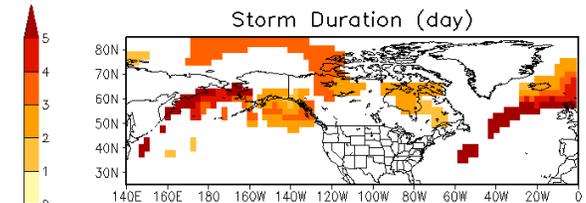
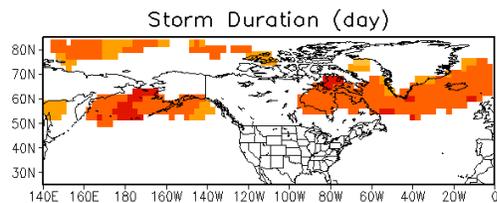
Anomaly



Storm
Intensity



Storm
Duration



GEFSv12

CFSR Verification

GEFSv12

CFSR Verification

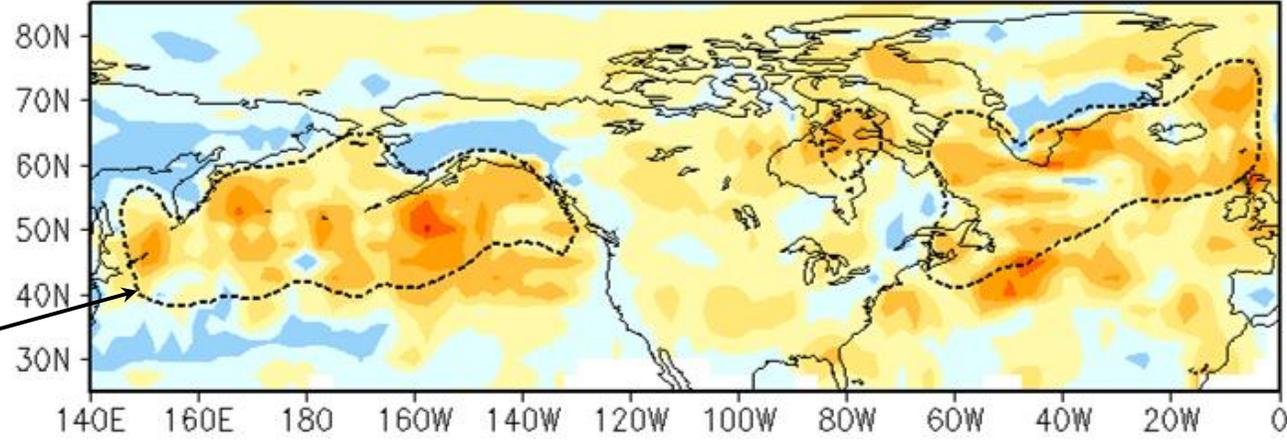
Total

Anomaly

Forecast Skill

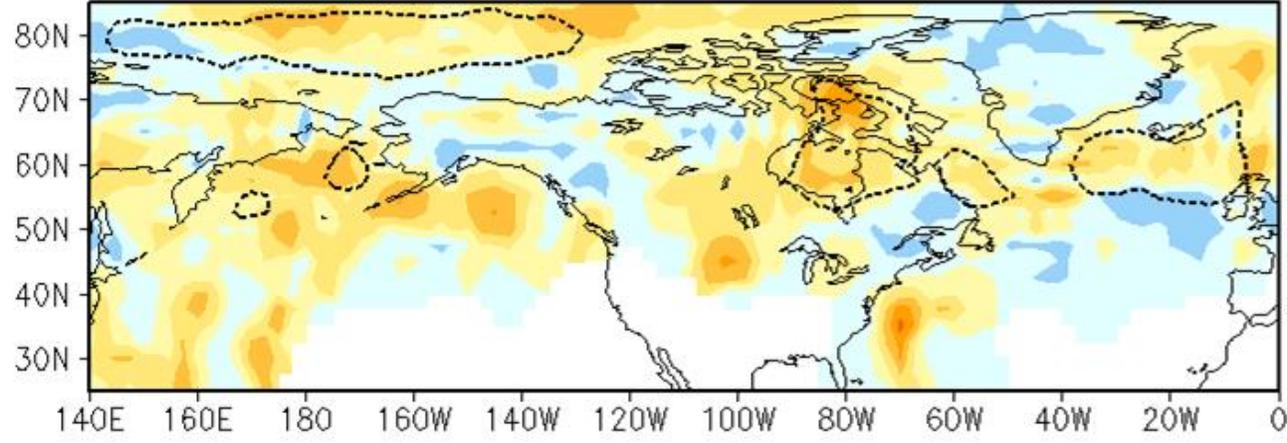
Anomaly Correlation (AC) of Week 3-4 Storm Track Density between GFSv12 21-year hindcast and CFSR

January



Active storm region

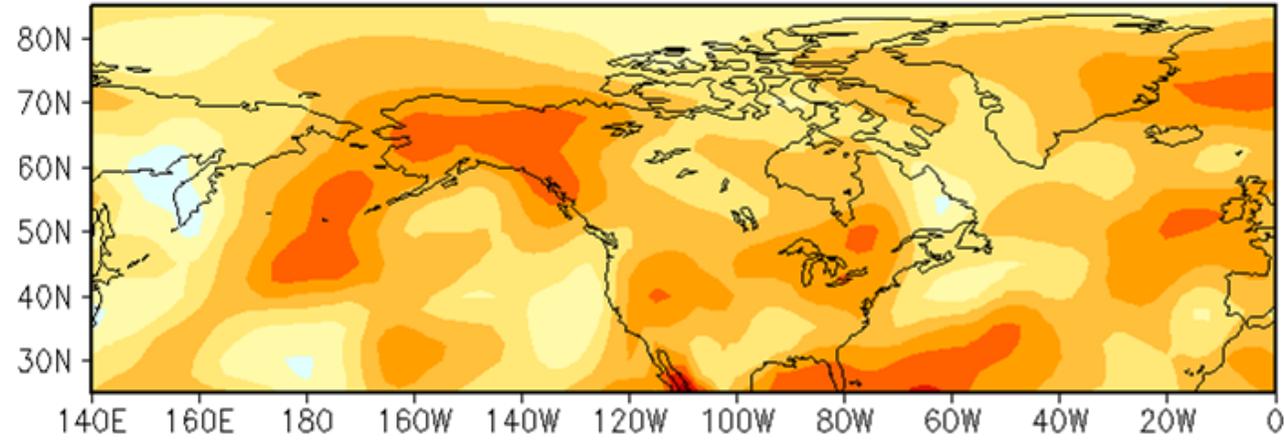
July



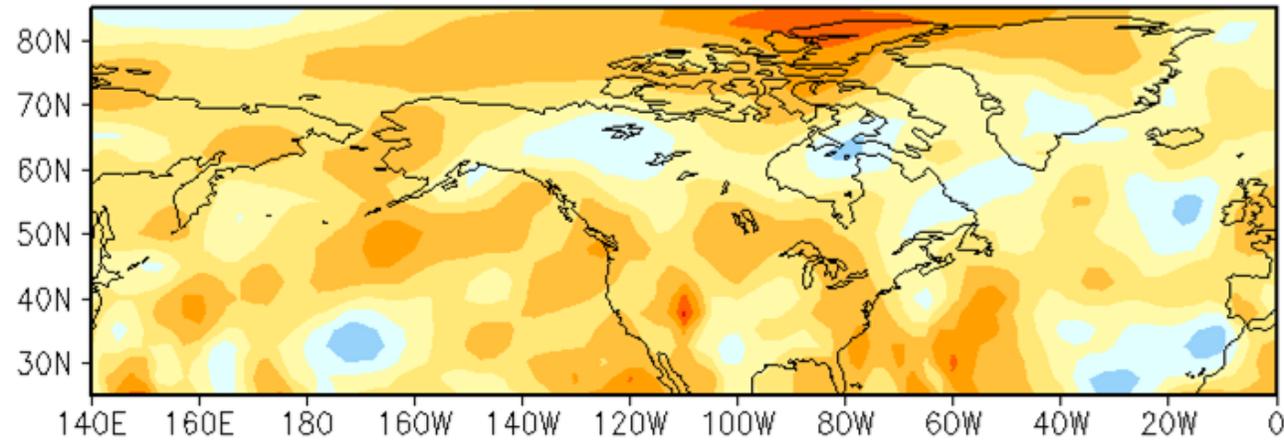
Forecast Skill

Anomaly Correlation (AC) of Week 3-4 Day-to-Day SLP Variance between GFSv12 21-year hindcast and CFSR

January



July



Summary

- Real-time week 3-4 outlook and verification are available at:
<https://ftp.cpc.ncep.noaa.gov/hwang/YP/week2/>
- Anomaly correlation of week 3-4 forecast indicates a certain level of skill for week 3-4 storm track density over the mid- and high-latitudes and better skills for precipitation, SLP, and day-to-day SLP variance.
- Skills in operational forecast are expected to be higher than the hindcast skill due to a larger ensemble in real-time forecast.
- To improve the week 3-4 forecast skill, combining the GFSv12 forecast with the NCEP CFS version 2 (CFSv2) 45-day forecast is being conducted and will be implemented in real time.