Catalysing Innovation in Weather Science - the role of observations and NWP in the World Weather Research Programme

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WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

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World Meteorological Organization
Organisation météorologique mondiale

WWRP
WORLD WEATHER RESEARCH PROGRAMME

The World Weather Research Programme

MISSION:

The WMO World Weather Research Programme (WWRP) *promotes international and interdisciplinary research* for

more accurate and reliable forecasts

from minutes to seasons,

expanding the frontiers of weather science

to **enhance society's resilience to high-impact weather** and

the value of weather information for **users**.

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The World Weather Research Programme

WWRP is steered and progress is evaluated by the WWRP Scientific Steering Committee (SSC) under the auspices of Commission for Atmospheric Sciences (CAS).

Peter Bauer - ECMWF Deputy Directorof Research and Programme Manager of the **ECMWF serves on the SSC of WWRP**

The activities are *coordinated and supported* by the World Weather Research Division of the WMO Research Department.

The programme will undergo *external reviews* by independent internationally recognized experts at appropriate intervals.

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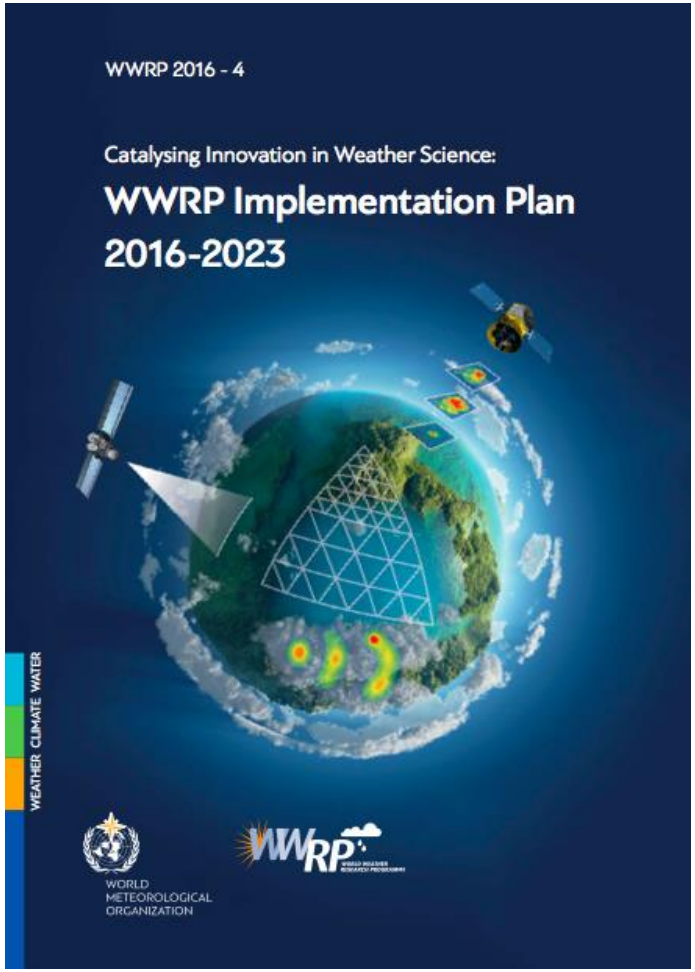
WWRP Implementation Plan

Based on outcome of the World Weather Open Science Conference and on the engagement of all the WWRP community



WWRP webpage:
http://www.wmo.int/pages/prog/arep/wwrp/new/wwrp_new_en.html

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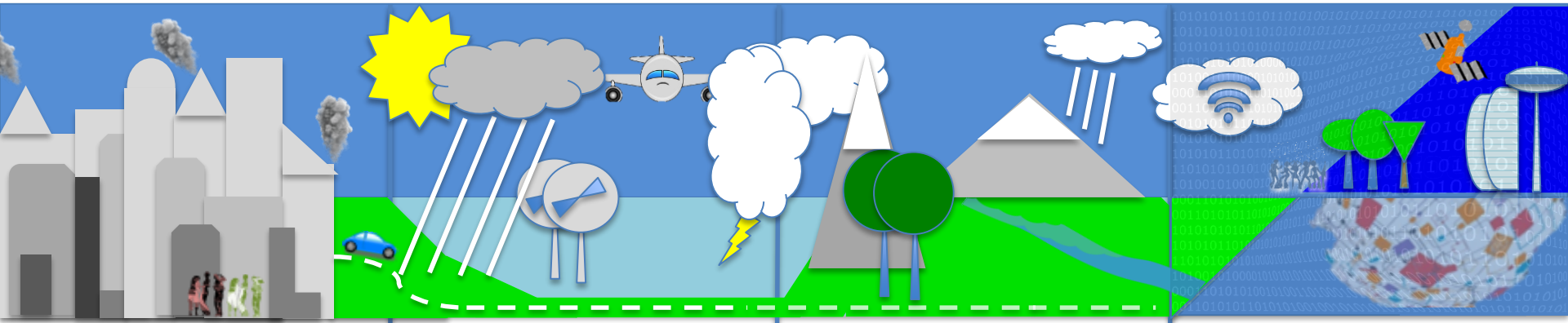
What are the societal challenges of our times?



URBANIZATION	EXTREMES (HIGH IMPACT WEATHER)	PREDICTING THE WATER CYCLE	EMERGING TECHNOLOGIES

NWP and Observations

Storms – large and small scale

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Urbanization

Key research issues:

- → Development of *model capabilities* that consider unique urban aspects (such as architecture etc.) and make use of *high-density (crowd sourced) data which* are available in cities (phones, cars etc);
- → An interdisciplinary *integrated urban services approach* that considers societal challenges, service requirements, crowd behaviour, messaging and trusted sources of information.

Extremes (or High Impact Weather events)

Key research issues are:

- → Seamless approach to *understand and model extreme events*, which also makes use of new and non-traditional *observations and* considers aspects of global change;
- → Refined understanding of the *socio-economic implications and decision processes taking into account vulnerabilities and risks*;
- → Integrated approaches to extend predictions from physical impacts to effects on social and economic systems, considering *stakeholders´ needs*.

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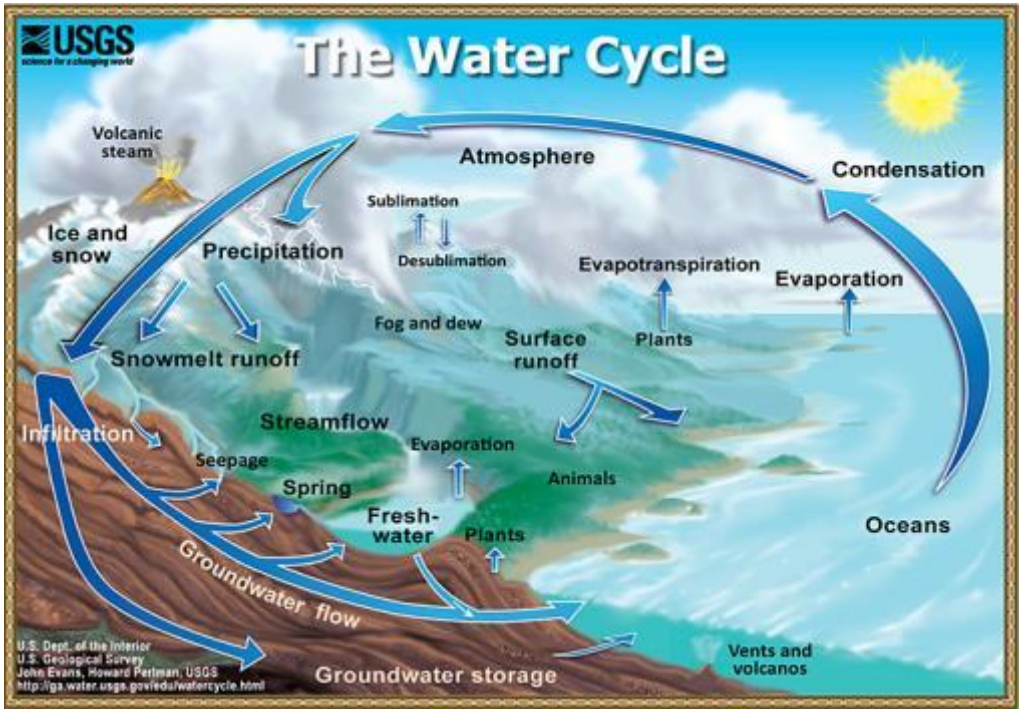
Predicting the water cycle

Key research issues are:

- → Seamless approach *to understand and model the water cycle* and its processes, including the correct *precipitation processes*;
- → Improved consideration of *socio-economic needs and benefits*, and decision processes related to the water cycle, enabling refined communication procedures and services;
- → Development and optimal application of *modelling and data assimilation* techniques



Emerging Technologies

Key issues:

- → Exploitation of *new methodologies and sources for observations*, to complement existing capabilities, assess *data quality and relative contributions of observing systems*;
- → Exploitation of *modelling and data assimilation capabilities* and methodologies, optimum usage of *computing power and communications bandwidth*;
- → Adaptation to *evolving communication technologies*, while continuing service to traditional means of obtaining information, which may become important in the event of disasters.

HOW DO WE ADDRESS THESE?

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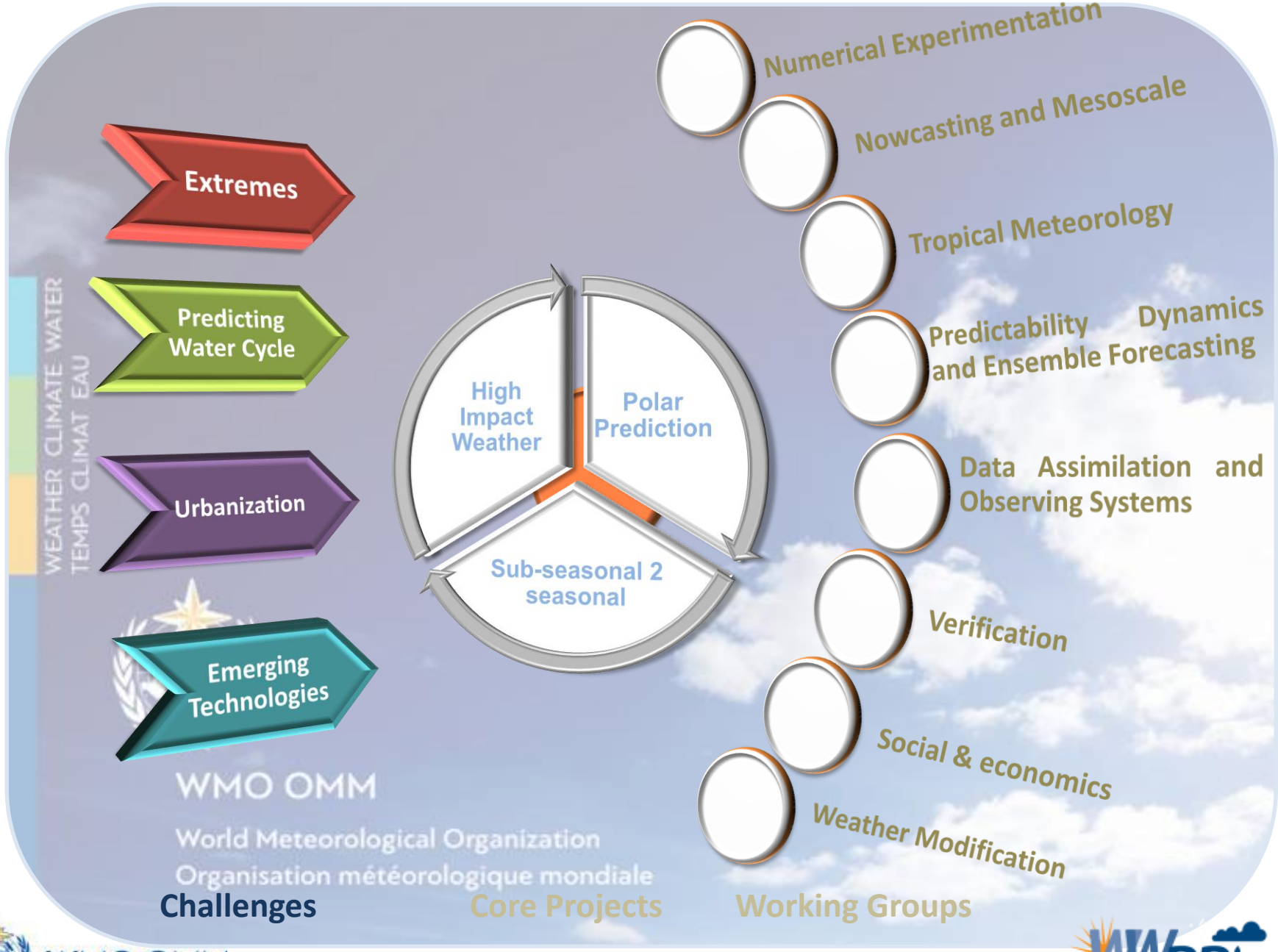

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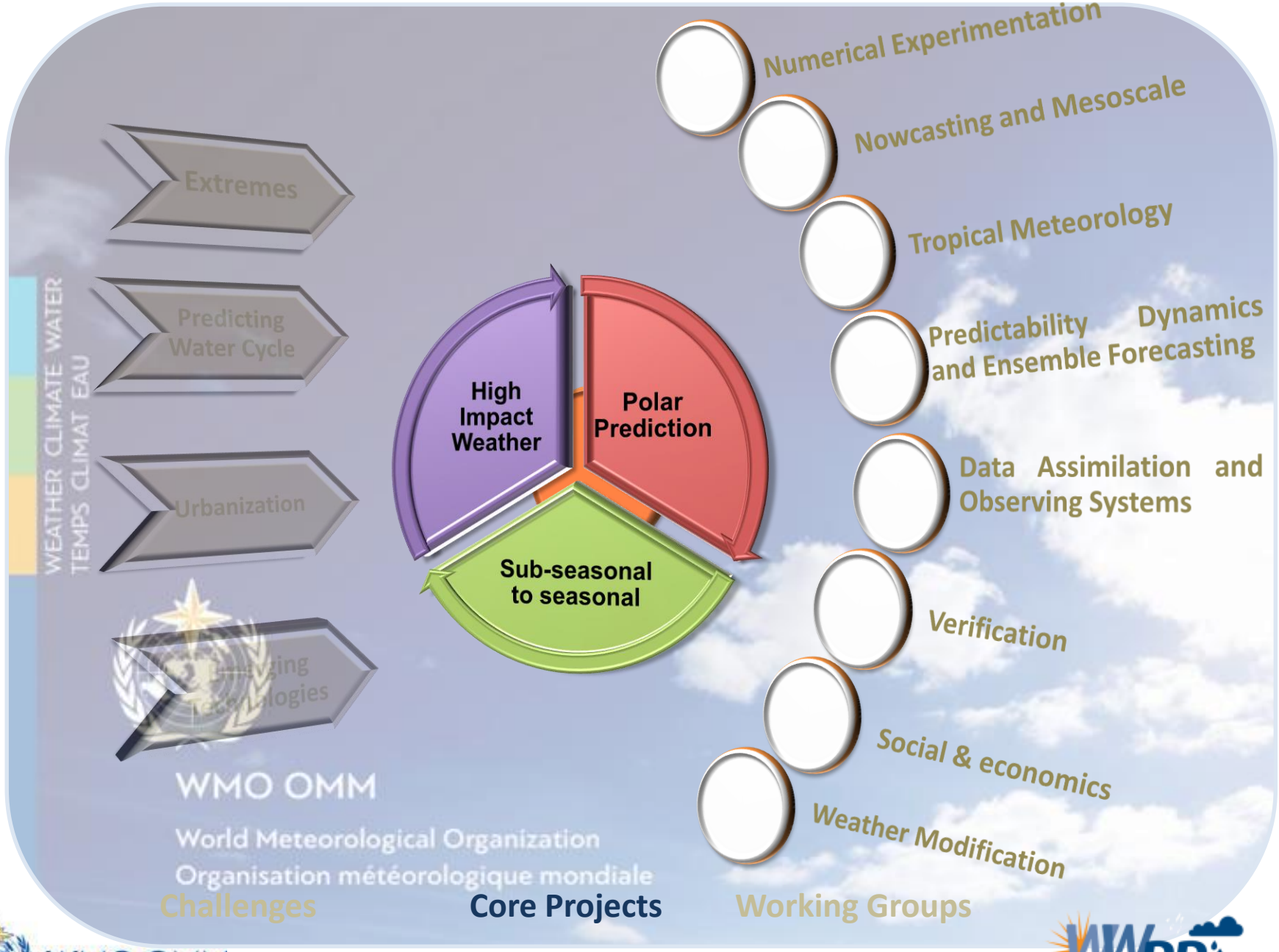

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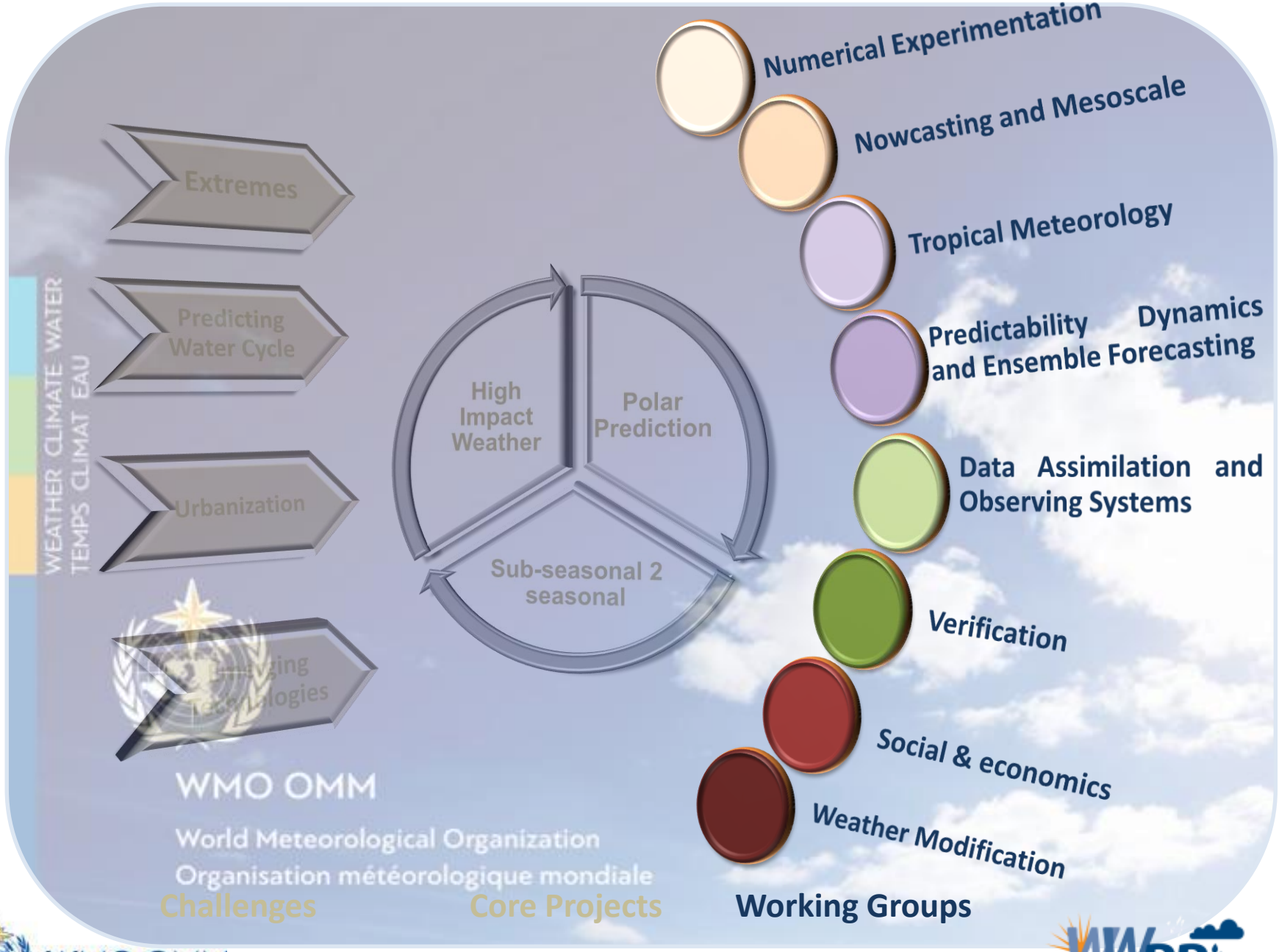

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THE THREE CORE PROJECTS

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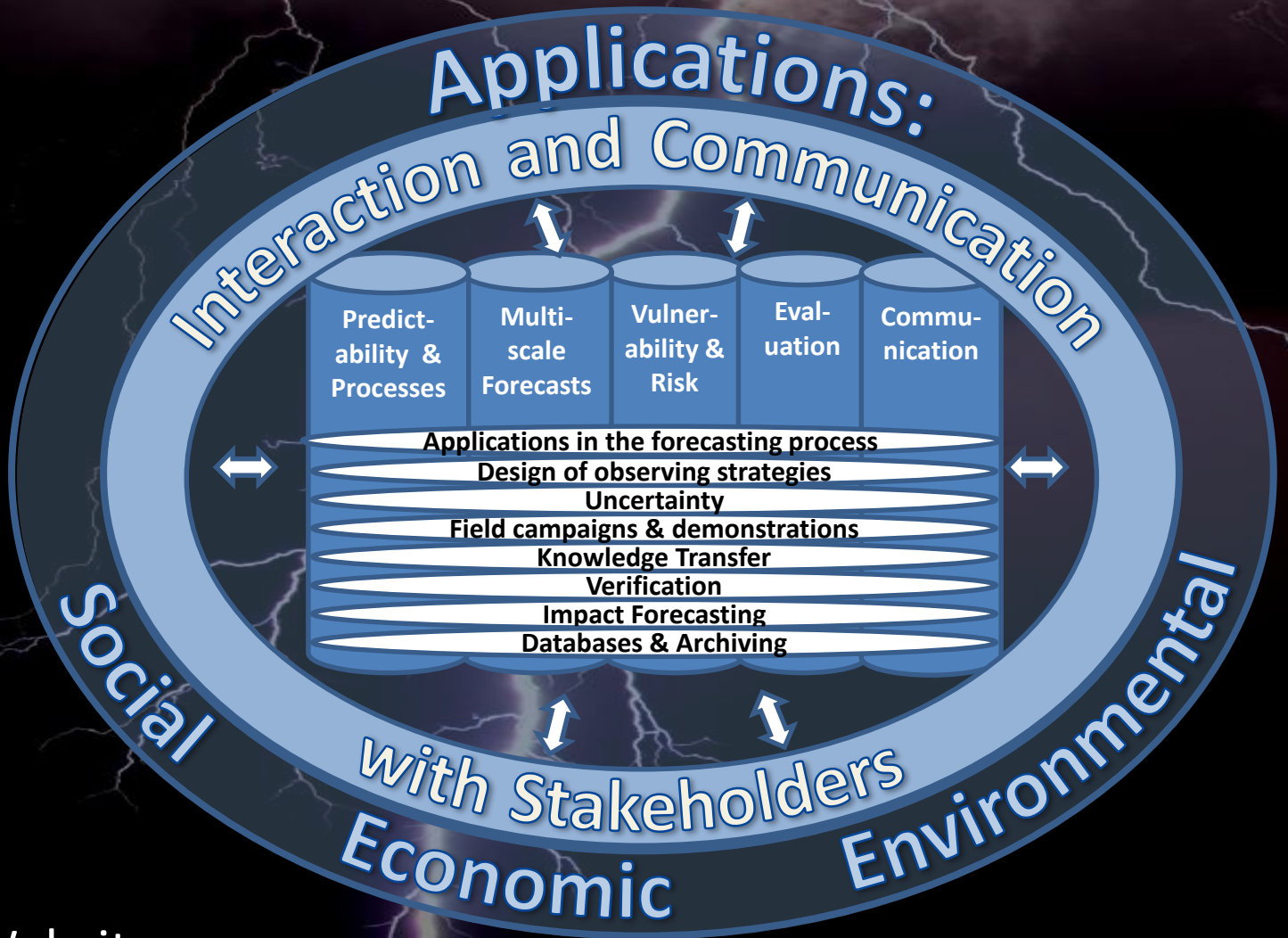
HIWeather

Co-chairs Brian Golding and David Johnston

High Impact Weather: Structure diagram



Website: http://www.wmo.int/pages/prog/arep/wwrp/new/high_impact_weather_project.html

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HIWeather projects

- NAWDEX: Aims to increase physical understanding of the effects of diabatic processes on disturbances to the jet stream near North America, as well as their influence on downstream propagation across the North Atlantic, and their consequences for high-impact weather in Europe.
- Waves to Weather (W2W): Aims to improve insight through the development of interactive visualization methods, which will enable rapid exploration of forecast ensembles to identify the sources and evolution of uncertainty.
- HIGHWAY : Aims to improve nowcasting and early warning systems in the Lake Victoria region – proposal submitted for funding.
- Other linked projects:
  - **HYMEX** (modelling of the hydrological cycle in the **Mediterranean**, with emphasis on the predictability and evolution of extreme weather events, inter-annual to decadal variability and associated trends in the context of global changeMediterranean),
  - **RELAMPAGO** (synoptic, mesoscale, and convective scale severe weather and flooding characteristics, **South America**),
  - **ICE-POP 2018** (**Korea winter Olympics**),
  - **SURF** (Urban precipitation and pollution in **Beijing**)

Lake Victoria EWS project

- Lake Victoria is Africa's largest and the world's second largest freshwater Lake 69,000 km^2
- Produces 700,000 to 800,000 metric tons of fish annually
- Approximately 30 million people live in its basin
- 200,000 fishermen on the Lake.

HIWeather

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Thousands of people die each year—
due to navigational accidents
Most of the accidents on the Lake
attrib

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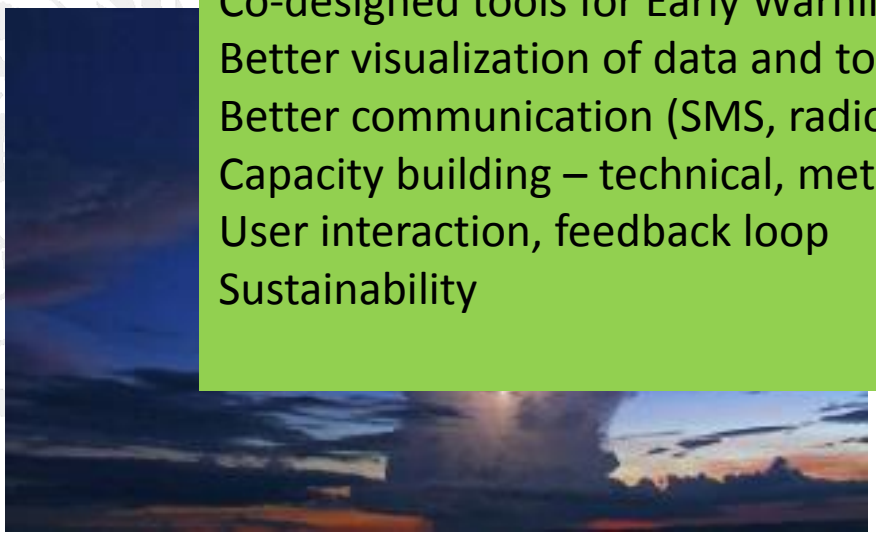
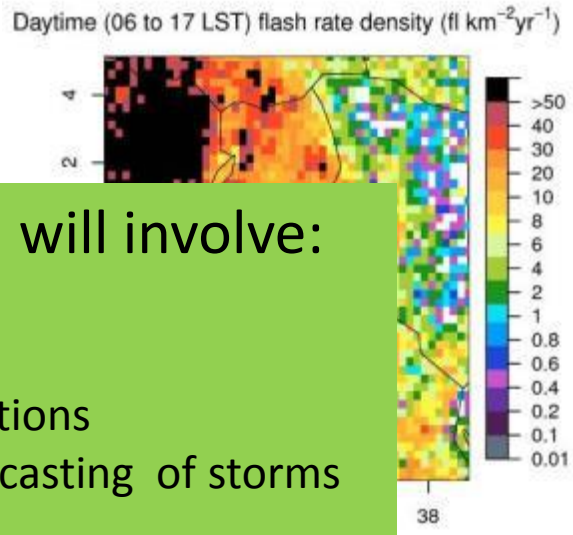
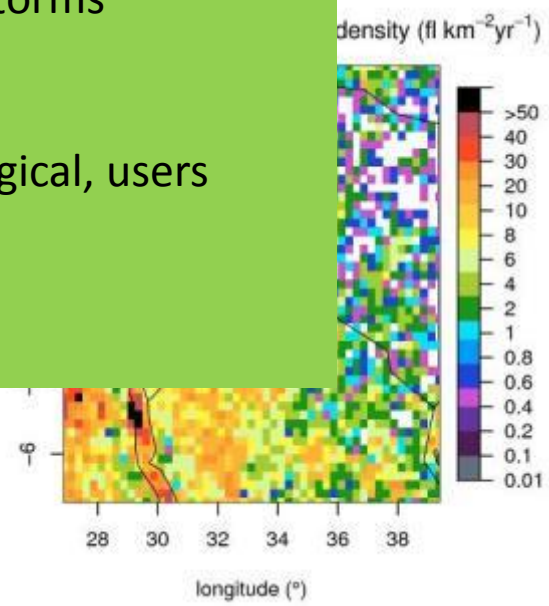




Proposed solution proposed will involve:

Modelling (NWP)
More access to existing data/observations
Using satellite and NWP data for nowcasting of storms in absence of radar systems
Co-designed tools for Early Warning of storms
Better visualization of data and tools
Better communication (SMS, radio..)
Capacity building – technical, meteorological, users
User interaction, feedback loop
Sustainability



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The Sub-seasonal to Seasonal (S2S) Prediction Project

"Bridging the gap between weather and climate"

Co-chairs:

Frédéric Vitart (ECMWF)

Andrew Robertson (IRI)

- 5-year project, started in Nov 2013.
- Project office: KMA/NIMR hosts the project office
- Website: http://s2sprediction.net/


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Polar Prediction Project (PPP) and
Year of Polar Prediction (YOPP)
Photo: S. Hendricks, AWI
Thomas Jung
Chair of the Polar Prediction Project
Alfred Wegener Institute, Germany
http://www.polarprediction.net/

Thank you
Merci

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