



World Meteorological Organization

Weather • Climate • Water

Technical Commission for Atmospheric Science

World Weather Research Programme

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Christof Stache/AFP/Getty Images; Marina Shemesh /publicdomainpictures.net; Alexandros Vlachos/EPA; NOAA NWS; NOAA NWS



Societal challenges: a 10y vision

- **High Impact Weather and its socio-economic effects in the context of global change**
- **Water: Modelling and predicting the water cycle for improved Disaster Risk Reduction and resource management**
- **Urbanization: Research and services for megacities and large urban complexes**
- **Evolving Technologies: Their impact on science and its use**

Technical Commission for Atmospheric Science

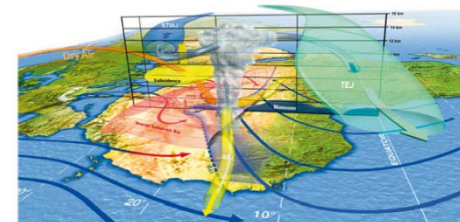
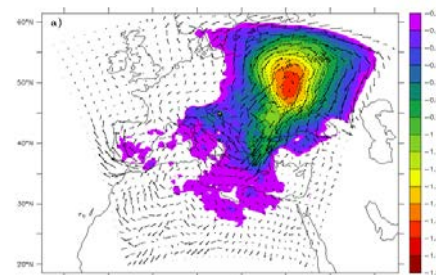
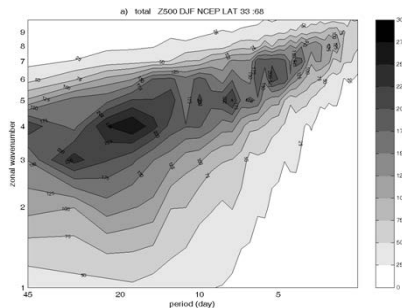




WWRP Vision



- WWRP advances society's resilience to high impact weather through research focused on improving the accuracy, lead time and utilization of weather prediction, and through engaging users & stakeholders to define research priorities and facilitate transition to applications
- WWRP promotes cooperative international & interdisciplinary research in the operational and academic communities and supports the development of early career scientists
- WWRP aims at Seamless Prediction of the Earth System from minutes to months using coupled systems – thus applying expertise in weather science to promote convergence between weather, climate and environmental communities





WWOSC: World Weather Open Science Conference



**Seamless Prediction of the Earth System:
from minutes to months.**

16 –21 August 2014, Montréal, Canada

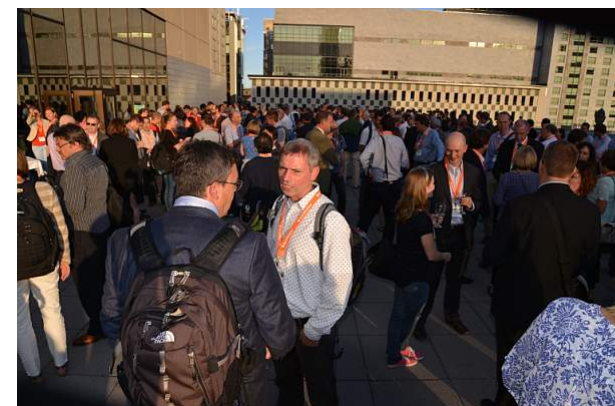
Science Program

User, Application & Social Science Program

Early Career Scientist Program

Panels on *Future of the Weather Enterprise*

**Book will be published this year providing a
reference of current state and future
challenges of World Weather Science**





WWOSC: some highlights



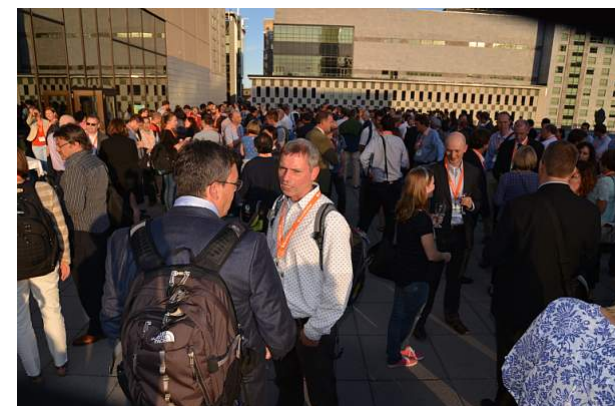
Over 1000 participants: experts from over 50 countries in meteorology, application developments, social science as well as users.

An A-list of heads and scientists from National Meteorological and Hydrological Services and academia:

Secretariat and members of World Weather Research Program Committees + representatives from other WMO programs

Early Career Scientists with support from WMO and National Science Foundation (US)

Largest international gathering of social and interdisciplinary scientists and application specialists focused on weather-related research

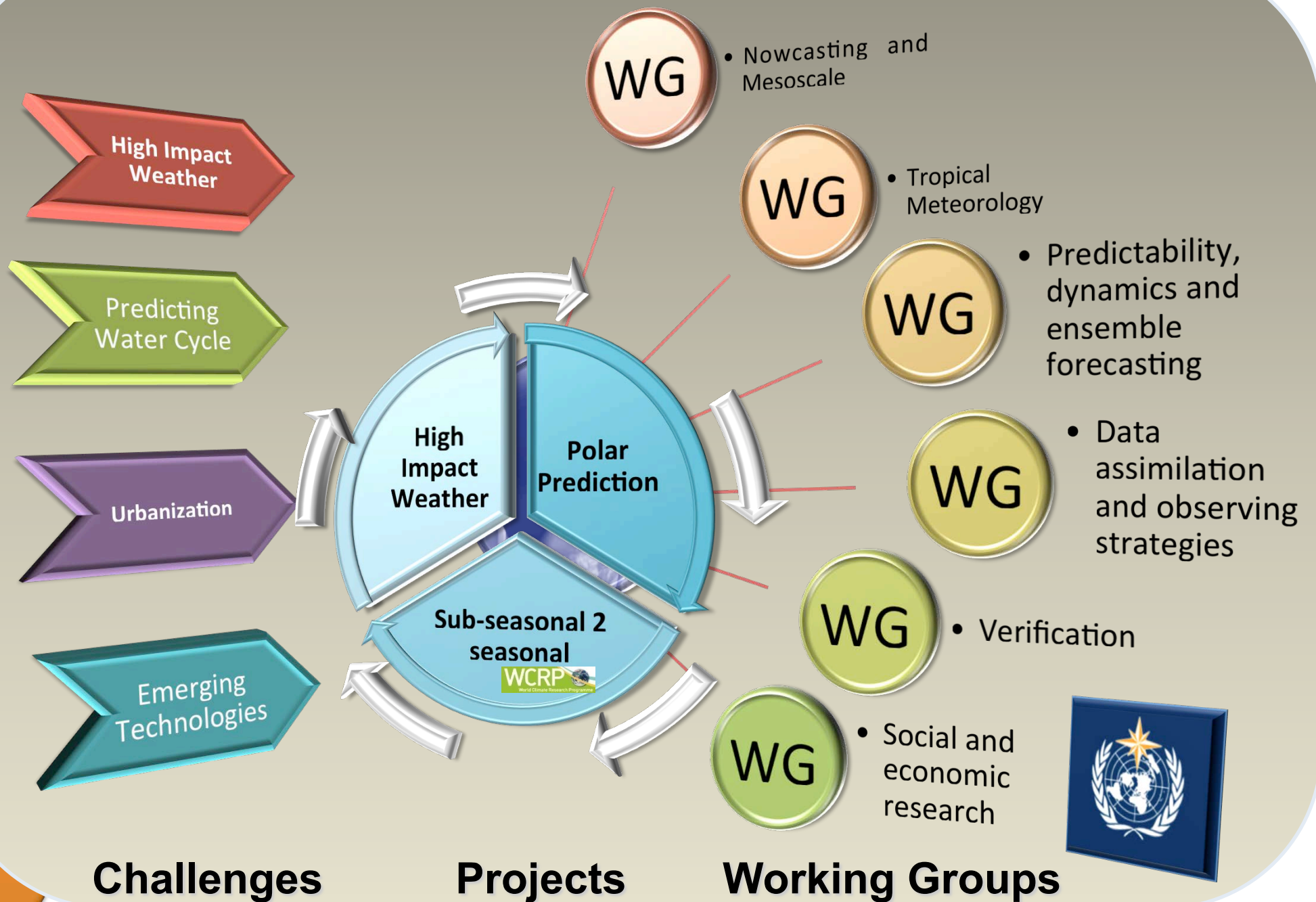




WWRP at a glance



WWRP a seamless programme



Challenges

Projects

Working Groups

The Sub-seasonal to Seasonal (S2S) Prediction Project

“Bridging the gap between weather and climate”

Co-chairs:

Frédéric Vitart (ECMWF), Andrew Robertson (IRI)

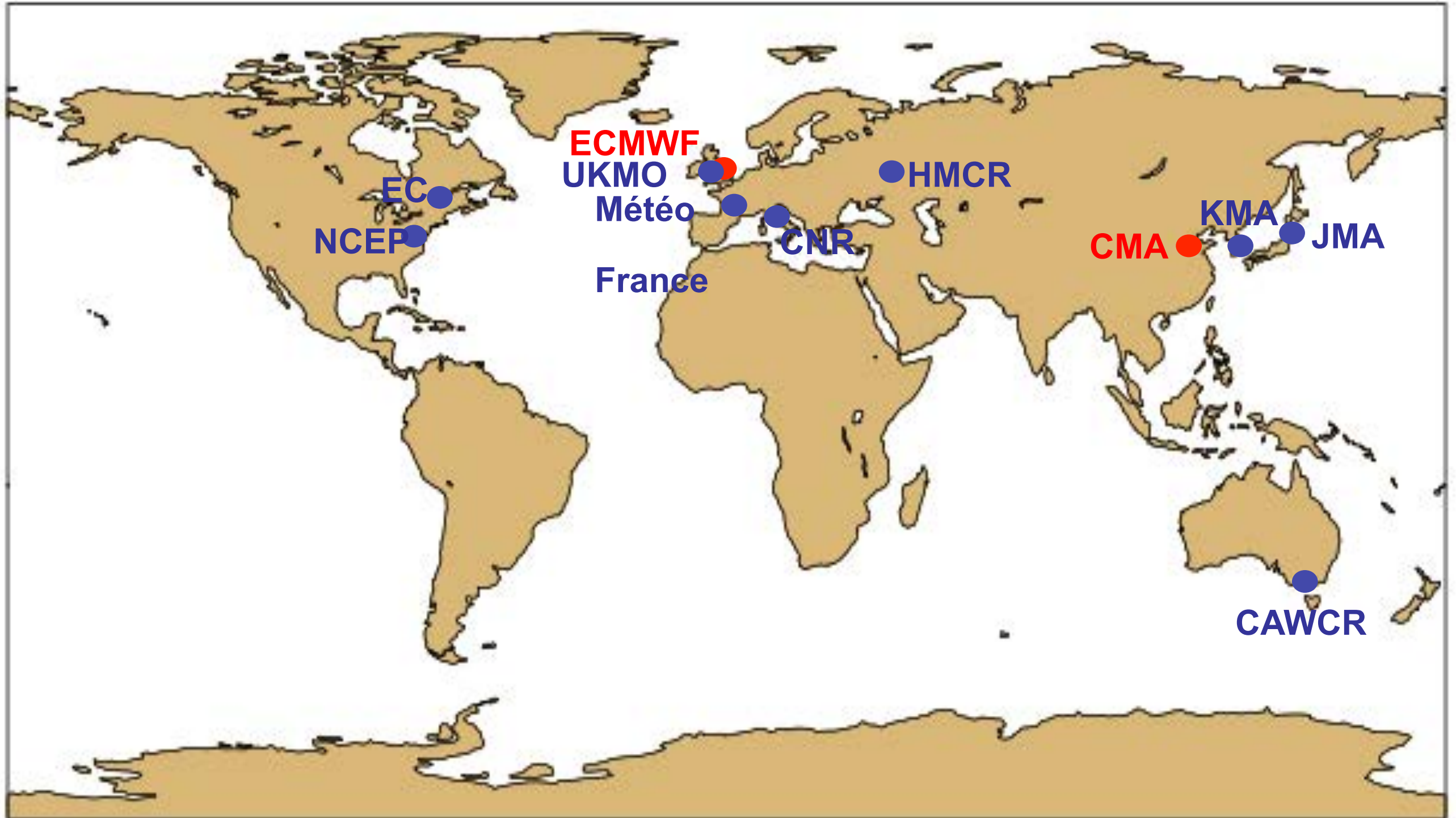
Project Office: KMA/NIMR



S2S – TIGGE data base



- 11 Data providers
- 2 Archiving centres





S2S – TIGGE data base



A fantastic research resource

- Daily real-time forecasts + re-forecasts, Available 3 weeks behind real-time; Common grid (1.5x1.5 degree)
- ~ 80 variables archived including ocean variables, stratospheric levels and soil moisture/temperature
- Archived in GRIB2; NETCDF conversion available
- All partners provided S2S test data; CAWCR, ECMWF, NCEP, JMA, CMA, HMCR, Météo-France ready for data exchange.
- Re-forecasts from JMA, CAWCR, NCEP and ECMWF archived in S2S database
- Real-time forecasts from ECMWF, NCEP, JMA and CAWCR routinely archived in S2S database
- CMA & Meteo-France re-forecasts acquisition in progress





S2S – TIGGE data base



	Time-range	Resol.	Ens. Size	Freq.	Hcsts	Hcst length	Hcst Freq	Hcst Size
ECMWF	D 0-32	T639/319L91	51	2/week	On the fly	Past 18y	2/weekly	11
UKMO	D 0-60	N96L85	4	daily	On the fly	1989-2003	4/month	3
NCEP	D 0-45	N126L64	4	4/daily	Fix	1999-2010	4/daily	1
EC	D 0-35	0.6x0.6L40	21	weekly	On the fly	Past 15y	weekly	4
CAWCR	D 0-60	T47L17	33	weekly	Fix	1981-2013	6/month	33
JMA	D 0-34	T159L60	50	weekly	Fix	1979-2009	3/month	5
KMA	D 0-60	N216L85	4	daily	On the fly	1996-2009	4/month	3
CMA	D 0-45	T106L40	4	daily	Fix	1992-now	daily	4
Met.Fr	D 0-60	T127L31	51	monthly	Fix	1981-2005	monthly	11
CNR	D 0-32	0.75x0.56 L54	40	weekly	Fix	1981-2010	6/month	1
HMCR	D 0-63	1.1x1.4 L28	20	weekly	Fix	1981-2010	weekly	10





Sub-seasonal to seasonal



Workshop on Sub-seasonal to Seasonal
Predictability of Monsoons

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Workshop on **Sub-seasonal to Seasonal Predictability of Monsoons**

22 - 24 June 2015

National Institute of Meteorological Research
Jeju, Republic of Korea

<http://s2sprediction.net>



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The WWRP Polar Prediction Project (2013-2022)

Chair: Thomas Jung, AWI

Project Office: Alfred Wegener Institute, Germany

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



PPP – selected activities

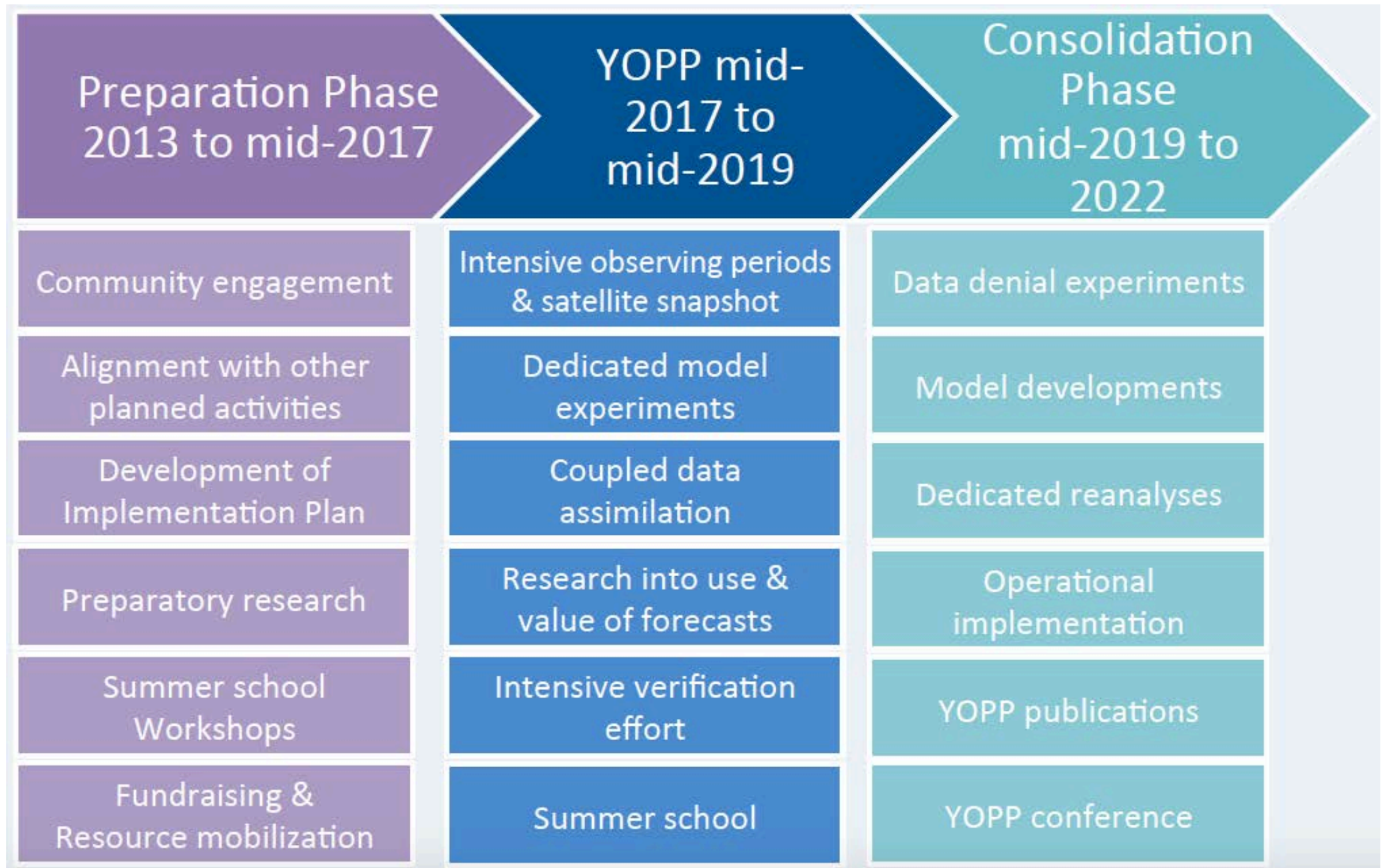


- New mailing list for polar prediction (jointly with WCRP)
- YOPP Implementation Plan 1.0
- Workshop on polar-lower latitude linkages and their role in weather and climate prediction, Barcelona, 10-12 December 2014
- WWRP/WCRP/Bolin Centre Polar Prediction School 5-16 April 2016
- YOPP briefing of the Interagency Arctic Research Policy Committee (IARPC)
- Strong engagement with funding agencies





The Year of Polar Prediction





YOPP Summit



When: 13-15 July 2015

Where: WMO, Geneva, Switzerland

Attendance: \approx 180 people

Purpose:

- give an overview of the present level of planning,
- identify stakeholder expectations and requirements,
- develop priorities,
- define intensive observing periods,
- agree on the YOPP data legacy,
- coordinate planned activities, and
- gather formal commitments from parties interested in YOPP





High Impact Weather Project



- Increasing resilience to Urban Flood, Wildfire, Urban Heat Waves and Air Pollution, Localised extreme wind, Disruptive Winter Weather through improving forecasts for timescales of minutes to two weeks and enhancing their communication and utility in social, economic and environmental applications
- Implementation Plan (2015-2024) approved by WWRP SSC
- Links to WCRP through quantifying vulnerability and risk assessment, and for response to High Impact Weather in a changing climate.
- Chair: Brian Golding, MetOffice



Christof Stache/AFP/Getty Images; Marina Shemesh /publicdomainpictures.net; Alexandros Vlachos/EPA; NOAA NWS; NOAA NWS





WWRP & WCRP



S2S Joint Project

Established links for Polar Prediction Project

Links to HIWeather need defining

Potential links to Working Groups e.g. on ensembles /quantifying uncertainty, Data Assimilation for reanalysis

Potential for collaboration on WCRP Grand Challenges: “Climate Extremes”, “Clouds, Climate, Circulation”, “Regional Climate Information”

Joint activities for Early Career Scientists

Potential joint future challenges: Urbanisation, Scalability, Providing underpinning research for developing services,





Big
Polar
interactions
Communication
New
Understanding
minute
Extratropical
Impact
Water
Processes
High
Urbanisation
Seasonal
observing
Weather
Uncertainty
Coupled Working
Applications
Ensembles
Knowledge
resolution
Tropical Systems
Partnership
Seamless
Subseasonal systems
HPC
months
Multiscale
Prediction
Data





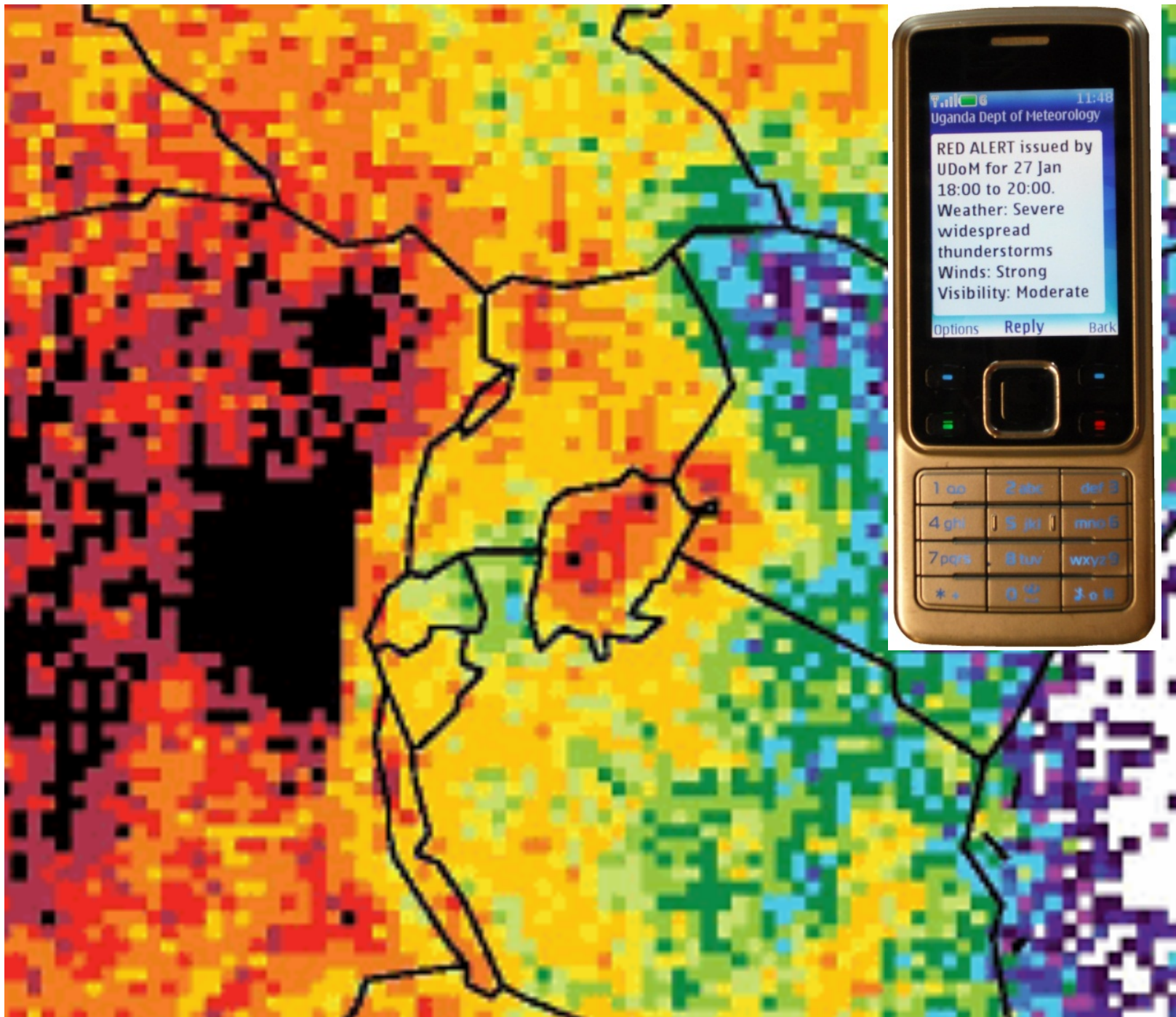
WWRP



- **WWRP**

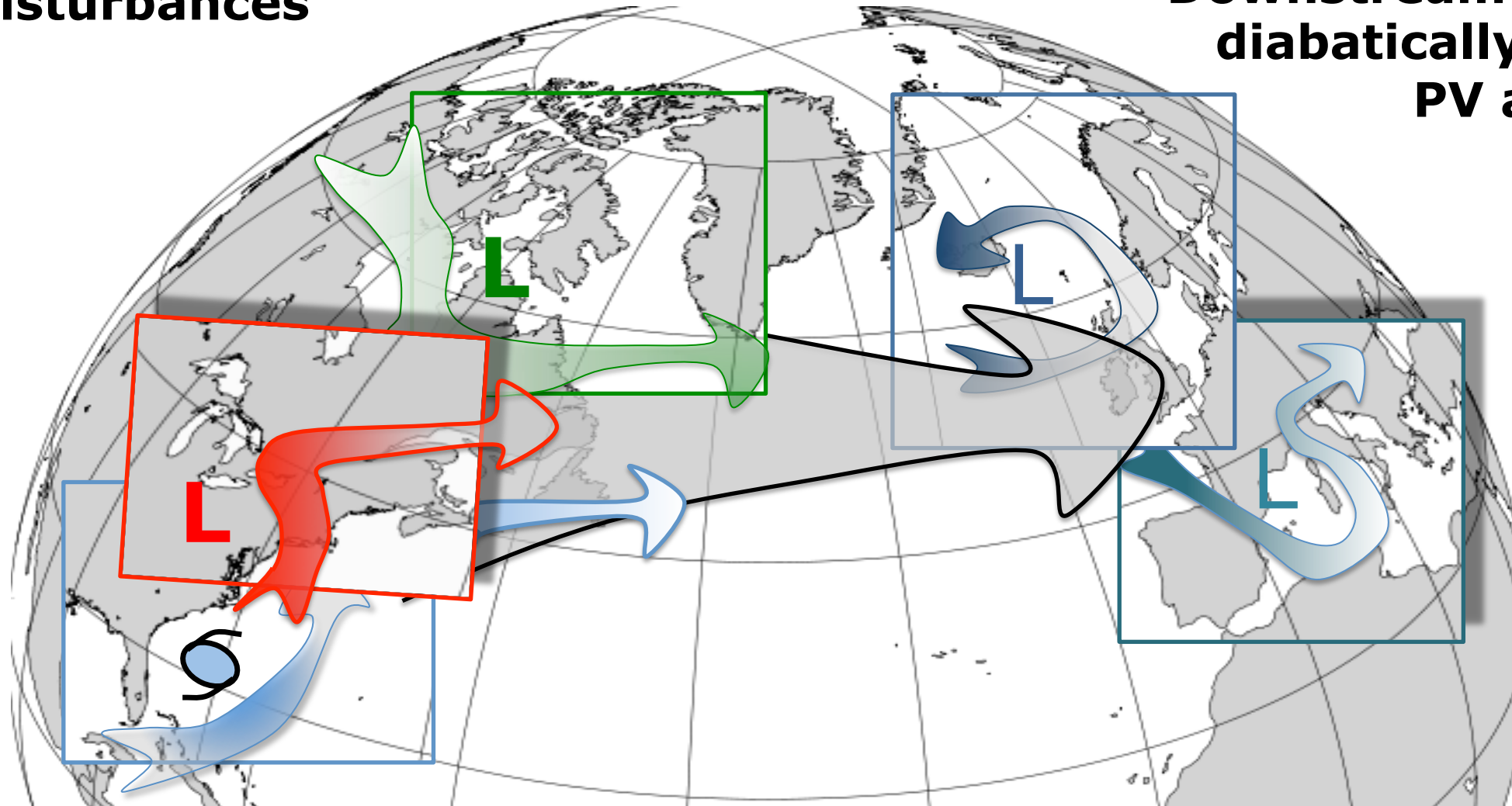


Lake Victoria – Understanding the Lake Dynamics and Severe Weather



“WMO Executive Council (EC) recommended that a World Weather Research Programme (WWRP) project be considered for the Lake Victoria Watershed that would include a test-bed for field campaigns to collect data for research to understand the dynamics over the lake in order to reduce disaster from water spouts, waves, and wind gusts that affect both lake transport and fishermen who rely on the lake for their livelihoods. The EC further noted the potential linkages with the SWFDP for Eastern Africa.”

Downstream impact of diabatically modified PV anomalies



Evolution of Rossby waves along the waveguide

Ideal operation period in
Sep/Oct 2016:

- strongest storm activity
- Tropical Cyclones
- Polar Vortices

US: GV



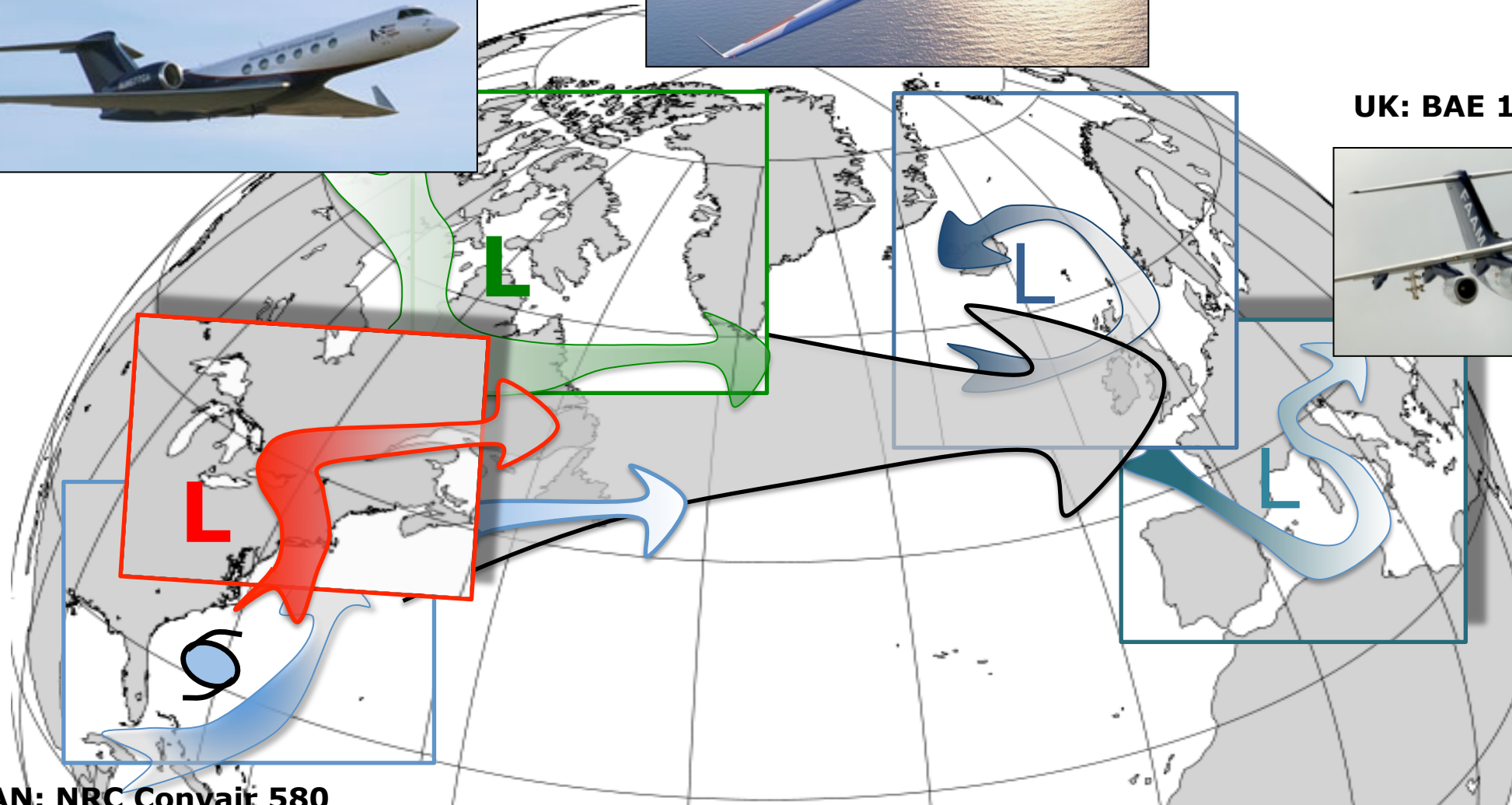
GV: HALO



UK: BAE 146



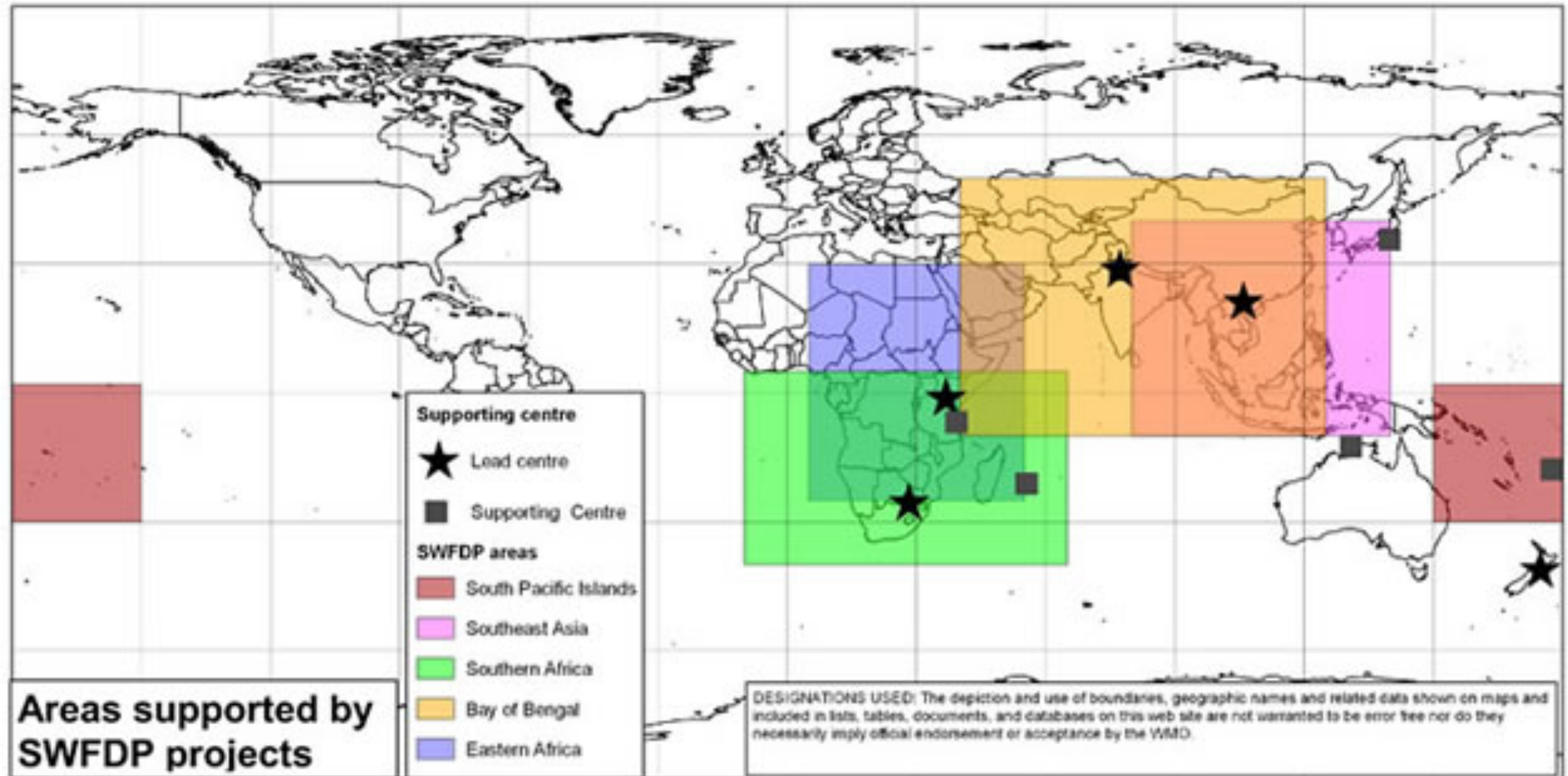
CAN: NRC Convair 580



Partners

- Germany: DLR IPA, FX, KIT Karlsruhe, Univ. Mainz
- ETH Zürich
- US: NPS, NCAR, OU, Princeton, MIT, NOAA
- French, UK, CAN contributions envisaged
- Links to national weather services: DWD, ECMWF

WMO / CBS Severe Weather Forecast Demonstration Projects





Underpinning Science

New technology

Research Infrastructure

Validation

Quantify impacts

Communication

Science to Applications

Education and Mentoring

International

Interdisciplinary

Partnerships:

Operational – Academic

Developed and Developing Countries

User and Research Communities