

WMO Integrated Processing and Prediction System (WIPPS) Overview and Roadmap for Integrating Cryosphere Information and Products

Third session of the third pole climate forum and
meeting of the TPRCC-N task team
(3-5 June 2025, New Delhi, India)



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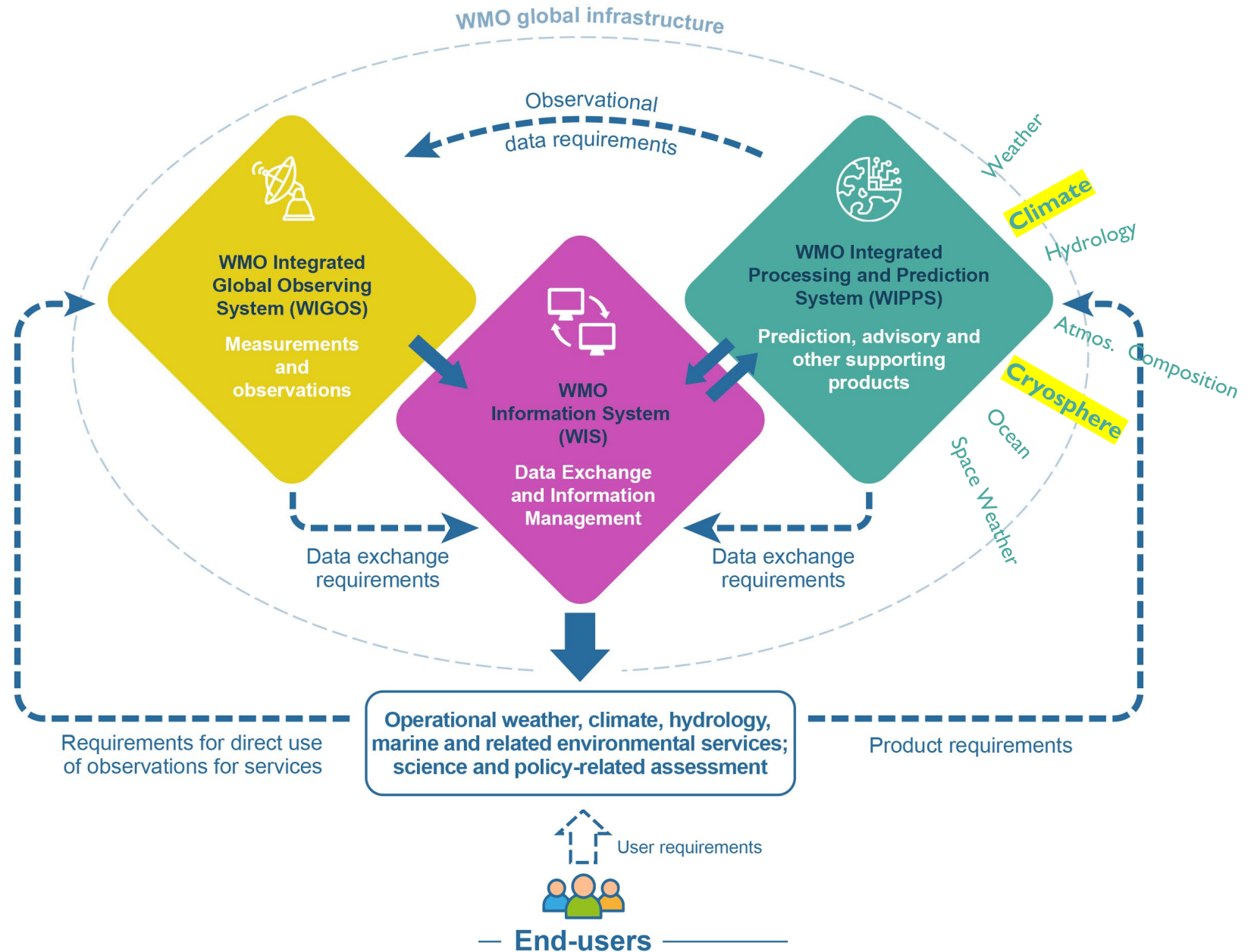
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Presentation Outline

- New contents introduced into WIPPS INFCOM-3 and EC-78 (2024)
 - Demonstration of WIPPS Rolling Review of Requirements (RRR)
 - Amendments to the Manual on the WIPPS (WMO-NO. 485) for climate prediction
- Road map for the integration of cryosphere information and products in the WIPPS
- Recommendations for cryosphere related pilot projects: AG-GCW-SC-WIPPS meeting, 3-5 Dec 2024

WMO Operational Infrastructure

- **WIGOS**: WMO Integrated Global **Observing** System
- **WIS**: WMO Information System (**Data exchange**)
- **WIPPS**: WMO Integrated processing and **Prediction** System



Demonstration of WIPPS RRR

- Decision 19 (INFCOM-3)
 - Demonstration of the WIPPS Rolling Review of Requirements (RRR), [link](#)
- Summary
 - Demonstrate the proposed WIPPS Rolling Review of Requirements (RRR) procedure in the area of **Climate Service** and Disaster Risk Reduction and Public Weather (DRR) Service
 - Will be reported to INFCOM-4 (2026)
- Procedures
 - **Collect user requirements by SC-Cli**, [link](#)
 - Review of user requirements for analyses and predictions
 - Gap analysis
 - Development of Statements of guidance
 - Development of High-Level Guidance for the evolution of WIPPS
- Action required by TPRCC-N
 - Ensure required products for operating TPRCC-N are properly included in the collected user requirements

} **SC-WIPPS / ET-OCPS**



Roadmap for Cryosphere

- Decision 20 (INFCOM-3)
 - Road map for the integration of cryosphere information and products in the WIPPS, [link](#)
 - Summary
 - Support WMO Members in understanding, responding to, mitigating, and adapting to cryospheric changes and their downstream impacts, including increased disaster risks with **five key priorities** will be addressed jointly by AG-GCW and SC-WIPPS
1. Integration of cryosphere products available from GPCs-SSP and GPCs-SP in the Manual on WIPPS
- Recommended activities
 - Verification of sea ice concentration

C	Core data			
R	Recommended data			
F	Feasibility to be data			
	Not on the list of WIPPS products, but available at some centres			
		Not requested by INFCOM-3		
Requested type	Variable	GPCs-SSP	GPCs-SP	GCR
C	Snowfall/depth	x	x	x
C	(SWE)/ Water Equivalent of Snow Cover	x	R	x
R	Sea ice cover/concentration	x	R	x
F	Snow temperature	x	x	x
F	Sea ice temperature	x	x	x

Roadmap for Cryosphere

2. Daily outputs from **seasonal** models in support of the detection of extreme events

- Purpose: to detect extreme events
- Feasibility of generating and disseminating daily outputs – currently monthly averaged outputs
- *[Note] GPCs-SSP generate and send daily averaged products to LC-SSPMME*

3. Survey on other available products on the cryosphere or relevant to characterize changes in the cryosphere

- Purpose
 - (1) opportunities for new products to be considered for WIPPS,
 - (2) interest on obtaining designation as WIPPS centres,
 - (3) on improving the verification of identified products, and
 - (4) potential intercomparisons of products from coupled models and from post-processing applications, e.g. for snowfall quality estimation.

4. Designation of RSMC for Limited Area NWP for polar regions



Changes in the Manual on the WIPPS for climate

- Resolution 19 (EC-78)
 - Amendments to the Manual on the WMO Integrated Processing and Prediction System (WMO-NO. 485) for climate prediction, [link](#)
- Summary
 - Change of SSF and LRF to SSP and SP, respectively, to ensure consistency across sub-seasonal, seasonal, annual to decadal predictions in the Manual
 - Establishment of two new WIPPS activities and designation of their centres
 - Global Climate Reanalysis (GCR): ECMWF and NASA
 - Coordination of assessment of multiple climate reanalysis (LC-GCR): ECMWF
 - Designation of four GPCs-SSP
 - Brazil (Centro de Previsão de Tempo e Estudos Climáticos (CPTEC)), China, Japan, and Russia
 - Introduction of 'contributing centres' under [LC-SSPMME](#)



Changes in the Manual on the WIPPS for climate

- Summary
 - Introduction of additional recommended products to GPCs-SSP
 - Soil moisture (Top 20, 100cm), Td, Tmin and Tmax (at 2m), Specific humidity (850hpa), Geopotential height (850 and 200hPa)
 - Note: The minimum and maximum temperatures at 2 m are not daily means; they are selected from a 24-hour window.
 - Introduction of additional recommended products to GPCs-SP
 - Sea-ice concentration, Snow water equivalent, u and v (10m and 200 hPa)
 - Removal of the password protection for downloading digital products from LC-SPMME

Note: product from Pretoria remain password-protected as they did not provide consent for unrestricted access
 - Verification of two activities (SSP & SP) are relocated under LCs' responsibility
 - Inclusion of publication of GADCU as a mandatory function of LC-ADCP



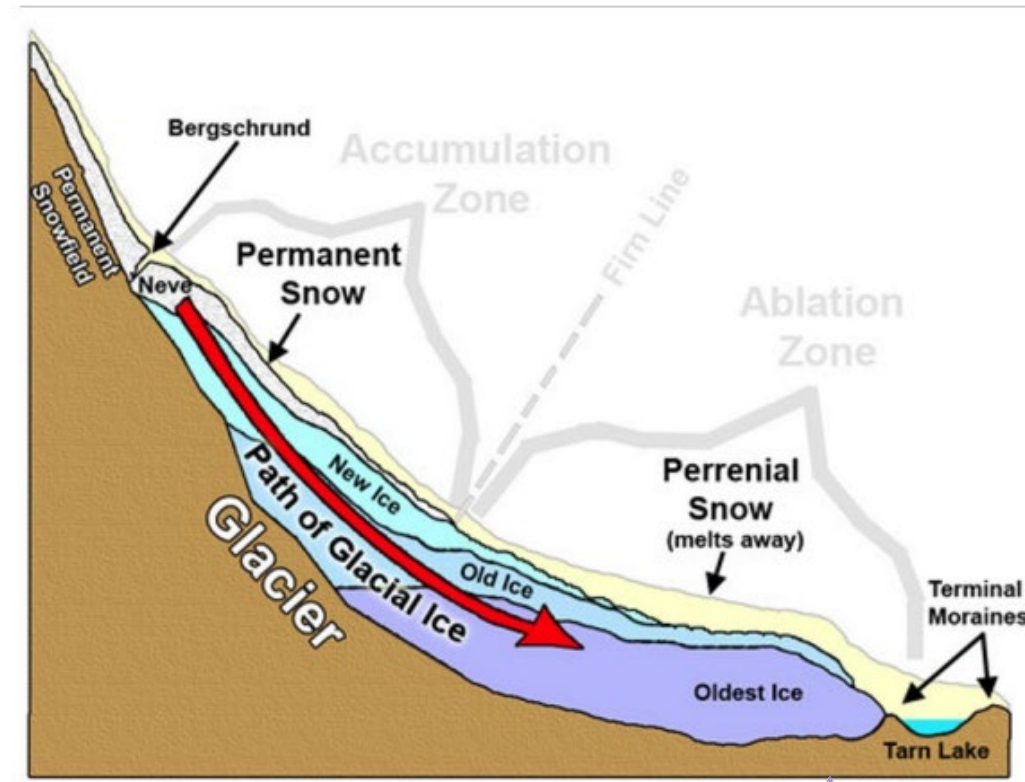
Roadmap for Cryosphere: potential WIPPS Pilot Projects (under preparation)

5.1 Advances in modeling cold region hydrologic processes

Anticipated benefits: Advances in the numerical robustness and the predictive performance of models that are used operationally

Proposed activities:

- Evaluate the accuracy of algorithms to simulate the dynamics of glaciers, seasonal snow, the ground thermal regime, and streamflow in cold regions.
- Evaluate the applicability of alternative representations of cold region hydrological processes in the operational environment used by the River Forecast Centers in the USA and Canada.
- Evaluate interoperable modeling frameworks across different model development groups



Roadmap for Cryosphere: potential WIPPS Pilot Projects (under preparation)

5.2 Monitoring and prediction of cryosphere related hazards as a joint effort between GCW and TPE based on existing literature and experience, to

- Prepare an inclusive list of cryosphere related hazards (polar and high mountains, e.g. snow, glaciers, permafrost, ocean cryosphere hazards) based on contributions from experts;
- Identify observing requirements (in-situ and remote sensing, including satellite) , including recommendations for potential inclusion in the requirements for Global Basic Observing Network (GBON);
- Identify core and recommended products for the monitoring and prediction of cryo related hazards, including model resolution requirements to support issuance of EWs (think in terms of future capabilities)

Example: Key challenges in monitoring hazards for GLOFs for usable products for EWS

- REAL-TIME DATA: crucial for imminent events
- EXTREME-EVENTS THRESHOLDS: the understanding of the phenomenon + adaptive thresholds
- Align observation frequency with hazard dynamics (e.g., seasonal snowmelt, monsoon rain)
- Climate downscaling

5.2 Monitoring and prediction of cryosphere-related hazards

Considerations:

- Many cryosphere hazards are cumulative effects – and could be predicted using the predictability of meteorological parameters, e.g. temperature and precipitation.
- Improved predictability of weather in polar and mountain regions is a first prerequisite.
- For mountain environments –critical to have observations of precipitation and temperature at high elevation
- Examples exist on AI and ML algorithms to predict GLOF and other events based on historical data, satellite imagery, and environmental conditions: these require evaluation

Status: planning under way – experts to be engaged in Q3/4 - 2025



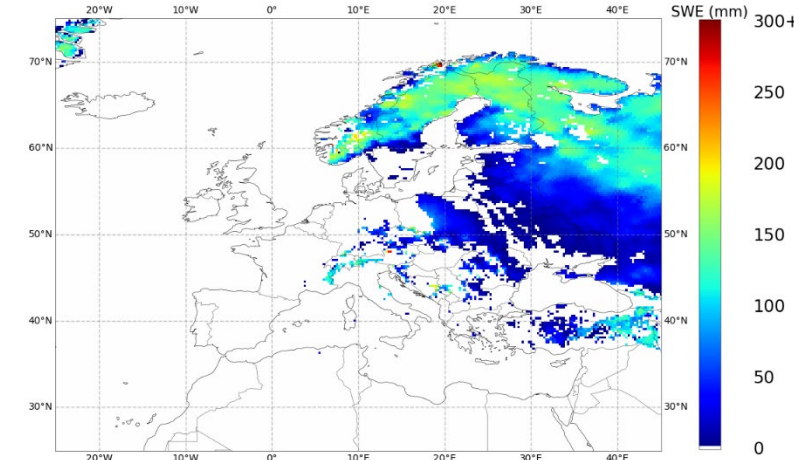
Recommendations made to CGMS Plenary (3 June 2025)

➤ Sustained monitoring of hazards in polar and high mountain regions: e.g. rapidly forming glacier lakes, snow, ice and frozen ground dynamics, icesheets

- There is huge potential for integrating snowpack and glacier runoff modelling into hazard forecasts and EWS in mountain catchments
- To do so we need:
 - *sustained satellite monitoring of the cryosphere (temporal & spatial coverage)*
 - ✓ high-alpine slopes and glacier changes
 - ✓ changes in snowpack
 - ✓ mountain precipitation
 - ✓ Icebergs and icesheets
 - *Improved retrievals of cryosphere-related products from existing satellite observations for mountain regions, e.g. snow cover*
 - *multisensory products for consistent snow and ice products*

A Space-based polar and cryosphere observations Task Team – being established by GCW to advocate for these with the satellite agencies

H13 Snow water equivalent by MW radiometry 20230213



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Thank you.



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