

Meteorology and PAME – let's start a discussion !

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World Meteorological Organization
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National & International Meteorological Work and PAME – WHY ?

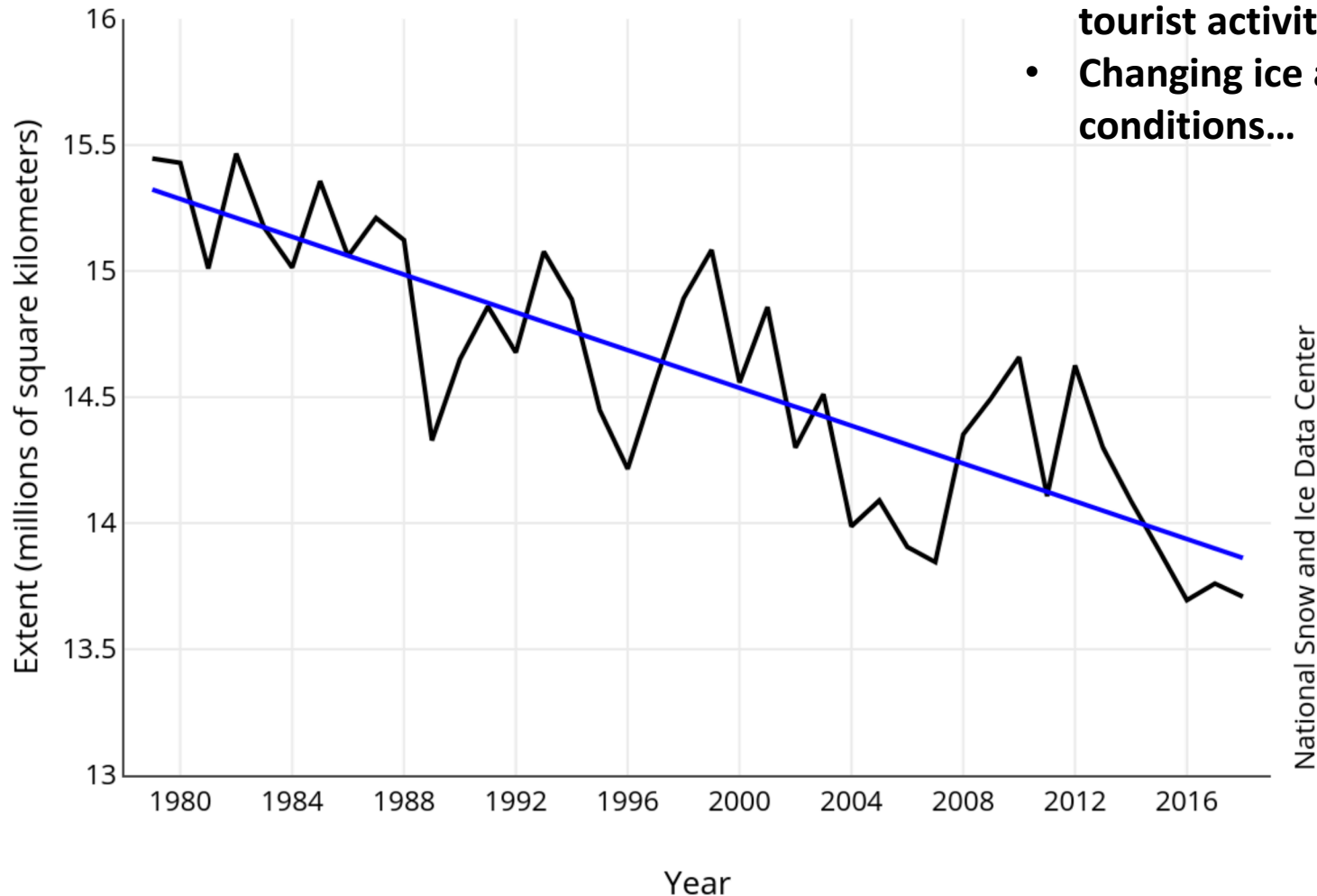
- Finland (Chair, Arctic Council) - 'meteorological cooperation in the Arctic' is one of four priorities
- Advancing meteorological cooperation in the Arctic Council Action Plan, and amongst the Working Group Work Plans
- Meteorological information is important for decision making in everyday life, globally.....
- Arctic Region – especially vulnerable to impacts from climate change - faster than elsewhere - meteorological information crucial to inform decision-making for adaptation



Average Monthly Arctic Sea-Ice extent

April 1979 - 2018

- Increased economic and tourist activity
- Changing ice and ocean conditions...



National Snow and Ice Data Center

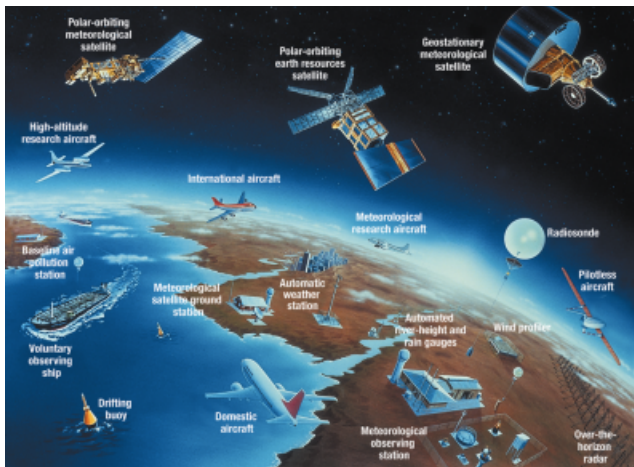
Importance of Meteorological data in the Arctic

- examples

- Changing conditions (eg melting ice) has led to opening up new shipping routes for both transport of goods and for tourism, increased risk of floating ice hazards, and environmental pollution (eg oil spills) in fragile marine areas
- Improved meteorological services are needed to ensure appropriate voyage planning and early, accurate and reliable forecasts and state of sea-ice for safe navigation (eg Polar Code 2017)
- Changing conditions also impacting marine and coastal biota (eg fish migration)
- Mid-latitude population (what happens in the Arctic matters world-wide)
- However.... Relatively poor observational coverage against the need to improve predictions (climate, weather, ice etc...)
- Challenges of weather, communications and positioning (eg poor satellite coverage) means that polar regions may become one of the highest risk areas in the world for safety of life and property at sea



World Meteorological Organization



- UN Specialized Agency: weather, climate, water
- 191 Members, HQ in Geneva
- 2nd oldest UN Agency, 1873-
- Coordinates work of ~200 000 national experts from meteorological & hydrological services and academia
- Co-Founder and host agency of IPCC (1st World Climate Conference, 1979)
- Co-Founder of UNFCCC (2nd World Climate Conference, 1990)
- Observer of Arctic Council - Fairbanks Ministerial meeting, 2017
- Active role in DRR Sendai Framework, Paris Agreement, SDGs
- Publishes Annual State of Global Climate

WMO's contribution to Arctic Resilience

- Observing
 - Improving observations in a value chain context
- Predicting and Adapting
 - Improving environmental prediction services for society
 - The Year of Polar Prediction
 - Arctic Climate Information
- Services
 - WMO/IMO Worldwide Metocean Information Warning Service (WWMIWS)
 - Polar Code (2017)
 - Environmental Emergency Response

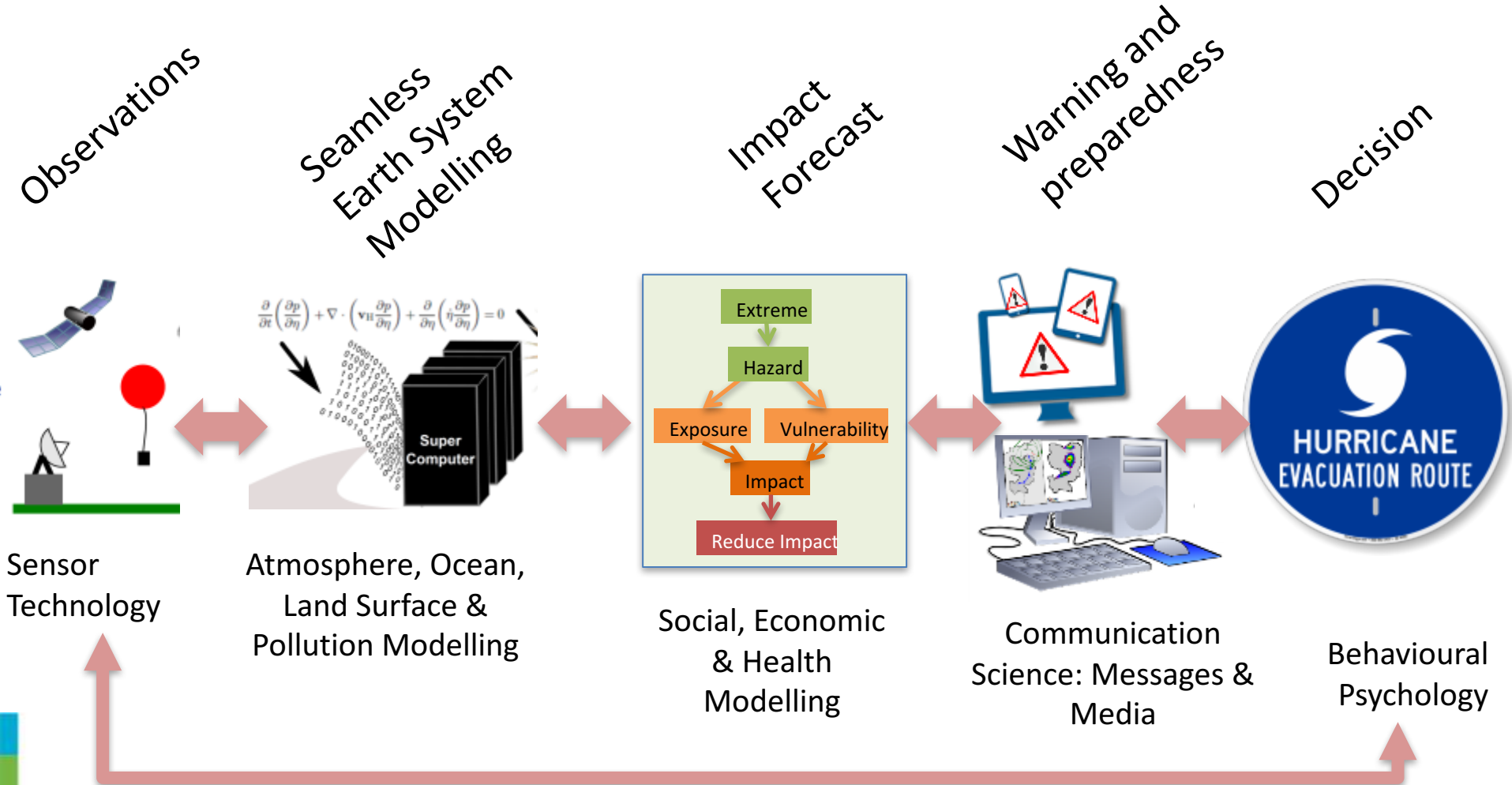


Observing



Valuing observations as part of a broader context where societal needs provide inputs to warning and prediction systems

...following a value chain approach...



The Global Cryosphere Watch - creating long-term monitoring and service capabilities

Predicting and Adapting

Promote cooperative international research enabling development of improved weather and environmental prediction services for the polar regions, on time scales from hours to seasons



A research and operational approach

- Global initiatives for societal needs
 - Regional Climate downscaling (CORDEX – World Climate Research Program), improved prediction of localised extreme events
 - The World Weather Research Programme launched the Polar Prediction and its Year Of Polar Prediction (YOPP)
 - YOPP is a research to operation laboratory – Arctic focus
 - Improving observations and science in Polar Regions through Special Observing Periods (SOP): 1 Feb-31Mar 2018 SOP1, and Jul-Sept 2018 SOP2.

Year of Polar Prediction



- 1,990 extra radiosondes from 17 Arctic stations including field work (7 nations involved) in SOP 1
- Major addition of buoys for SOP2 (Russian Met Service)
- YOPP endorsed campaigns
 - **Iceland-Greenland Seas Project** (N Atlantic) –100 sondes from vessel
 - **OASIS-YOPP** (Thule Base, Greenland) –Helium shortage but 3 sondes
 - **ICECAPS** (Summit Camp, Greenland) – 2 daily sondes, no extra
 - **MACSSIMIZE** (Alaska, Canada) –aircraft campaign over Canada, snow emissivity



Arctic Weather & Climate Information

Time Scale	Days	Weeks	Months (sub-seasonal)	Seasons (3 months)	Years	Decades	Centuries
Weather or Climate Information	Weather forecasting		New climate products with scientific advances			Climate Change Models	
Geographic Scale	Local		Regional			Global	

1. Seasonal Outlooks for the upcoming season: forecasts from models on

- temperature,

1. ▪ precipitation and
2. ▪ sea-ice forecasts

2. Seasonal Summaries of the past season: describes actual temperature, precipitation and sea-ice details based on monitoring observations

Adaptation to climate change in the Arctic

- Tailored Information for Adaptation
 - Arctic Regional Climate Center
- Co-design and engagement -PARCOF
 - Pan-Arctic Regional Climate Outlook Forum

May 2018 Ottawa → May Finland 2019

To meet with Arctic users of climate information

- **Share advances in climate information**
- **Show and explain the new ArcRCC products and how they can be used**
- **Better understand users planning and adaptation needs**
- **Adapt new and future products to meet your needs**

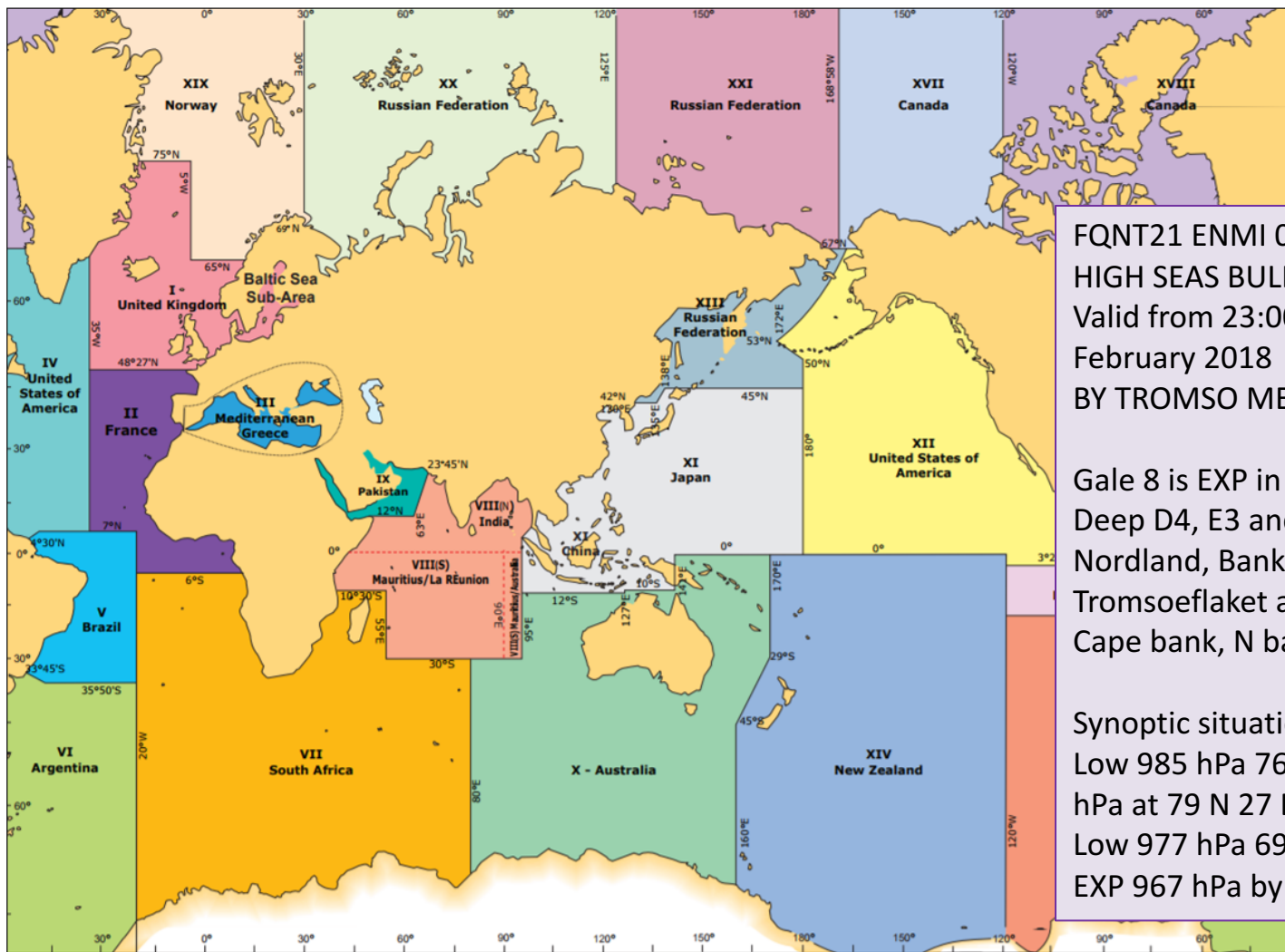
SOLAS and WMO's role

- *UN International Convention for Safety of Life At Sea (SOLAS): WMO's obligation is to support the provision of *Maritime Safety Information (MSI)* via the *Global Maritime Distress Safety System (GMDSS)*, and more specifically delivered by the *IMO/WMO WorldWide Met-Ocean Information & Warning Service (WWMIWS)*.*
- To effectively manage this provision of MSI, the world's oceans are divided into regions - METAREAS – to which specific warnings are delivered
- A METAREA Coordinator is responsible to coordinate the provision of the WWMIWS for their METAREA. The National Meteorological and Hydrological Services (NMHS) in each METAREA are the responsible issuing service, for forecasts and warnings to reach vessels in their METAREA
- 7 METAREAS (out of 21) cover the Arctic waters, with Coordinators from Canada, Norway, Russian Federation, UK and USA.
- The success of Search and Rescue (SAR) operations also rely heavily on reliable and accurate meteorological information. In the Arctic, where hypothermia sets in quickly, timely weather information is critical.



Global Maritime Distress and Safety System

Limits of metareas - 2017



FQNT21 ENMI 072300
HIGH SEAS BULLETIN FOR METAREA 19
Valid from 23:00 UTC on Wednesday 7
February 2018
BY TROMSO METEO, NORWAY

Gale 8 is EXP in areas: B1, B2, C2, D2, D3,
Deep D4, E3 and Deep E4, Banks outside
Nordland, Banks outside Troms,
Tromsoeflaket and Hjelmsøey bank, N
Cape bank, N bank and Kildinbank

Synoptic situation at 18 utc
Low 985 hPa 76 N 13 E Mov Ne, EXP 990
hPa at 79 N 27 E by THU 18 utc.
Low 977 hPa 69 N 17 W almost STNR,
EXP 967 hPa by THU 18 utc.



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WMO METAREAS align with IMO/IHO NAVAREAS

MARPOL and WMO's role

- *UN Convention for Prevention of Pollution from Ships (MARPOL)*: minimizing pollution from ships into the marine environment.
- WMO supports the provision of *Maritime Safety Information (MSI)*, thereby reducing risk of pollution (from ship accidents).
- WMO is developing environmental emergency response standards to minimize response time to pollution (eg modelling direction of ocean currents to determine oil dispersion).
- Potential proposal to the Arctic Council's Emergency Prevention Preparedness and Response (EPPR) Working Group



National & International Meteorological Work and PAME – WHY ?

- So far:
 - Arctic Science Networking Workshop (2017)
 - Arctic Meteorology Summit (March 2018)
 - AC Senior Arctic Officials Meeting (March 2018)
 - AMAP Working Group – Work Plan discussions (Sept 2018)
 - Upcoming ‘Arctic Weather and Climate Workshop’- (November, Copenhagen) – potential to expand Climate Outlook expert group to include weather and climate
 - Upcoming Side Event ‘Connecting Indigenous Knowledge’ at AC Ministerial Meeting, Finland, May 2019)
- PAME WG (Vladivostok) starting the discussion today....

Discussion Topics for PAME – suggestions from Finland

- Is meteorological collaboration relevant to PAME ?
- If so, which meteorological topics would best support and strengthen the work of PAME?
- Can PAME identify elements of its own work that would benefit from meteorology ?
- If the points above are worthwhile exploring, how should this be taken forward in PAME?



Future Directions

- WMO encourages the inclusion of meteorological cooperation in the Rovaneimi Declaration, especially for safe and efficient maritime operations in the Arctic waters, and to be carried on further during the Chairmanship by Iceland and thereafter Russia.
- WMO stands ready to support through:
 - international facilitation with Met Agencies across the Arctic Members, and
 - input from experts including the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM), the WMO Commission for Climate, WMO Commission for Atmospheric Science (CAS), the Global Cryosphere Watch and efforts such as the Year of Polar Prediction (YOPP) and Executive Council Group for Polar and High Mountain Observations Research and Services (EC-PHORS)
- Partners such as the International Ice Charting Working Group also stand ready to support efforts as stated at their meeting last week



WEATHER CLIMATE WATER
TEMPS CLIMAT EAU



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Thank you
Спасибо