Atmospheric Research and Modeling Efforts at UAF

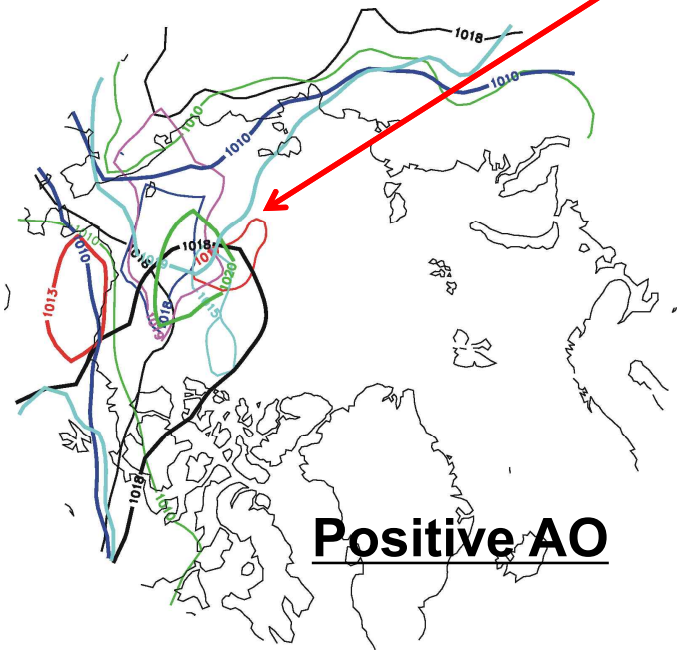
- Atmosphere **is a fundamental driving force for ocean currents and properties**
- There is a need to develop a new, high-resolution data to best describe atmospheric forcing
- Research, economy, and society activities require a real time, high-resolution weather forecast system

Xiangdong Zhang, IARC/DAS, UAF; xdz@iarc.uaf.edu

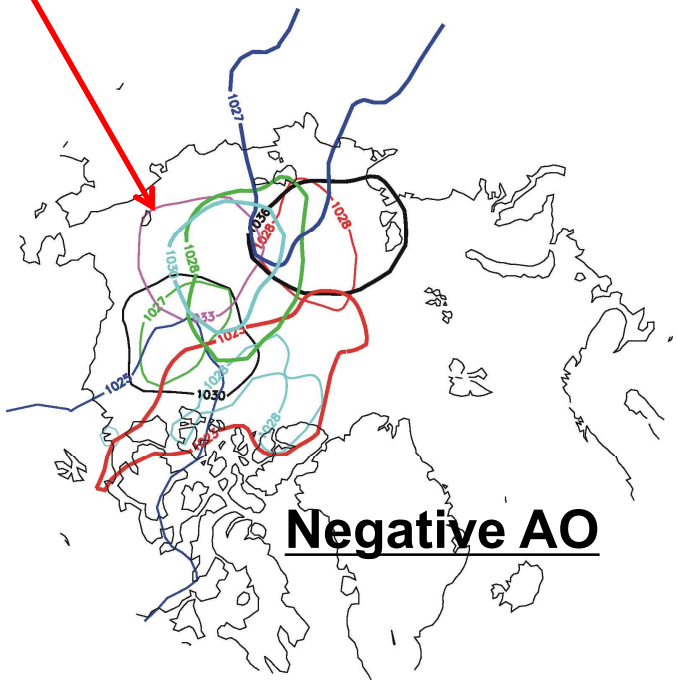
Highly Variable Beaufort High

Beaufort high in different years

Innermost closed SLP



Positive AO



Negative AO

Zhang et al. (2011)

Simulated salinity and 3D circulation corresponding to the relocation and intensity fluctuation of the Beaufort high

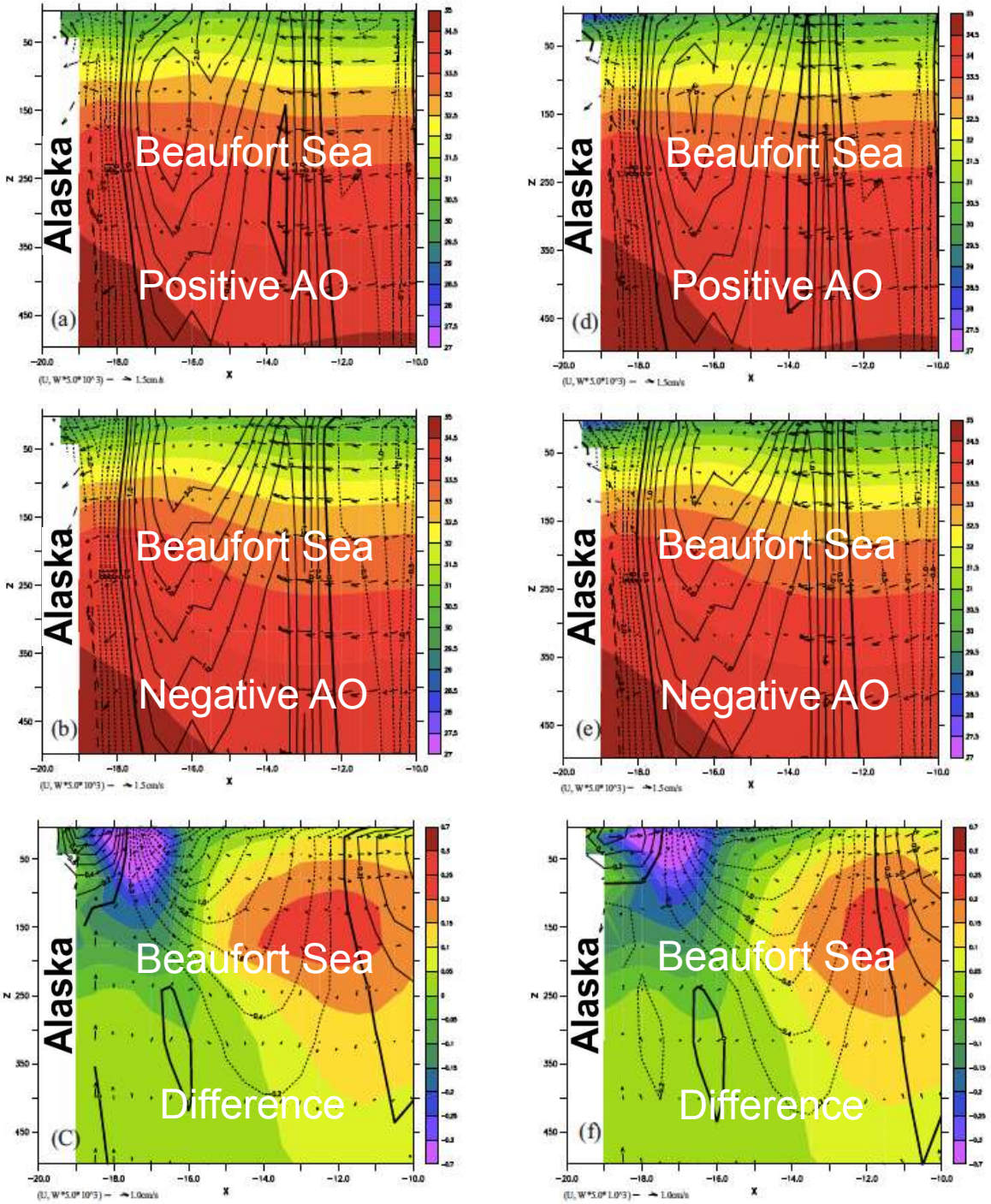
Contours: zonal ocean currents (solid line: westward; dashed line: eastward);

Vector: meridional and vertical circulation;

Color: salinity.

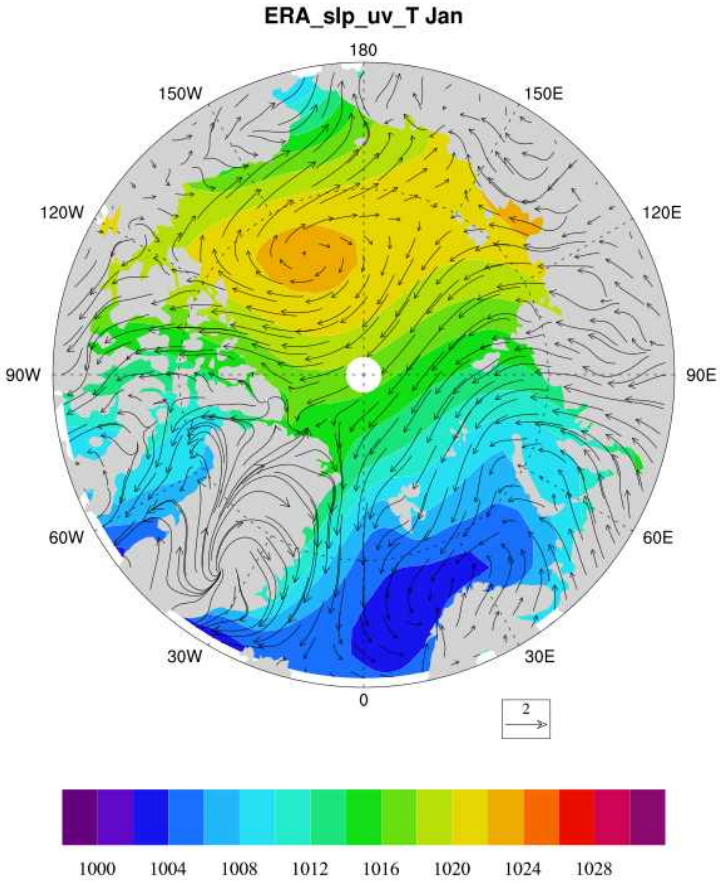
Left panels: winter;

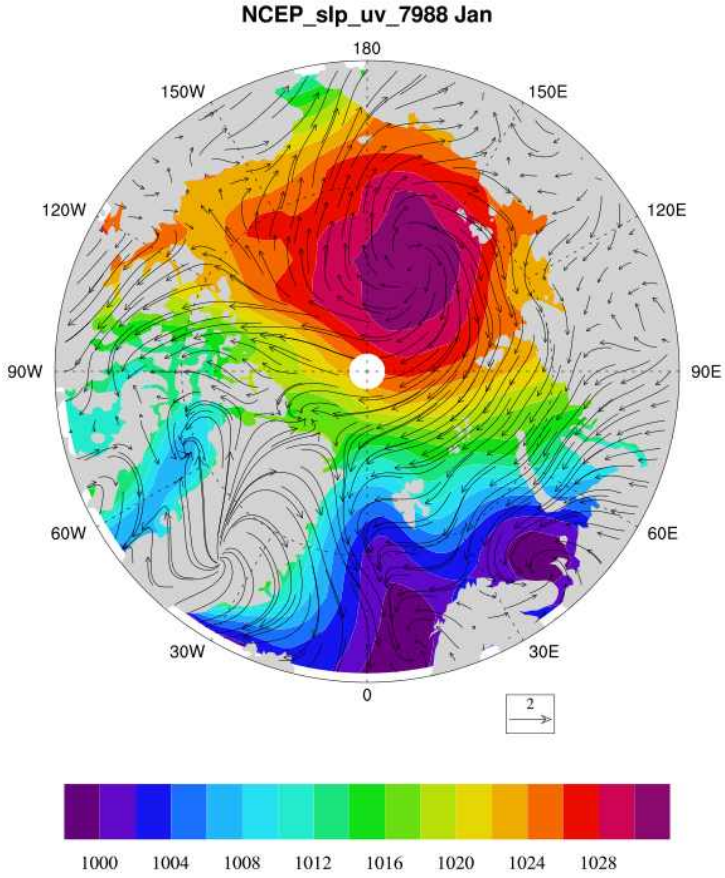
Right panels: summer



Zhang et al. 2012

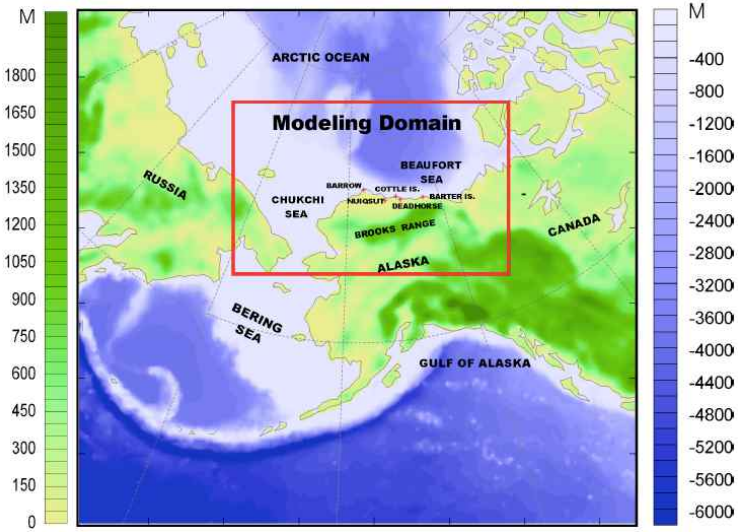
January Sea Level Pressure and Surface Winds
ERA-Interim vs. NCEP/NCAR Reanalysis

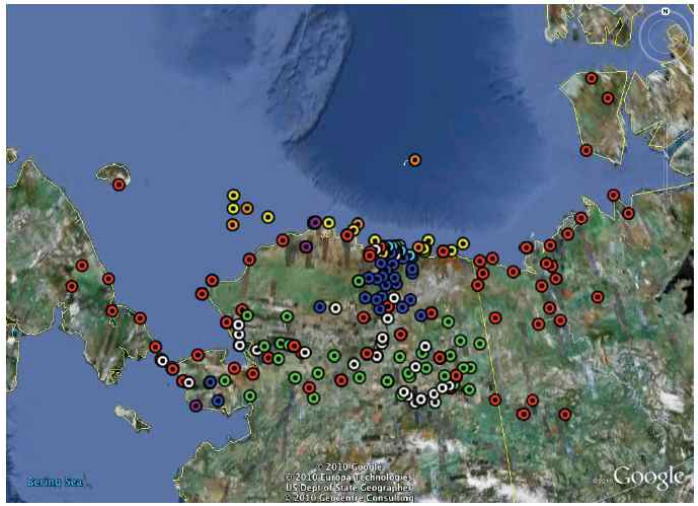


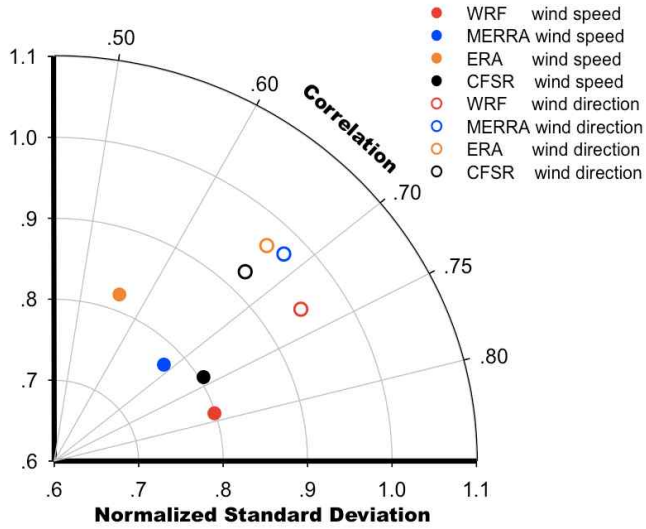


The Chukchi-Beaufort seas High-resolution Atmospheric Reanalysis (CBHAR) – Better Regional Representation

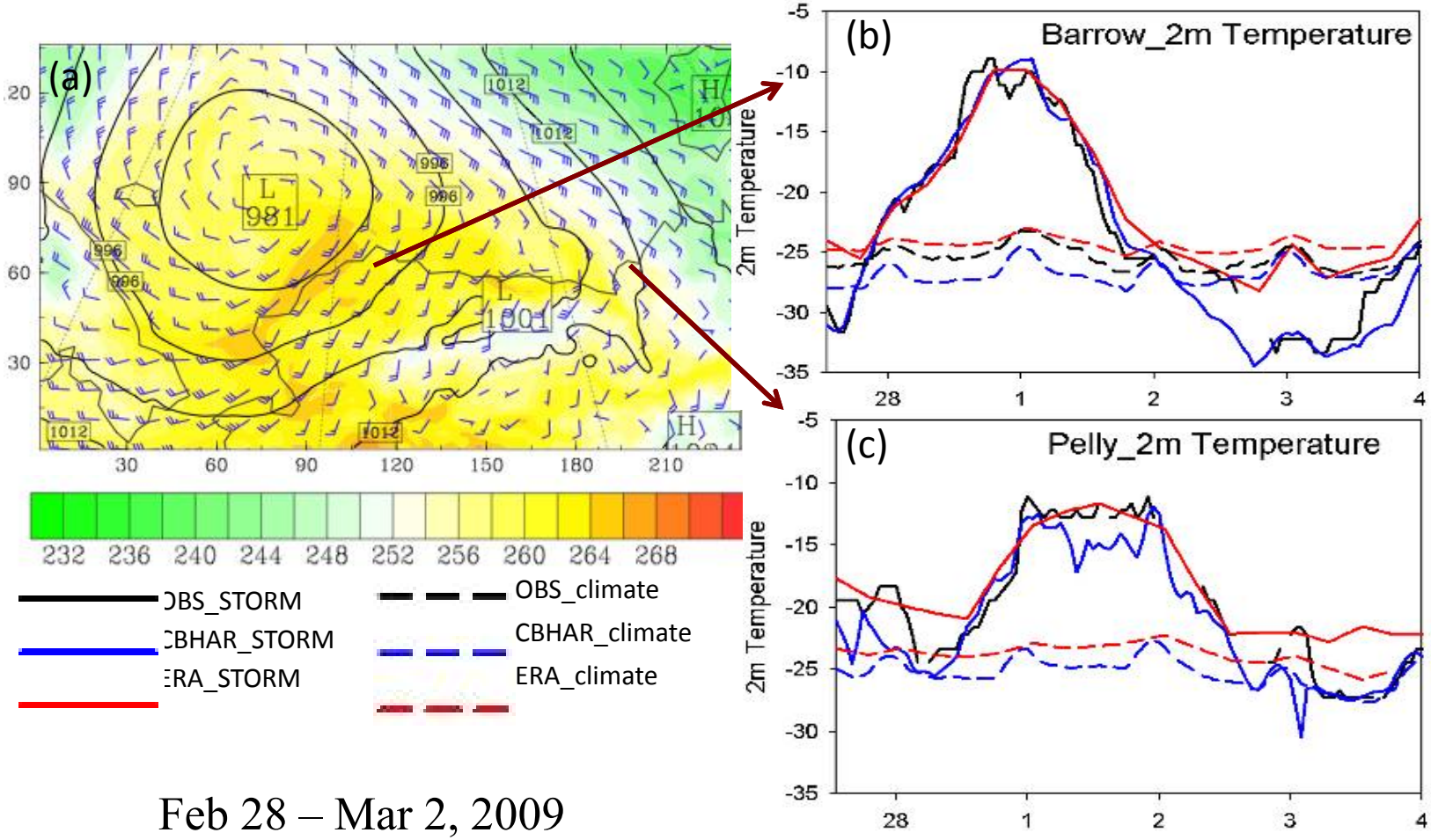
Model: WRF-ARW; Resolution: 10 km with 1 hourly interval;
Time span: 1979-2009, 31 years.





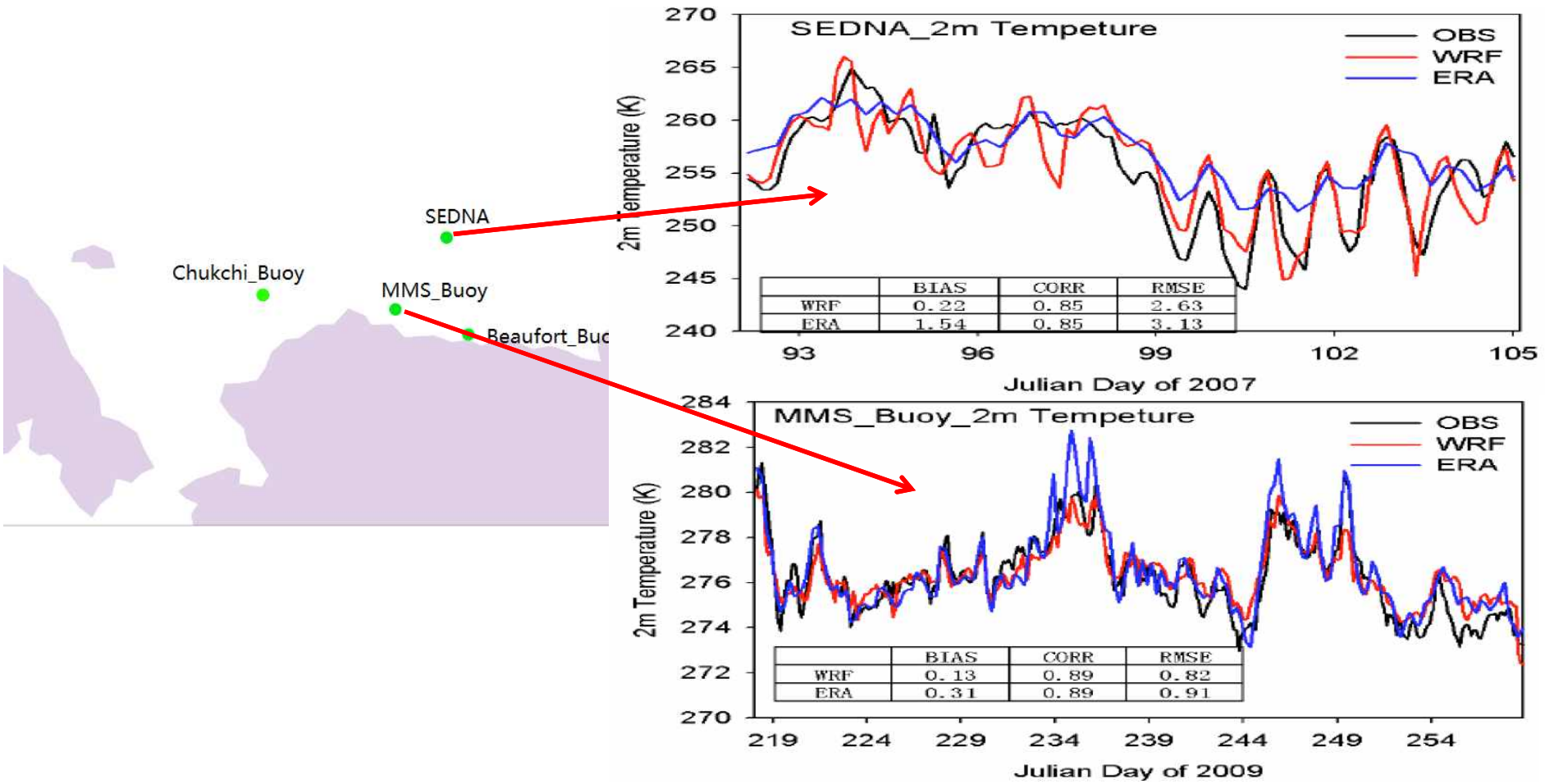


The CBHAR better captures the synoptic scale storm process

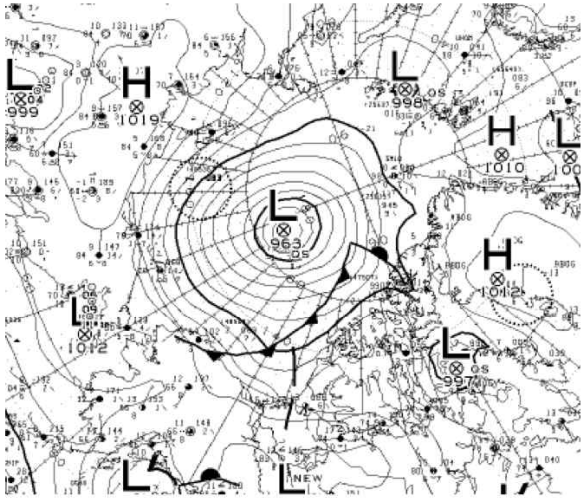


Feb 28 – Mar 2, 2009

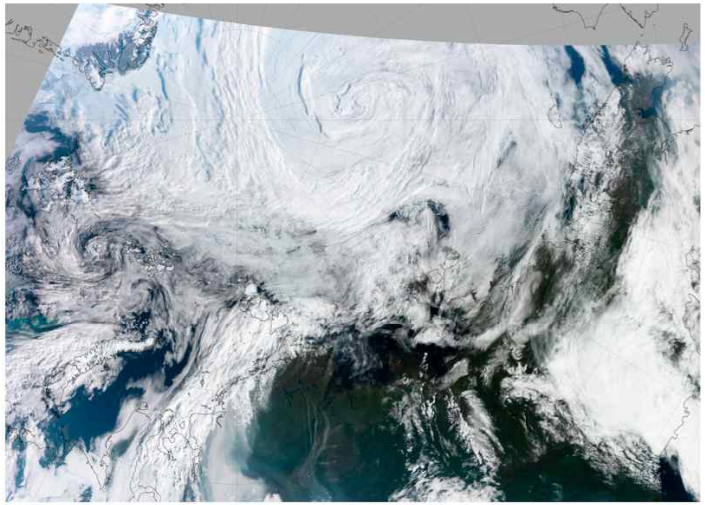
The CBHAR better captures the high frequency variability of temperature over sea ice and open water



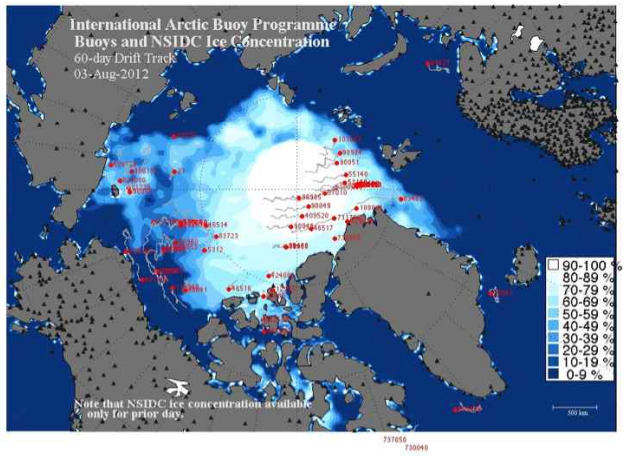
Impacts of Storm on Sea Ice



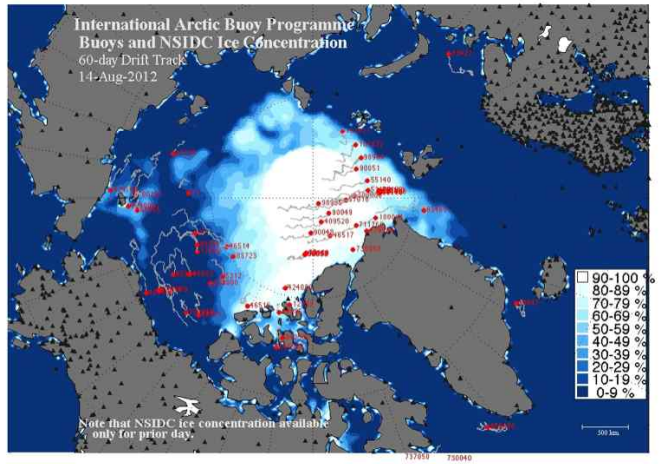
(a)



(b)

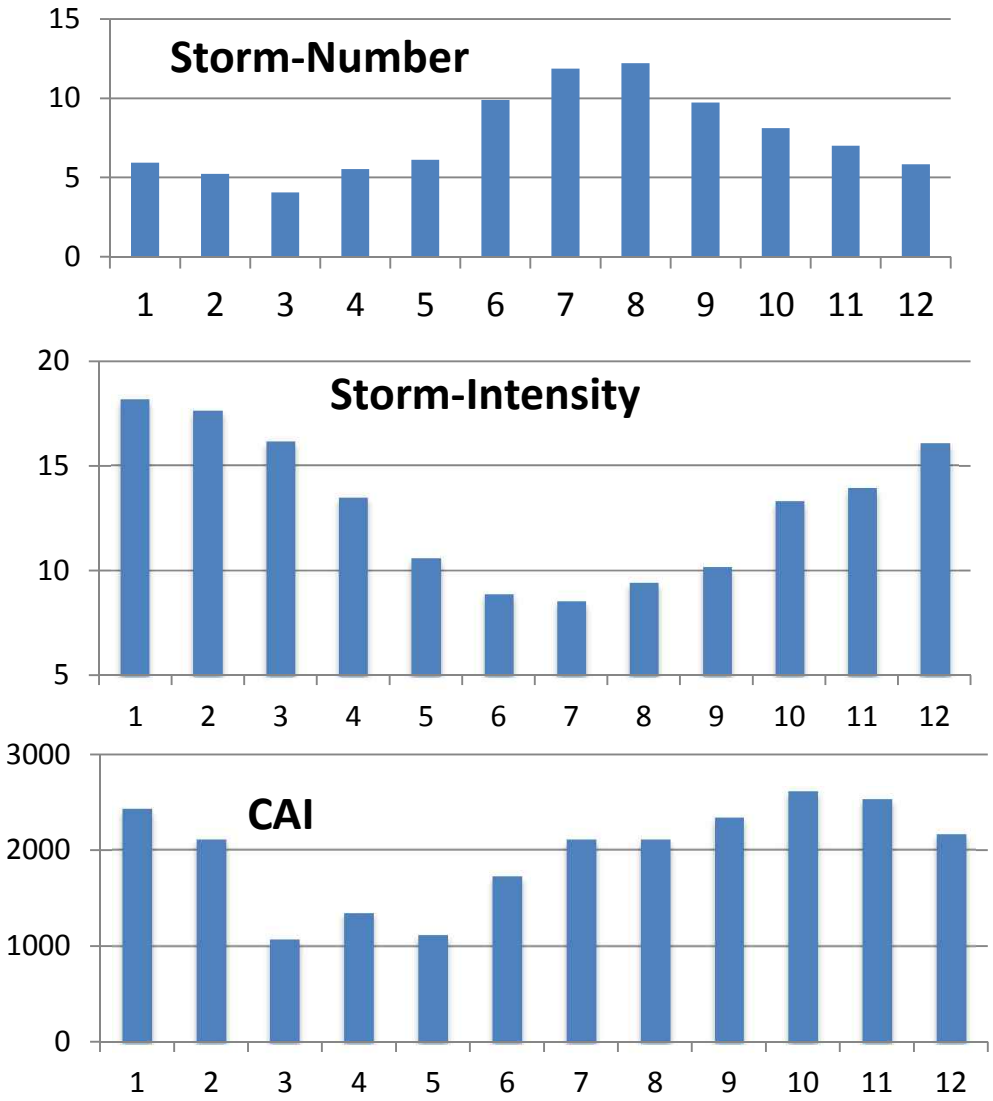


(c)

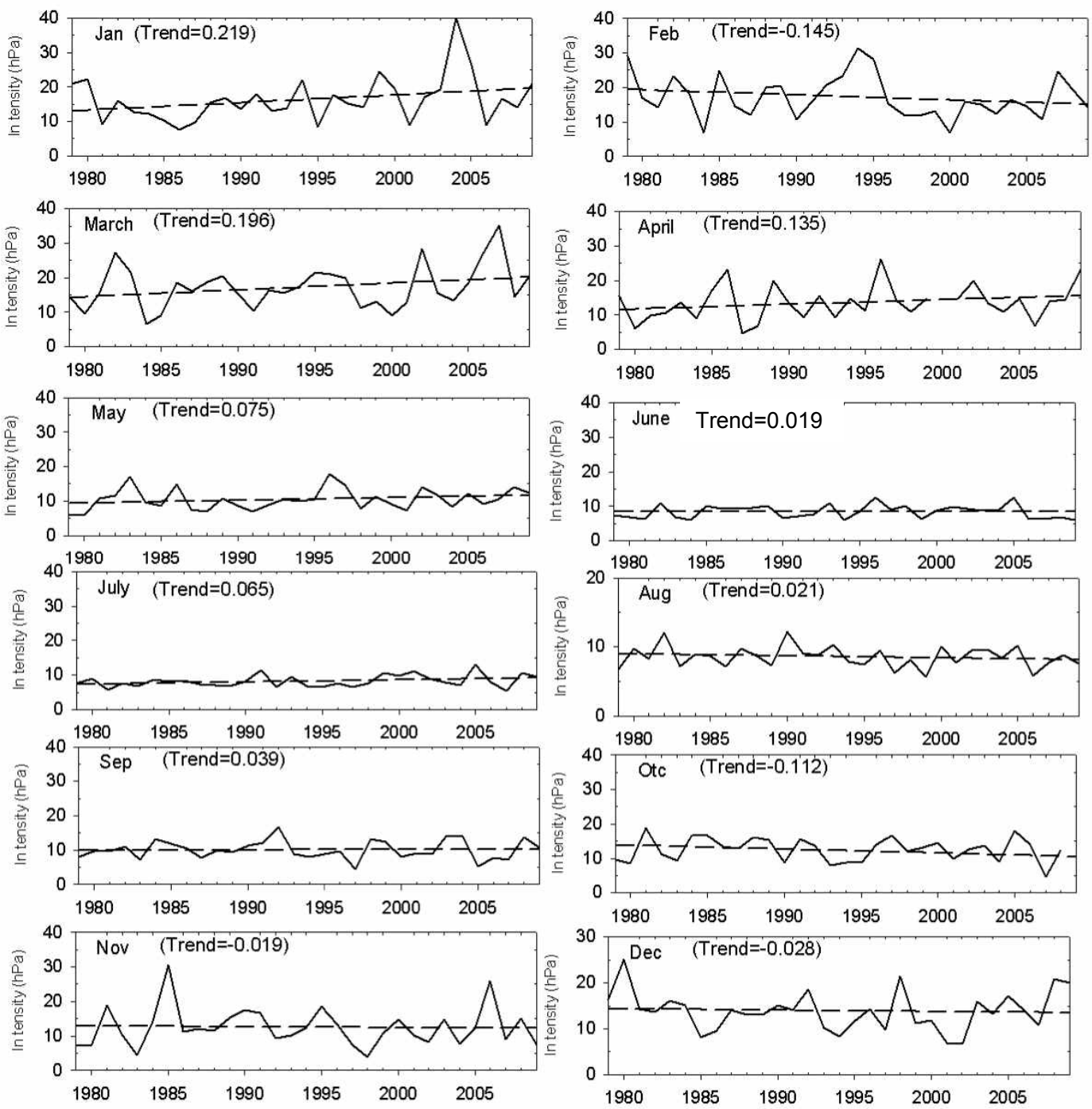


(d)

Storm Climatology (1979-2009) in CBHAR

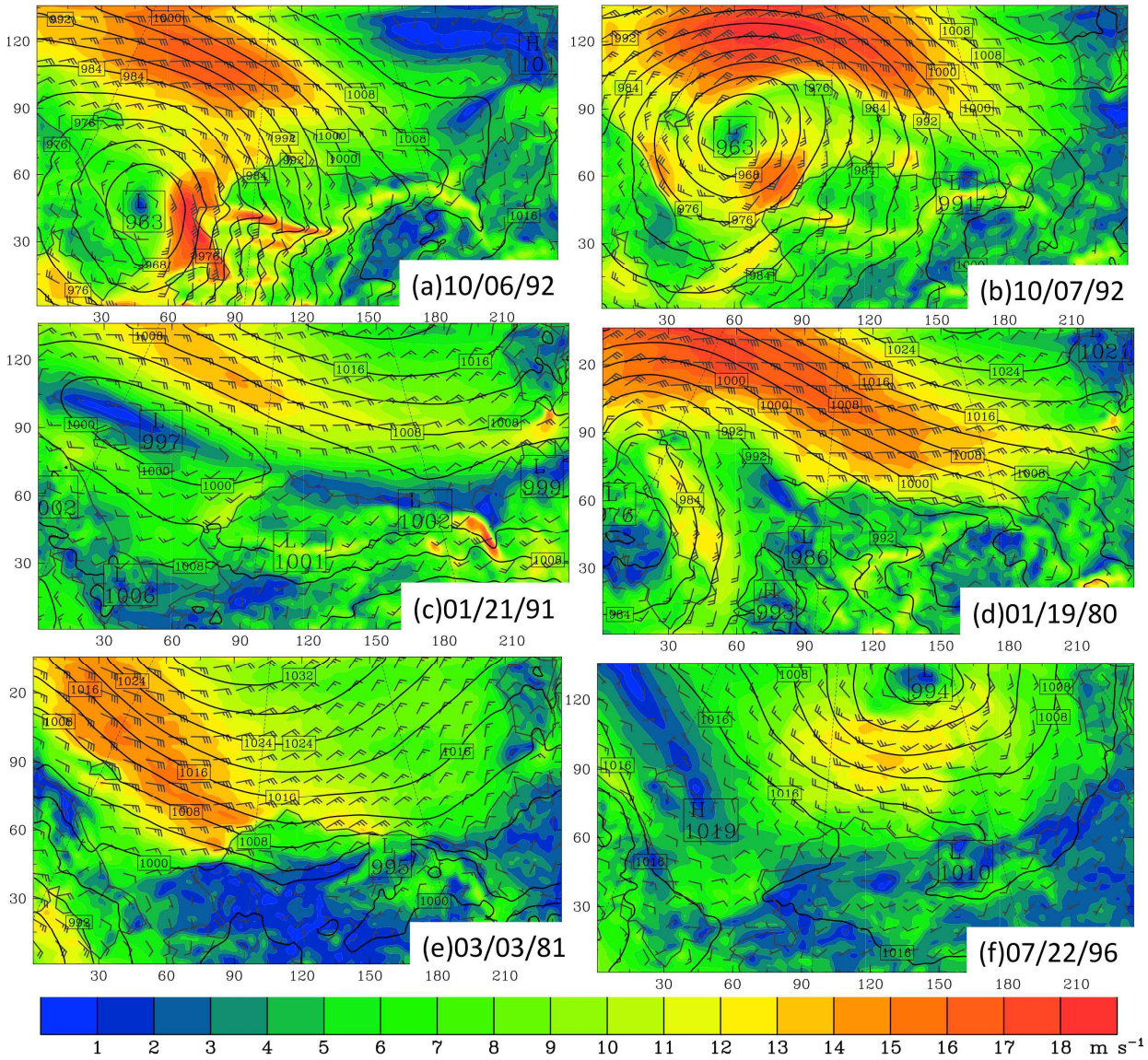


- More numerous storms in summer season, while a minimum count of storms in March.
- Stronger storms in winter and weaker storms in summer
- Weaker CAI in March & May



Variability and changes in storm intensity (1979-2009)

Surface wind associated with storm and the Beaufort high

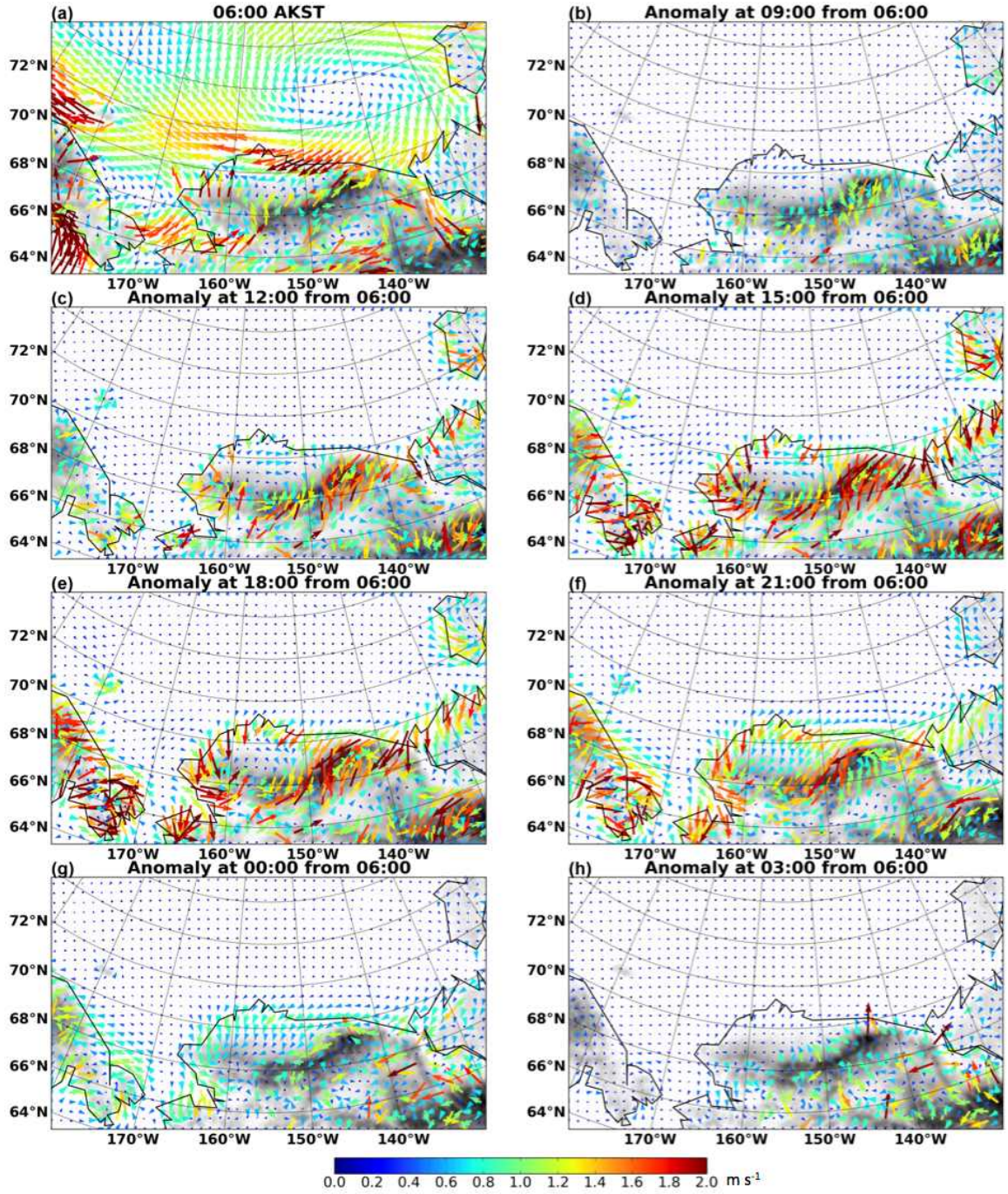


Intense storms

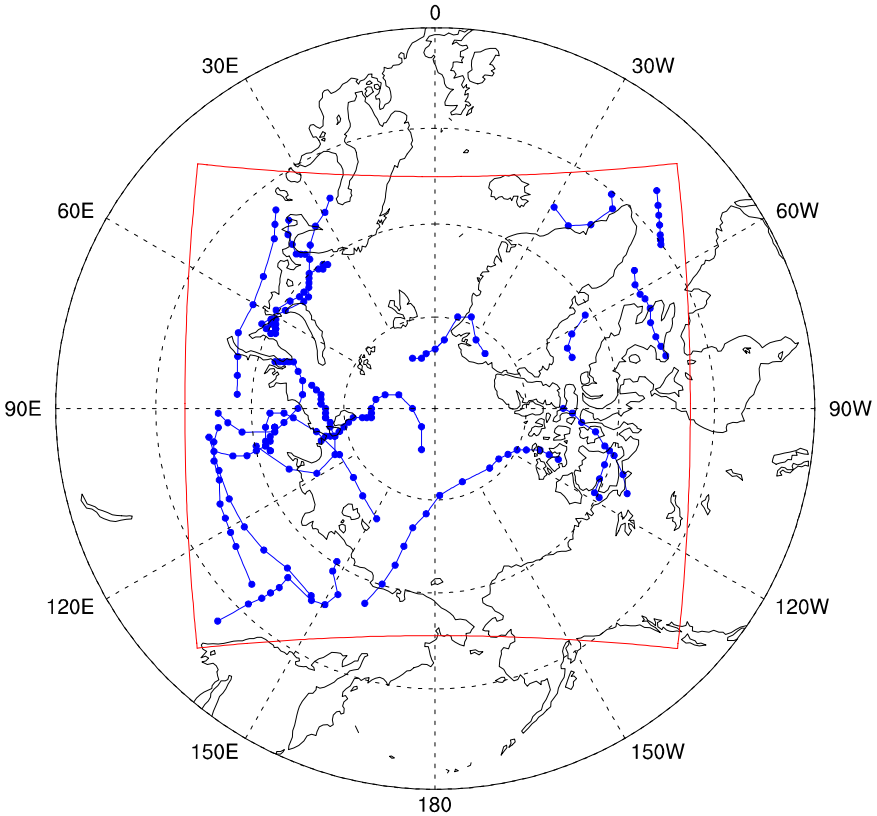
Storm coupled with Beaufort high

Strong Beaufort high

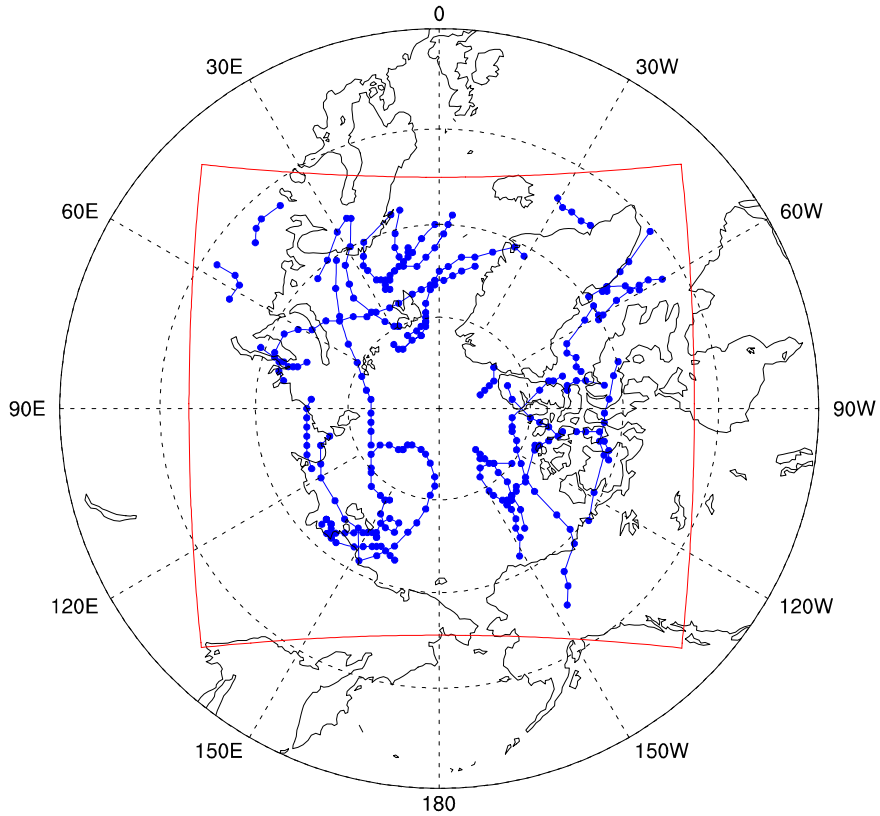
Climatology of high frequency mesoscale winds (1979-2009)



Storm Tracks in Fully Coupled Arctic Regional Model

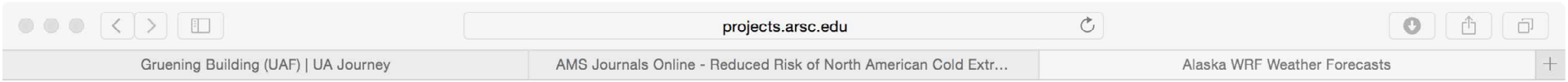


September 2010



September 2012

http://www.projects.arsc.edu/giarctic/ForcastGraphics.htm



Alaska WRF Weather Forecast Page

[Mid-Term](#)

[Short-Term](#)

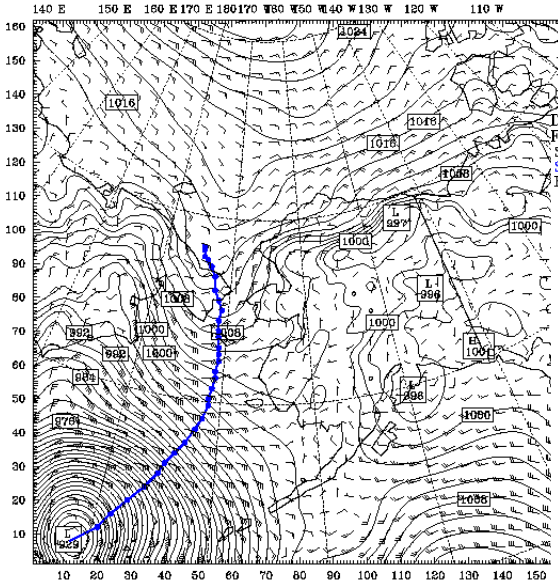
Welcome to the Alaska real-time forecast page! This product includes 16-day mid-term and 2-day short-term forecasts, performed with the WRF model. The mid-term runs once a day and the short-term two times per day if the computational resources are available. Comments and suggestions are welcome! (e-mail)

Mid-Term Forecasts (16 days)

Current Cycle: 03/12/2016 00 UTC

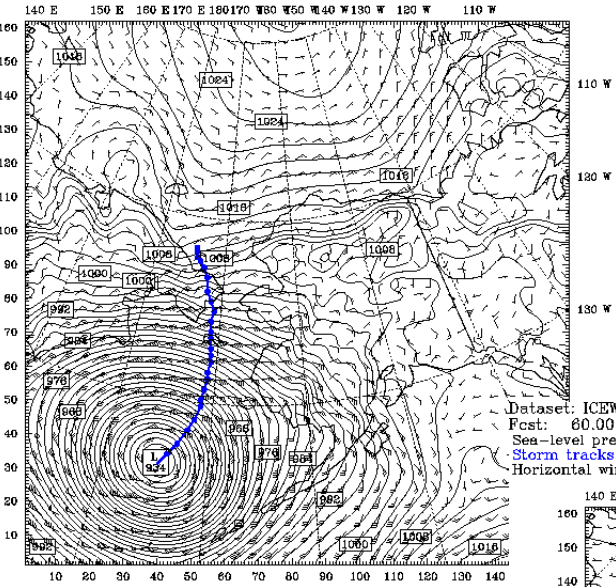
Fields	Alaska Region 20 km grid (16 day forecast, output every 6h)				
	Days 1–4	Days 5–8	Days 9–12	Days 13–16	16-day Loop
Surface Fields					
Sea Level Pressure / Surface Temperature / Winds	click loop	click loop	click loop	click loop	click loop
Accumulated Precipitation	click loop	click loop	click loop	click loop	click loop
Accumulated Precipitation (Convective)	click loop	click loop	click loop	click loop	click loop
Accumulated Precipitation (Large Scale)	click loop	click loop	click loop	click loop	click loop
Precipitation Category	click loop	click loop	click loop	click loop	click loop
Snow Water Equivalent (on ground)	click loop	click loop	click loop	click loop	click loop
Integrated Cloud Water	click loop	click loop	click loop	click loop	click loop

Dataset: ICEWRF RIP: STORM TRACK Init: 0000 UTC Sun 13 Dec 15
Fcst: 0.00 h Valid: 0000 UTC Sun 13 Dec 15 (1500 LST Sat 12 Dec 15)
Sea-level pressure sm= 5
Storm tracks from hour 0.000 to 384.000
Horizontal wind vectors at k-index = 41



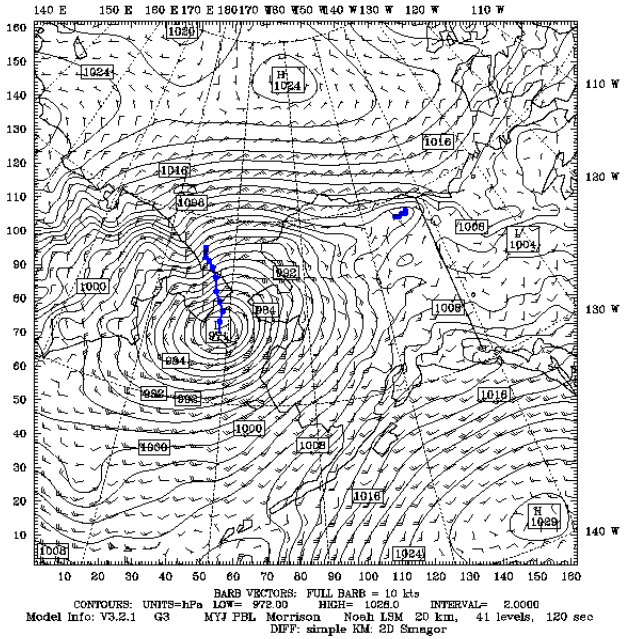
BARB VECTORS: FULL BARB = 10 kts
CONTOURS: UNITS=hPa LOW= 930.00 HIGH= 1028.0 INTERVAL= 2.0000
Model Info: V3.2.1 G3 MYJ PBL Morrison Noah LSM 20 km, 41 levels, 1
DIFF: simple KM: 2D Smagor

Dataset: ICEWRF RIP: STORM TRACK Init: 0000 UTC Sun 13 Dec 15
Fcst: 18.00 h Valid: 1800 UTC Sun 13 Dec 15 (0900 LST Sun 13 Dec 15)
Sea-level pressure sm= 5
Storm tracks from hour 18.000 to 384.000
Horizontal wind vectors at k-index = 41



BARB VECTORS: FULL BARB = 10 kts
CONTOURS: UNITS=hPa LOW= 936.00 HIGH= 1028.0 INTERVAL= 2.0
Model Info: V3.2.1 G3 MYJ PBL Morrison Noah LSM 20 km, 41 leve
DIFF: simple KM: 2D Smagor

Dataset: ICEWRF RIP: STORM TRACK Init: 0000 UTC Sun 13 Dec 15
Fcst: 60.00 h Valid: 1200 UTC Tue 15 Dec 15 (0300 LST Tue 15 Dec 15)
Sea-level pressure sm= 5
Storm tracks from hour 60.000 to 384.000
Horizontal wind vectors at k-index = 41



BARB VECTORS: FULL BARB = 10 kts
CONTOURS: UNITS=hPa LOW= 972.00 HIGH= 1028.0 INTERVAL= 2.0000
Model Info: V3.2.1 G3 MYJ PBL Morrison Noah LSM 20 km, 41 levels, 120 sec
DIFF: simple KM: 2D Smagor