

PREDICTION CHALLENGES IN A DYNAMIC ARCTIC

6th Symposium of the Impacts of an Ice-Diminishing Arctic on Naval and Maritime Operations

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NOAA'S ARCTIC ASSETS

INTERNATIONAL ARCTIC SYSTEM FOR OBSERVING THE ATMOSPHERE



NOAA Fairbanks Command and Data Acquisition Station

2 Home Ports for NOAA Ships

National Weather Service Alaska Region

- Headquarters
- 3 Weather Forecast Offices
- 12 Weather Service Offices
- Alaska Aviation Weather Unit
- Anchorage Center Weather Service Unit
- Alaska-Pacific River Forecast Center

NOAA Alaska Fisheries Science Center
NOAA Fisheries Alaska Regional Office
NOAA Fisheries Enforcement Offices

NOAA Kasitsna Bay Laboratory
CIFAR, a NOAA-supported Cooperative Institute
Alaska Sea Grant

TIME SCALES OF PREDICTIONS

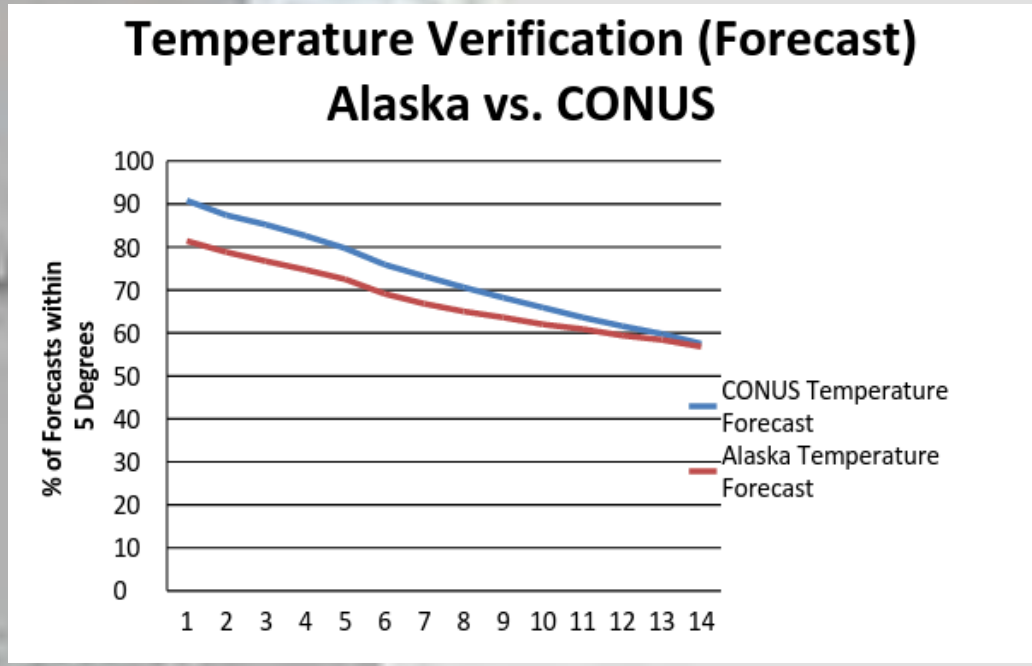


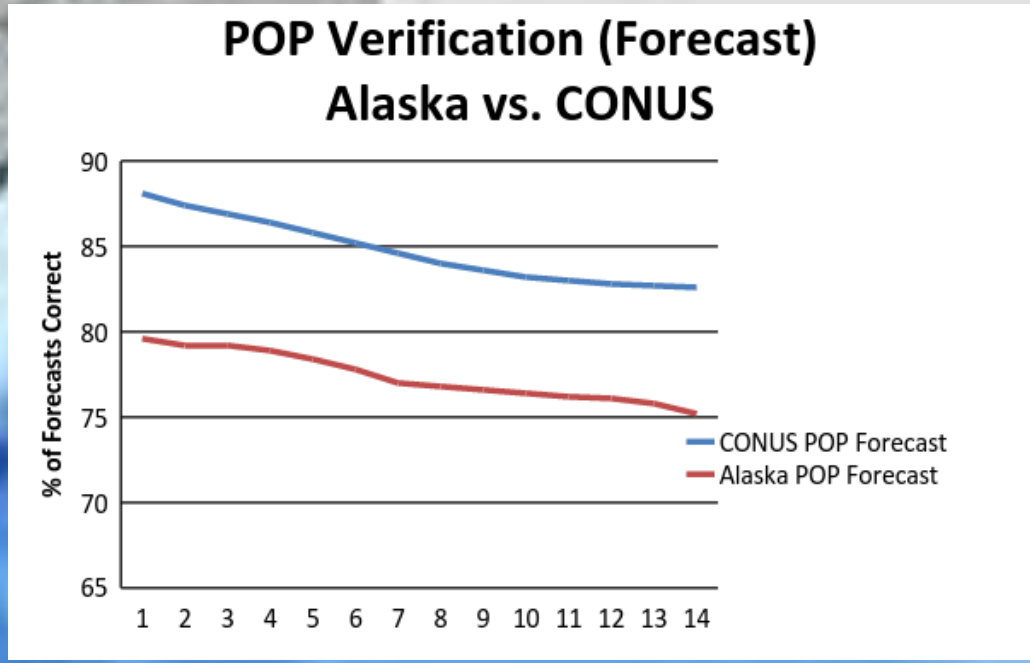
DAYS, WEEKS, SEASONAL

YEARS

DECADES

FORECAST SKILL COMPARISON (2012)





TIME SCALES OF PREDICTIONS



DAYS, WEEKS, SEASONAL

YEARS

DECADES



Photo credit: USCG

ARE WE READY?



Photo credit: NOAA



COMMUNITY LIFELINES

Photo credit: USCG

PREDICTIVE UNCERTAINTY

Ice Extent October 30st



Ice Extent November 1st



Derived from NIC Sea Ice Analysis

TIME SCALES OF PREDICTIONS



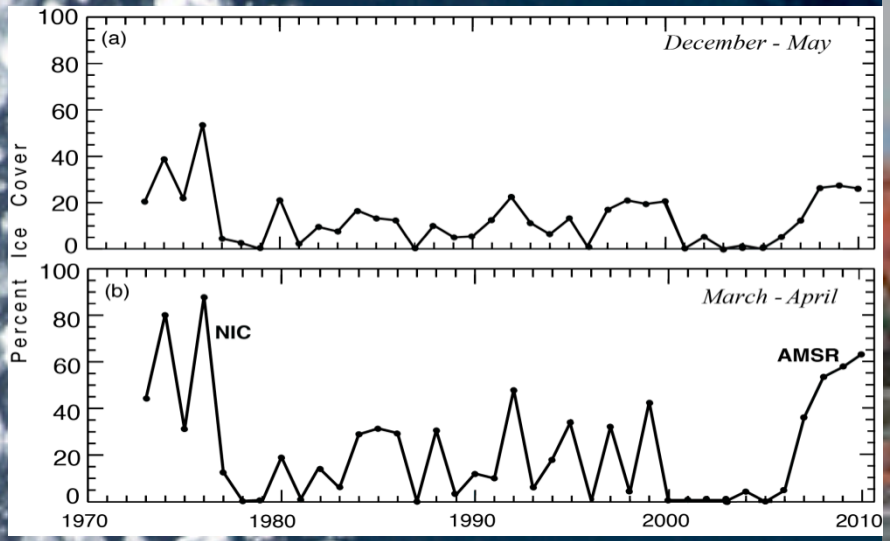
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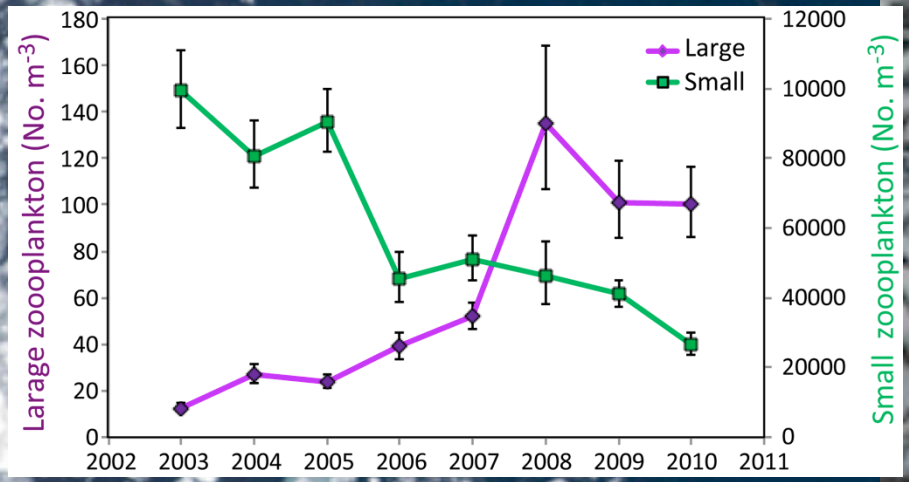
YEARS

DECADES


ARE WE READY?

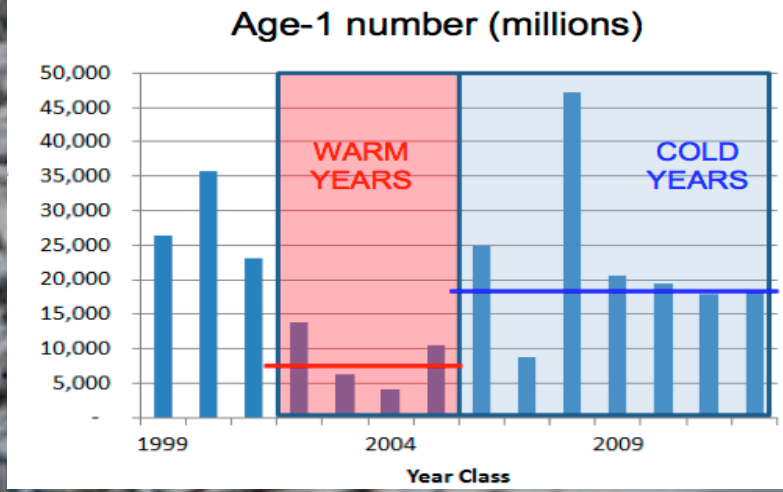
SEA ICE STRUCTURES THE BERING SEA ECOSYSTEM





Zooplankton abundance in warm and cold years

Survival of age-1 pollock in the Bering Sea



Stabeno et al., 2010; 2012

OCEAN ACIDIFICATION

Chemical oceanography models show good predictive capability

	Saturation Threshold Ω < 1	Annual Threshold Ω < Ann Min	Persistent Threshold Ω < Mo Min
Bering Sea	2062	2044	2085
Chukchi Sea	2033	2027	2059
Beaufort Sea	2001	2025	2054
Pacific-Arctic Region	2030	2052	2079

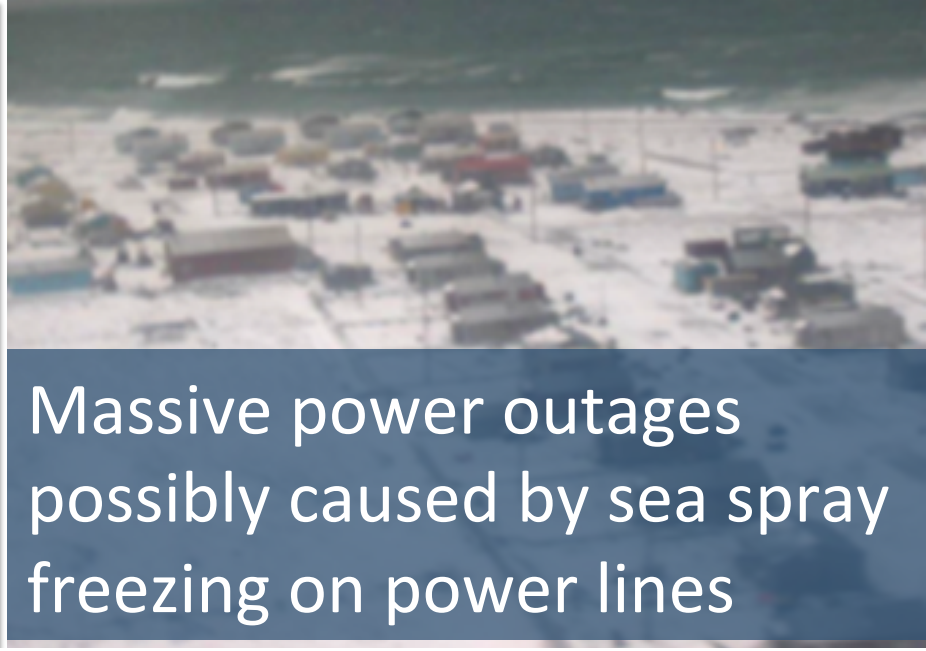
Mathis, Cross, Evans, & Doney (2015)





But what about key species responses?





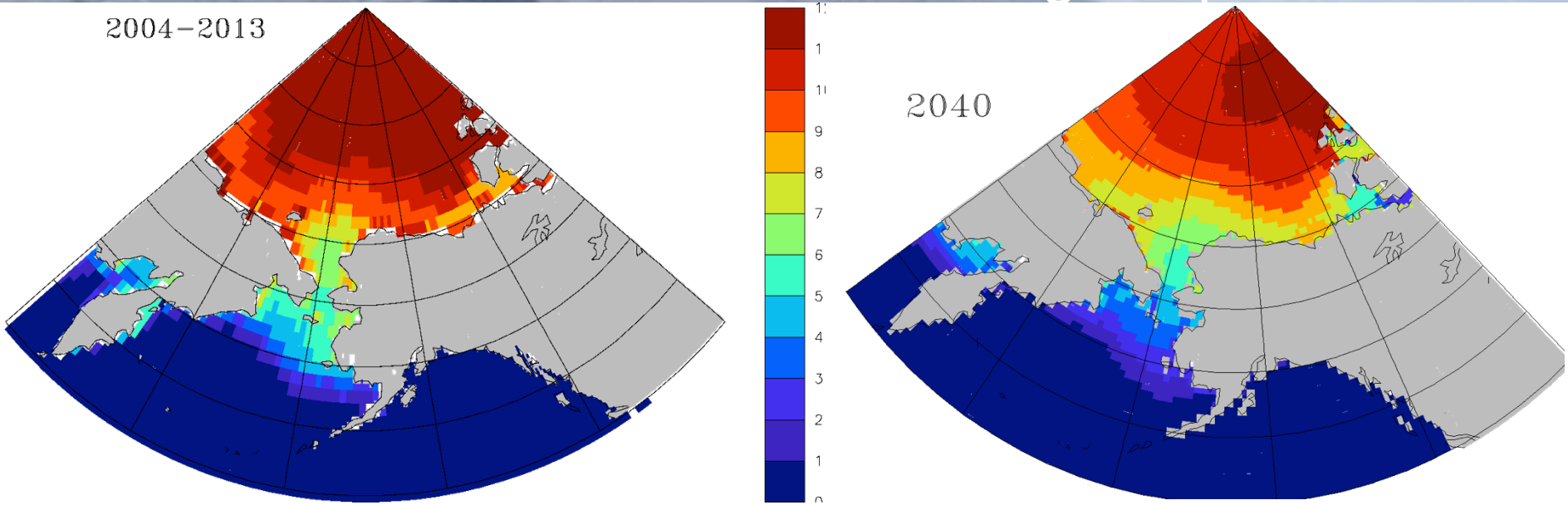
INFRASTRUCTURE





OPEN WATER IN ALASKA ARCTIC

Still have a winter wall of freezing temperatures



Observations (72 N)

3 months open water now

Ensemble mean of 12 CMIP5 models

5 months open water by 2040

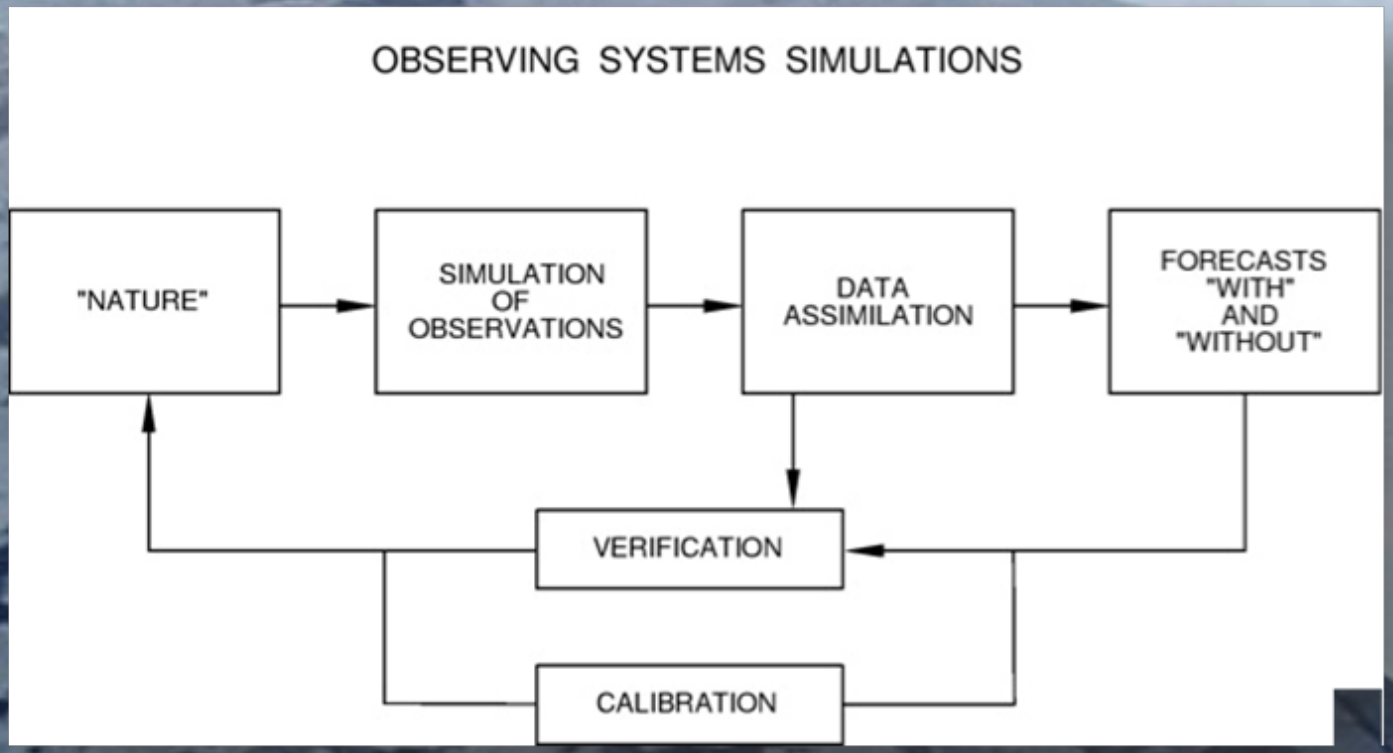
Wang and Overland, 2015

WHAT'S NEEDED

- Clarity of mission requirements & their priority
- OSSEs and OSEs
- Focused observations and modeling investments
- Coordinated delivery of products

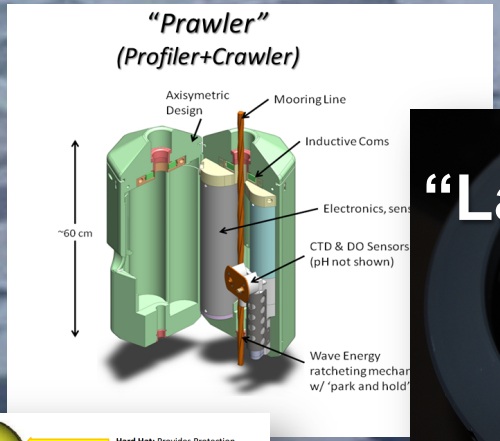
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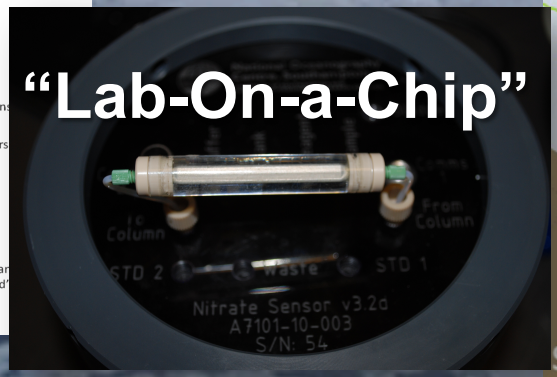
OSSEs and OSEs



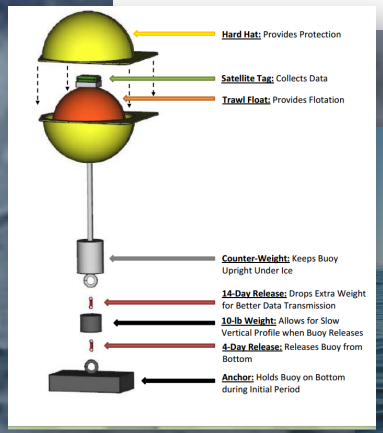
WHAT'S NEEDED

FOCUSED OBSERVATIONS









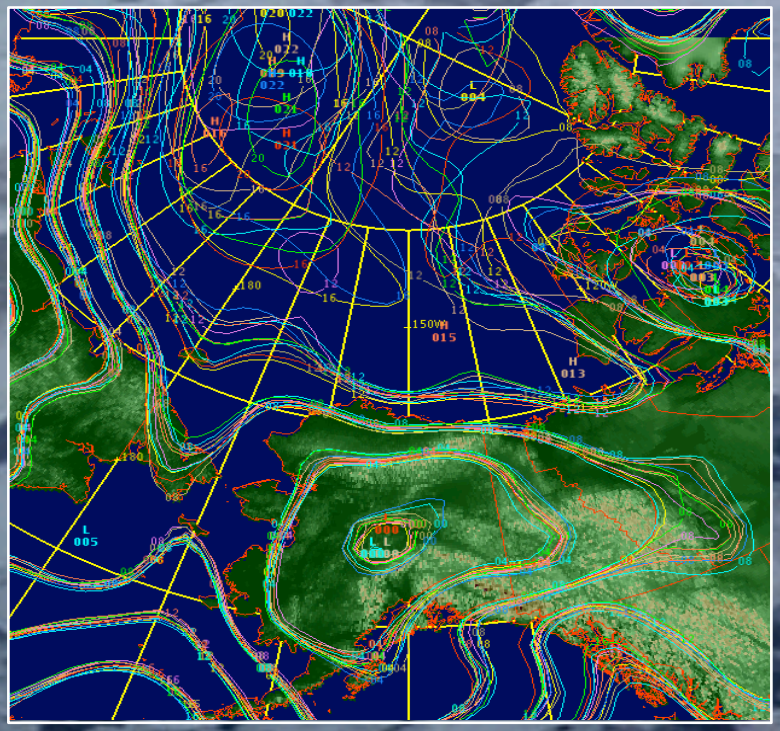
Under-ice pop-up float



DISTRIBUTED BIOLOGICAL OBSERVATORY

WHAT'S NEEDED

MODELING INVESTMENTS



Comparison of multiple weather model sea level pressure initializations over the Arctic

- Develop and issue experimental seasonal Arctic sea ice melt-out/ freeze-up outlook
- Implement RTOFS global upgrade to incorporate CICE ice model
- Demonstrate coupled numerical weather prediction for Arctic sea ice forecasting by implementing an experimental coupled atmosphere-ocean-wave-sea ice mode
- Demonstrate coupled polar model

WHAT'S NEEDED

COORDINATED DEVELOPMENT OF PRODUCTS



Hazardous Weather Testbed,
Norman, OK

NOAA Arctic Testbed

www.testbeds.noaa.gov


THANK
YOU
www.noaa.gov
NOAA