WEATHER CLIMATE WATER
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WMO OMM
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Organisation météorologique mondiale
Organización Meteorológica Mundial
Всемирная метеорологическая организация
المنظمة العالمية للأرصاد الجوية
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Annex: 1 (available in English only)

Subject: Announcement of the ninth WMO Workshop on the Impact of Observing Systems on Numerical Weather and Earth System Predictions and Implications for Observing System Design and Evolution

Action required: To distribute the announcement to interested parties

Dear Sir/Madam,

The World Meteorological Organization (WMO) is organizing the ninth WMO Workshop on the Impact of Observing Systems on Numerical Weather and Earth System Predictions and Implications for Observing System Design and Evolution, from 27 to 30 September 2027. The impact workshop will be hosted by the Meteorological Service of Canada (MSC), Environment and Climate Change Canada (ECCC) and will be held at McGill Faculty Club and Conference Centre – McGill University, Montreal, Canada. The workshop will be held in a hybrid format, enabling participants to attend either in person or online, and will be conducted in English.

The impact workshop series is an important, usually quadrennial, forum for providing scientific evidence on the value and impacts of surface- and space-based observing systems, on different applications, including Numerical Weather Prediction (NWP) and other Earth system applications, such as climate. The ninth impact workshop will assess the impacts of diverse data sources, including satellites, ground-based remote sensing systems, private-sector data providers, Internet of Things (IoT), Analytics of Things (AoT), Uncrewed Systems/Vehicles (such as aircraft, drones, gliders) and citizen science. It will also address the design, evolution, and optimization of observing systems. Artificial Intelligence (AI) is recognized as a cross-cutting enabler for observation impact assessment, forecasting, modelling and observing system optimization. The workshop will further consider continuous refinement of observational requirements through the WIGOS OSCAR/Requirements database and the feedback between impact assessment and the observing system design.

Participation in the impact workshop is open to all experts, including academia and the private sector, active in the field of impact studies of the observing systems, either from NWP centres, or from any other institutes or communities involved in Earth system predictions and to those involved in design, evolution, and optimization of observing systems and networks.

The outcomes of the workshops aim at the development of evidence-based recommendations to optimize observing systems, identify key gaps and investment priorities, strengthen links between impact assessments and observational requirements, and enhance collaboration among scientific, operational, public, and private communities.

To: Permanent Representatives of Members with WMO

cc: Hydrological Advisers
Presidents and vice-presidents of technical commissions
Presidents of regional associations
Chair and Vice-Chair of the Research Board
Members of the INFCOM Management Group
President and Vice-Chancellor of McGill University

A Scientific Organizing Committee, chaired by Dr Erik Andersson, will oversee the workshop and will be responsible for overall organizational matters, including the selection of papers for oral presentations or poster displays, and drafting the workshop recommendations.

The purpose of this letter is to announce the workshop, provide the themes and topics to be addressed at the workshop (available in the annex), encourage the experts to conduct necessary experiments and studies ahead of the workshop, and prepare for abstract submission. The online abstract submission is already open and will remain open until mid-May 2027.

Those wishing to participate in the workshop are kindly requested to consult the annex, but also to monitor the workshop website.

More details will follow in due course. Should you have any further questions regarding the workshop, do not hesitate to contact us via the workshop email address: nwp9@wmo.int.

I should be grateful if you would make this announcement widely known within your respective Service and beyond.

Yours faithfully,



Ms Ko Barrett
for the Secretary-General

WMO Workshop on the Impact of Observing Systems on Numerical Weather and Earth System Predictions and Implications for Observing System Design and Evolution

Overview

The ninth workshop on the Impact of Observing Systems on Numerical Weather and Earth System Predictions and Implications for Observing System Design and Evolution will be organized by WMO and will be hosted by Meteorological Service of Canada (MSC), Environment and Climate Change Canada (ECCC) and will be held at McGill Faculty Club and Conference Centre – McGill University, Montreal, Canada, from 27 to 30 September 2027. The workshop will be organized in hybrid form and will be conducted in English.

Background and history

WMO impact workshop series is an important, usually quadrennial, venue for providing science evidence on the impacts of surface- and space-based observing systems, on short- to medium- and longer-range forecasting including climate monitoring. It is held under the auspices of the WMO INFCOM/SC-ON/Expert Team on Earth Observing System Design and Evolution (ET-EOSDE). Conclusions from the workshop provide guidance on how to optimize the use of the current global observing system as well as help guide its future evolution.

The previous eight workshops in this series took place successively in Geneva (April 1997), Toulouse (March 2000), Alpbach (March 2004), Geneva (May 2008), Sedona (May 2012), Shanghai (May 2016), then in a virtual format, in December 2020, and the most recent one in Norrköping, on 27–30 May 2024. Results from a multitude of observing system experiments, with both global and regional aspects, were presented each time and conclusions were drawn concerning the contributions of the various components of the observing systems to forecast skill at short and medium range.

Workshop proceedings for the first four workshops were published as WMO World Weather Watch Technical Reports TD Nos. 868, 1034, 1228, 1450 and are available from the WMO e-Library. The *Final Report of the Fifth WMO workshop on the Impact of Various Observing Systems on Numerical Weather Prediction* was published as WMO Integrated Global Observing System (WIGOS) Technical Report No. 2012-1 and is available on the WMO website[1]. The final reports with presentations on the sixth, seventh and eighth workshops were also published on the WMO website[2,3,4]. Like for the previous eight workshops, it is planned to produce a workshop report, which will be published as a WMO technical publication and will include the presentations submitted by the participants.

Since then, both the global observing systems and the numerical weather prediction (NWP) systems that utilize them have undergone significant changes. Many space missions have been launched, and ground observation systems networks have been enhanced. NWP systems are being coupled with models and data assimilation systems for the ocean, land, cryosphere and atmospheric composition, in pursuit of a whole Earth system predictions (ESP) capability. There has also been a continued trend toward using techniques other than Observing System Experiments (OSEs) and Observing System Simulation Experiments (OSSEs) to document data impact, such as adjoint- and Ensemble-based Forecast Sensitivity Observation Impact (FSOI and EFSOI) and other quantitative assessment techniques and estimates of analysis uncertainty.

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[1] NWP5_Sedona2012_Final_Report
[2] NWP6_Shanghai2016_Final_Report
[3] NWP7_2020_Final_Report
[4] NWP8_Norkoepping2024_Final_Report_and_presentations

As a result, in this upcoming ninth workshop, we will continue to focus on assessing the impacts of various observing systems in all Earth system domains on NWP, but we will extend the scope to also encompass the impact assessment of the various observing systems to other Earth system applications. This is done in order to achieve a comprehensive understanding of the value of the observations and to support the strategic goals of WMO.

Scope

- Observation impact across applications, with NWP maintained as a central component, reflecting its fundamental importance for global operational meteorology, while explicitly extending the scope to all Earth-system domains to address a broader spectrum of societal and environmental effects.
- Approaches to design, evolution, and optimization of observing systems and networks, encompassing space-based and Earth-based observing components, including global and regional frameworks (e.g. Global Basic Observing Network (GBON), Regional Basic Observing Network (RBON)) and evolving satellite constellations, with emphasis on the effective use of observation impact assessment to inform observing system design, prioritization, and investment decisions.
- Impact of observations from space-based and Earth-based data providers, including ground-based remote sensing systems, the private sector, the Internet of Things (IoT), Analytics of Things (AoT), Uncrewed Systems/Vehicles (such as aircraft, drones, gliders) and citizen science.
- Evaluation, implementation, and ongoing refinement of observational requirements, including the application and interpretation of the data in the OSCAR/Requirements database, and the feedback mechanisms linking impact assessment, requirements definition, and observing system design at global, regional, and national levels.
- Role of Artificial Intelligence (AI) as a cross-cutting enabler, spanning modelling, forecasting, impact assessment, and observing system design, with particular attention to:
    - the implications of AI-based methods for the assessment of observation impacts across applications; and
    - the potential of AI-driven approaches to support the optimization and future evolution of observing systems.

Themes and topics

1. Theme 1: Assessing observational needs: current and future

1.1. WIGOS Rolling Review of Requirements (RRR) outcomes (this will be an opportunity to present technology agnostic requirements to the community). Increase visibility of RRR.

2. Theme 2: Assessing impact of observing systems

2.1. Regular impact assessment (of Earth-based networks, space-based systems, etc.) on NWP systems.

2.2. Regular impact assessment (of Earth-based networks, space-based systems, etc.) on non-NWP: High-resolution nowcasting/NWP, hydrology, climate, cryosphere, ocean, Earth system prediction, etc.

2.3. Data assimilation methods and diagnostics for observation impact assessment.

3. Theme 3: Assessing impact of observing systems using AI

3.1. Assess and compare impacts using Artificial Intelligence-based global NWP. Comparison with traditional NWP.

3.2. Assess and compare impacts using various applications that use AI-based global NWP.

4. Theme 4: Assessing the impacts of emerging/new observing systems

4.1. Internet of Things (IoT).

4.2. Internet of Animals (IoA), for example, instrumented mammals.

4.3. Citizen data.

5. Theme 5: Local measurement, global impact.

5.1. Test cases of assessing impact of geographically isolated Earth-based measurements on various applications including NWP.

5.2. This will be an opportunity to highlight the individual stations' benefits: to increase motivation and show the benefits gained.

6. Theme 6: Observing systems design and evolution: tools, best practices and connection to impact assessments

6.1. Satellite constellations design and evolution.

6.2. Earth-based networks design and evolution.

6.3. Synergistic space and Earth-based systems design and evolution.

6.4. Exploring AI-based approaches for observing systems intelligent design and evolution.

7. Theme 7: Impact assessment of global and regional observing networks, including RBON, GBON, Global Climate Observing System (GCOS) Surface Network (GSN), GCOS Surface Reference Network (GSRN), GCOS Upper-air Network (GUAN), GCOS Reference Upper-air Network (GRUAN), Global Ocean Observing System (GOOS) networks, and other relevant global/regional observing networks.

Expected outcomes:

- Consolidated, impact-based recommendations:

  The workshop will aim to deliver a set of consolidated recommendations, grounded in observation impact assessment, addressing:

  - areas where observing systems provide the greatest benefit across applications
  - identified gaps, limitations, or inefficiencies in current observing networks
  - opportunities to better target future investments and development priorities
  - Science-based input to the design and evolution of observing systems:
    - The workshop is expected to provide strategic, assessment-based insight to support the design, evolution and optimization of global, regional and national observing strategies, with particular attention to coordination between space-based and Earth-based observing components

- Strengthened linkage between impact assessments and observational requirements: the workshop will aim to reflect on existing observational requirements, including OSCAR/Requirements, and to provide feedback on the interpretation and application of requirements at global, regional, and national levels

- Enhanced cross-community dialogue and coordination:

  The workshop is expected to strengthen interaction and mutual understanding between:

  - observation impact and modelling communities
  - observing system designers and operators
  - space-based and Earth-based observing communities
  - public and private stakeholders

- Workshop report

  The workshop will produce a formal outcome report capturing key findings, conclusions, and recommendations.

Who should attend and what is expected

Experts who have results of impact assessment of various observing systems, representing space-based and surface-based observing communities, observing system designers and operators, researchers, and public and private stakeholders are invited to submit a short abstract and participate in the workshop.

Contributions to the workshop should fall within general topics (present under the section Themes and topics above) and they will frame the workshop sessions (to be determined at a later stage). Note that to increase the chances of being responsive to this call, abstracts should clearly articulate what type of impact assessment(s) will be presented and the amount of evidence that the study will have amassed and its conclusions will be based on.

During the workshop, the results presented will be reviewed in plenary discussion sessions and a consensus view will be formed where possible. Conclusions to help guide the design and evolution of components of the WIGOS[5] for NWP and ESP in general, will be drawn.

Participation

1. Abstract submission

- Subject matter experts who want to present their results should submit one or multiple abstracts through the workshop website. These will be reviewed by the scientific organizing committee. Authors will have to create a user account.
- The submissions will be reviewed by the Scientific Organizing Committee.
- See the corresponding abstract submission deadline below.

[5] WIGOS is the overarching framework for all WMO observing systems and for WMO contributions to co-sponsored observing systems in support of all WMO Programmes and activities. Currently the component systems are the Global Observing System (GOS), the WMO Hydrological Observing System (WHOS) and the observing components of the Global Atmosphere Watch (GAW), the Global Cryosphere Watch (GCW) and Space Weather Observing System (SWOS), including their surface-based and space-based elements.

2. Registration

- The authors who have been accepted to present at the workshop should register through the workshop websitehttps://wmo.int/events/workshop/wmo-9th-workshop-impact-of-observing-systems-numerical-weather-and-earth-system-predictions-and-0 (to be available in due time).
- Non-authors (without presentation) who want to participate in the workshop should seek approval from WMO. This should be done through the workshop website.
- See the corresponding registration deadline below.

3. Financial support request

- WMO expects to have limited financial resources available to support participation of a small number of participants. An early indication of the need for financial support should be submitted to the WMO Secretariat, via email to Mr Krunoslav Premec (kpremec@wmo.int). Priority will be given to support participants from developing countries who will present their abstracts at the workshop.
- See the corresponding financial support request deadline below.

Important dates

Start of the abstract submission period (through website)	October 2026
Deadline for abstract submission	15 May 2027
Deadline for requesting financial assistance	15 May 2027
Acceptance of abstract and decision on financial assistance	15 June 2027
Deadline for requesting an invite to workshop (without abstract)	1 July 2027
Notifications on acceptance of participation (for non-authors)	15 July 2027
Deadline for registration (authors)	15 July 2027
Deadline for registration (non-authors)	15 August 2027
Workshop date	27–30 September 2027

Organizers

Scientific Organizing Committee (SOC)

Erik Andersson	INFCOM/SC-ON/ET-EOSDE Chair, SOC Chair
Volker Lehmann	DWD, Germany, SOC Vice-chair
Sid Boukabara	NASA, USA
Seiyoung Park	KMA, RoK
Jianxia Guo	CMA, China
Paolo Ruti	EUMETSAT, Germany
Elisabetta Carrara	BoM, Australia
Rossella Arcucci	Imperial College London, UK
Kristian Mogensen	ECMWF, UK
Shannon Kaya	MSC, ECCC, Canada
Vijay Tallapragada	NOAA, USA
Yanina García Skabar	SMN, Argentina
Yi Huang	McGill, Canada

Workshop website

Information about the workshop including abstract submission, registration, relevant news, updates and the workshop programme can be found under:

WMO 9th Workshop on the Impact of Observing Systems on Numerical Weather and Earth System Predictions and Implications for Observing System Design and Evolution.

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