

The 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.

WWRP aims at Seamless Prediction by increasing convergence between weather, climate and environmental approaches. WWRP strengthens academic – operational partnerships and interdisciplinary collaborations, and enhances the role of Early Career Scientists.

WEATHER CLIMATE WATER
TEMPS CLIMAT EAU



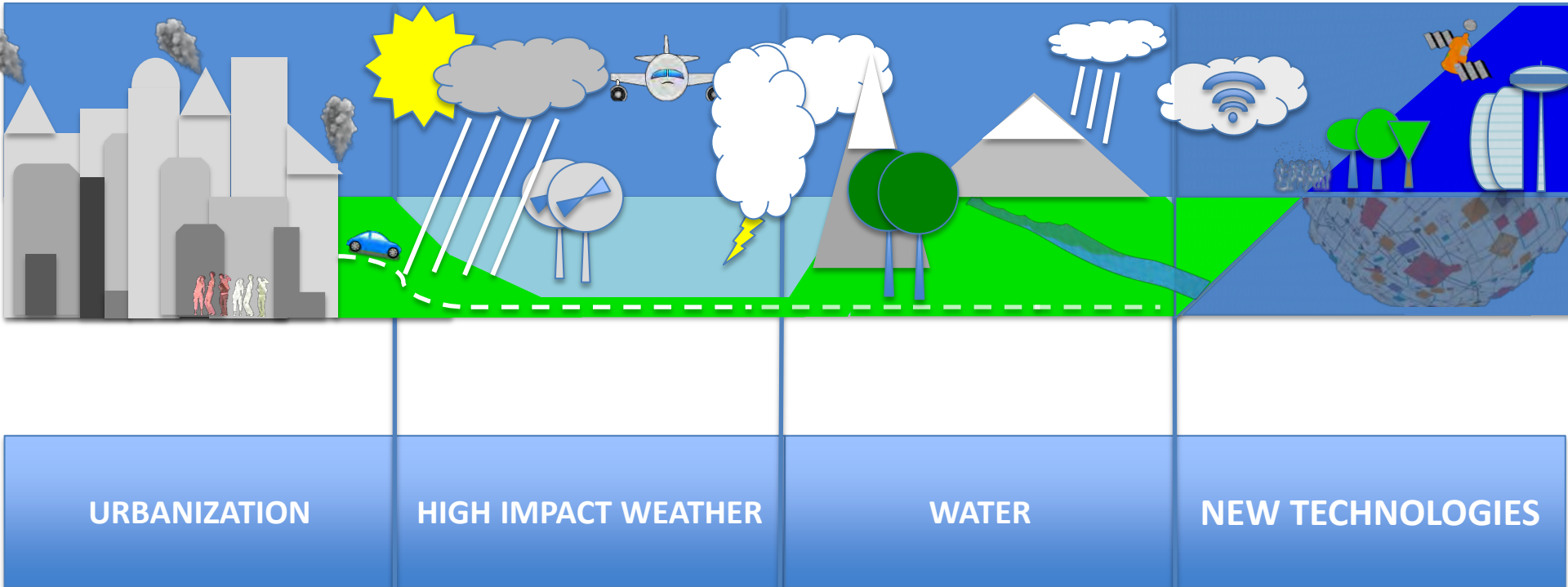
Paolo Ruti, Chief World
Weather Research Division

Sarah Jones,
Chair WWRP Scientific Steering Committee

WMO OMM

World Meteorological Organization
Organisation météorologique mondiale

WWRP Societal Challenges



With its new implementation plan, WWRP will ensure the realization of a research strategy towards the seamless prediction of the Earth system from minutes to months. This research strategy is developed to face four scientific and societal challenges identified by the Commission for Atmospheric Sciences : High-Impact Weather, Water, Urbanization and Evolving Technologies.

WWRP Implementation Plan Structure

Societal Challenges



Action Areas



Objectives and Concrete Activities

Each Action Area comes along with a set of objectives.
Concrete Activities have been defined that will ensure to achieve the objectives and make progress in the action areas.



WWRP Structure

WWRP Working Groups

Tropical Meteorology

Identify and support research initiatives on tropical cyclones and monsoons

Predictability, Dynamics and Ensemble Forecasting

Advance the science of dynamical meteorology, predictability ensemble forecasting, promoting the development of ensemble applications

Weather Modification

Promote scientific practices in weather modification

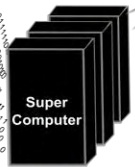
Data Assimilation and Observing Systems

Obtain and make use of best possible information on the atmospheric state

Socio-Economic Research Applications

Advance the social and economic application of weather related information and services

$$\frac{\partial}{\partial t} \left(\frac{\partial p}{\partial \eta} \right) + \nabla \cdot \left(\mathbf{v}_{11} \frac{\partial p}{\partial \eta} \right) + \frac{\partial}{\partial \eta} \left(\eta \frac{\partial p}{\partial \eta} \right) = 0$$



WCRP-JSC / CAS Working Group on Numerical Experimentation

Foster the development of atmospheric circulation models and resolve shortcomings

Nowcasting and Mesoscale

Promote prediction on the mesoscale for short time scales considering models and observations

Verification

Develop and apply new verification techniques to help improving quality of forecast models
(joint WG with World Climate Research Programme)

WWRP Core Projects

Polar Prediction



High Impact Weather



Sand & Dust Storm



WWRP Implementation Plan & GEWEX

Societal Challenge - Water (Modelling and predicting the water cycle for improved disaster risk reduction and resource management)

Action Area INTEGRATED WATER CYCLE: Improve understanding, observation, assimilation and modelling of the components of the integrated water cycle, and its global, regional and local interactions

Improve coupled modelling of atmosphere/land/ocean/water; in particular, some weaknesses in exchange processes (both vertical and lateral) are better understood and modelled; AND

Improve land surface models in coupled modelling systems to incorporate more hydrological processes; better represent snow; and use higher resolution land use information, including temporal variability

- Collaborate on improved land surface models [S2S, with GEWEX/GLASS]

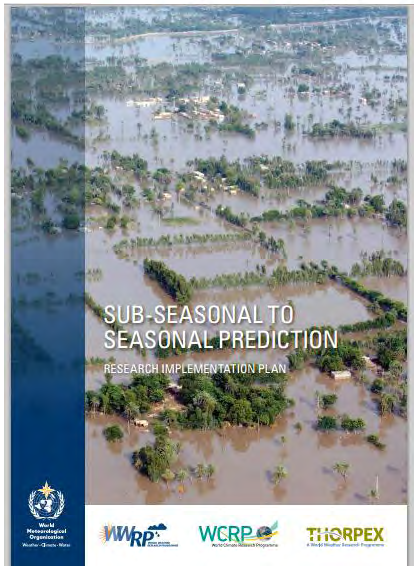
Improve numerical forecasts for catchment conditions through collaboration of meteorological and hydrological scientists; AND

Increasingly use ensemble and probabilistic approaches to provide seamless precipitation and hydrological predictions across time and space scales

- Support and facilitate participation in high resolution modelling projects focussing on the hydrological cycle [NMR, PPP, RDP's/FDP's with, e.g., GEWEX]



Sub-seasonal to seasonal



- ECWMF and CMA host S2S data-base, 13 global centers provide pre-operational products (30-60 days of sub-seasonal pred)
- Highlights: Tropical Cyclone land-falling prediction products, skill for Indian Monsoon, contribution to Year of Polar Prediction,
- Two regional projects proposed under the Global Framework for Climate Services (India – Water management; Uruguay – Energy management)

**Project Office:
KMA/NIMR**



**Co-chairs: Frédéric Vitart (ECMWF),
Andrew Robertson (IRI)**

Designing Polar Prediction Systems

Year of Polar Prediction

A modelling and field campaign from mid-2017 to mid-2019 for improving predictive capabilities

Preparation Phase
2013 to mid-2017

YOPP mid-
2017 to
mid-2019

Consolidation
Phase
mid-2019 to
2022

YOPP
YEAR OF
POLAR
PREDICTION

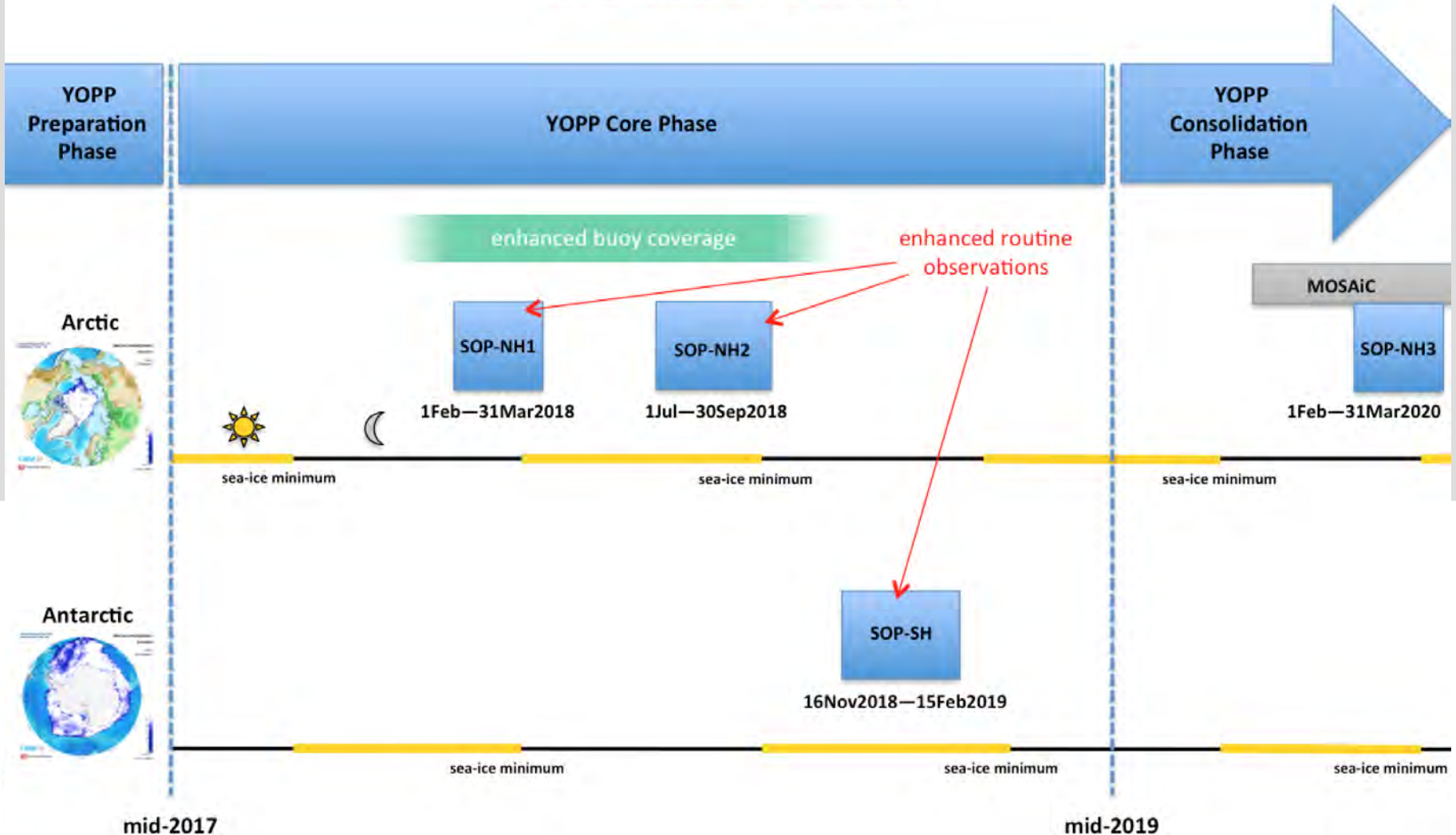


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Special Observing Periods

Year of Polar Prediction Special Observing Periods (SOPs)

Final approval pending (12 Oct 2016)



High Impact Weather Project (HIWeather)

Growing resilience through better warnings

- HIWeather Kick-off workshop attracted > 90 delegates from 20 countries. It identified the priority research activities
- Establishment of the HIWeather task teams
- Highlights
- HIWeather & GEWEX interactions
 - GC on Extremes
 - HIWeather advisory board
- GEWEX Open Science Conference

HIWeather Steering Group complete

Co chairs: Brian Golding, UK and David Johnston, New Zealand

George Craig, Jenny Sun, Brian Mills, Sally Potter & Shannon Panchuk, Beth Ebert

**Predictability &
Processes**

Develop knowledge and understanding of processes relevant for initiation and evolution of weather systems related to hazard and the factors that determine their predictability

**Multi-Scale
Forecasting**

Enhance multi-scale prediction of variables needed to forecast weather impacts in coupled modelling systems

**Vulnerability &
Risk**

Produce more relevant forecasts and warnings through prediction of the impact of hazards on individuals, communities and businesses, their vulnerability and hence their risk

**User-oriented
Evaluation**

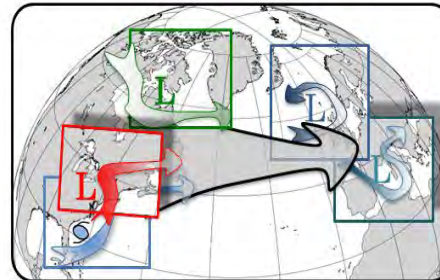
Evaluate benefit and build trust in forecasts and warnings through assessment of accuracy, value and response.

Communication

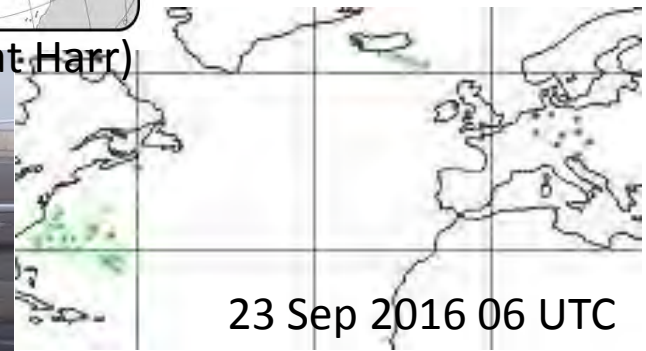
Achieve more effective responses to forecasts through better communication of forecasts and warnings of hazards and their impacts

HIWeather highlights 2016

- Vision reinforced by UNISDR post-Sendai science conference.
- Quarterly newsletters circulated to ~200 addresses.
- Communications web platform under construction at Massey University.
- Fire Weather workshop highlighted value of ensembles.
- NAWDEX field phase.



(Courtesy of Pat Harr)



The NAWDEX team with DLR Falcon (left), HALO (center) and the UK aircraft FAAM (right) (Photo: Julia Mack from LMU).

International Workshop on Monsoons

IWM-6

- Hosted by the Government of Singapore 13-17 November 2017
- WMO major quadrennial workshop series for researchers and forecasters to discuss recent advances and current issues covering all time scales relevant to the forecasts of high-impact weather in the monsoon regions around the world.
- Organized by the WWRP/WGTMR Monsoon Panel.
- Co-sponsors include include the MJO Task Force, the GEWEX/CLIVAR Monsoon Panel, the S2S Steering Group, and the YMC Scientific Steering Committee.
- An effective means to transfer new science and technology to National Meteorological and Hydrological Services in these monsoon regions.
- Outcomes published in a WMO-sponsored book
- Training workshop that offers short courses to developing country NMHS forecasters sponsored by WMO.

Further information:

wmo2017iwm6@gmail.com

IWM-5 (2013)
Training
Workshop



WMO Urban Strategy

- WMO Congress 2015 Resolution 68 - Establishing a WMO cross-cutting urban focus
- WMO task team on Urban (Climate&Water, Disaster Risk, Obs, Research – GAW, WWRP, WCRP)
- Highlights:
 - Indonesia Met Service (BMKG) in collaboration with WMO has developed a concept note for Green Climate Fund on Jakarta
 - It is planned to also request funding for a project preparation phase.

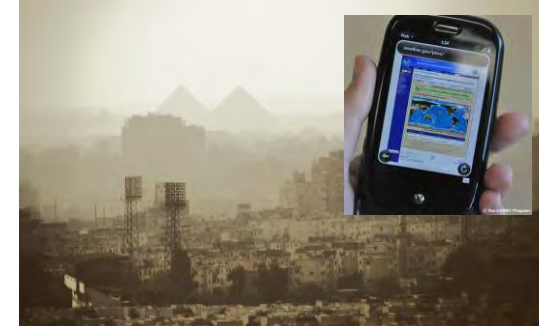
Background and Objective



Increasing Urbanization



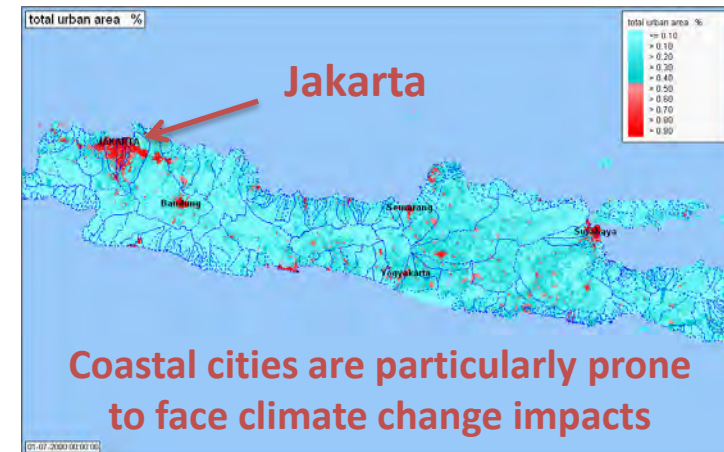
Weather and Climate extremes



Reliable meteorological, climatological and air quality information

Goal of project & overarching objective

- Enhance Jakarta's capabilities for the provision of weather, climate and air quality information
- Contribute to build urban resilience to the impacts of climate change and variability and associated weather and environmental threats
- Support urban short to long term response to the impacts of climate change and associated weather and environmental threats



Regional Development Projects

- WWRP Regional Development Projects and Forecast Demonstration Projects are intended to leverage science&innovation at regional level
- Link to GHP
- Highlights:
 - HIGH-WAY proposal submitted to DFID in October 2016
 - John Marshal involved with his companion climate project



High-Way Lake Victoria

Component 1 - Co-design, uptake and use of information and services:

This component focusses on improving regional coordination and engagement to better assess user needs, from institutional to ground-roots level, to understand the economic value of improved EWS to these groups

Component 2 – Innovation on the full value chain in the provision of

Early Warnings: This component will focus on research activities to develop innovative ways improving existing services and developing new ones through the optimal use of current and additional data sources in the sub-region

Component 3 – Operationalization of the Regional Early Warning

System in the Eastern Africa Region: This component will ensure that the Regional Early Warning System is fully operational and will put in place an institutional arrangement to ensure the sustainability of the System.



Commission of Atmospheric Science

- The mission of CAS is to support research in atmospheric science in order to reduce and mitigate disasters related to natural hazards, and enhance understanding and response to environmental change.
- It governs the WMO research activities and meets every 4-y – session this year in October
- A Science Summit involving GAW WWRP WCRP will precede the session

Improvement of the numerical models that underpin weather research and forecasting

This requires improvement of the representation of key physical processes in the atmosphere (convection, clouds and precipitation, boundary layer processes, radiation,), in the land/ocean/cryosphere, and in the exchange of water, energy and momentum between the atmosphere and the underlying surface.

From a **WWRP perspective** we are looking for a group who help identify the model improvements needed to achieve the objectives of WWRP as set out in the implementation plan, prioritise these, and initiate and carry out specific projects that will facilitate / accelerate (over and above what is being done anyway for individual models) these improvements. From a WWRP perspective this group would be linked to WGNE but focusing on understanding physical processes and coordinating / facilitating work that supports the improvement of the representation of physical processes in atmosphere and land models. Much of work is relevant at a variety of time and space scales from weather to climate

Improvement of the numerical models that underpin weather research and forecasting

How do we align WWRP objectives to the research community in this area.

Expertise is needed:

- in identifying the key deficiencies in weather and climate models and finding solutions for them
- on detailed atmosphere and land processes
- in using observations from field campaigns and routine observing platforms
- in process modelling (Large Eddy Simulation, Single Column Models, etc)

Expertise at home in:

- WGNE
- WCRP GEWEX Panels GASS and GLASS
- Elsewhere in WCRP?
- WWRP Working groups
- Research in NMHSs and academic community

Improvement of the numerical models that underpin weather research and forecasting

3 options from WWRP perspective:

- 1) Using WGNE as the focal point for this research.
- 2) initiating a joint WWRP / WCRP working group to cover this (but this would duplicate what is happening in GASS/GLASS);
- 3) **making GASS and GLASS a joint activity between WWRP and WCRP that is closely coordinated with WGNE.**

Issues:

Need to avoid duplication

How does this link to other WCRP modelling activities?

Aerosol / chemistry? New GAW SAG (Chair Vincent-Henri Peuch) with modelling focus

Others

Thank you Merci



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Six major components

1: Integrated Urban Information – Urban Analytics

Create an information layer of the relationship between the unique socio-economic nature of the urban physical and built environment and population and the needs for integrated weather and climate-related environmental services on seamless time scales

2: Multi-level urban monitoring and Data Integration

Enhancing observational capabilities, monitoring and understanding of the unique urban physical processes, including dynamical, chemical and hydrological

3: Development of urban predictive capabilities, including demonstration & validation

This output aims at building urban environment integrated prediction systems to support decision making for different applications

4: Establish an urban early warning system

This output aims at making the best use of integrated information, monitoring and predictive capabilities for establishing an urban early warning system and for developing relevant tomorrow's city case studies

5: Strengthening urban community-based preparedness and response capabilities

This output aims at strengthening the engagement of the Jakarta population and at developing multi-level training activities

6: Project management, monitoring and evaluation

Oversight, coordination, monitoring, financial management and evaluation

WWRP Implementation Plan Structure

WWRP IP consists of two documents.

- “Catalysing Innovation in Weather Science: WWRP Implementation Plan 2016-2023”:

Outlines the broad structure and vision of WWRP for 2016-2023, introduces the four societal and technical challenges, the Action Areas and objectives that are set to meet the challenges.

- “WWRP 2-year detailed plan” :

Details concrete activities within the Action Areas, together with the needed collaboration. This is an online living document, which will be updated regularly and hence allows to take into account and adjust to advances and developments reached by the research community