Application for Endorsed/Partner Projects, proposals or events

When you submit this form, it will not automatically collect your details like name and email address unless you provide it yourself.

* Required

The Scientific Steering Committee (%C) of the World Weather Research Programme (WWRP) provides endorsement for a) projects, b) programmes and c) initiatives that plan to contribute to the aims of the WWRP, as outlined in the WWRP Implementation Plan. Projects seeking endorsement through WWRP may be either a) funded or b) in the process of seeking funding through a proposal to a funding agency. Projects that are not seeking speciźc funding through a proposal, but rather are convening the research community through a scientific event (meeting or workshop), may also receive an endorsement for that meeting.

The WWRP Scientific Steering Committee (SSC) also oPers inclusion of partner projects that plan to contribute to the aims of the WWRP, as outlined in the WWRP Implementation Plan. Partner projekt:s are closer, and potentially longer, relationships with WWRP than are endorsed projects. **AII applications am accumulated until the 20th of each month when they will be circulated to the relevant Chairs of Projects/Working Groups and subsequently to the WWRP ScientiŃc Steering Committee (SSC) for their consideration. The outcome will be available early in the following month.**

1. Name of the Project/event Leader *

Pierre-Marie Poulain

2. Email of the Project;/event Leader *

ppoulain@ogs.it

3. Affiliation of the Project/event Leader *

OGS – National Institute of Oceanography and Applied Geophysics

4. Name/Title of the Project/event *

M3E - Mediterranean Extreme Events Experiment

5. What are the start and end dates for your project/event? *

September 2025 - December 2028

6. Please list the partners in your project (if any) *

- **OGS - Istituto Nazionale di Oceanografia e di Geofisica Sperimentale:** Pierre Marie Poulain, Milena Menna, Antonio Bussani - Coordinator
- **CMCC - Centro euro-mediterraneo sui cambiamenti climatici*:*** Emanuela Clementi, Viviana Piermattei, Enrico Scoccimarro, Paola Mercogliano, Mario Raffa, Angelo Campanale - Co-Coordinator
- **Agenzia Italia Meteo:** Carlo Cacciamani, Lina Porciello, Giacomo Davide Pagliaro, Virginia Poli, Thomas Gastaldo
- **E-SURFMAR/MF:** Olivier Desprez de Gesincourt, Sebastien Pere
- **ECMWF - European Centre for Medium-Range Weather Forecasts:** David Lavers
- **CNR ISMAR – Consiglio Nazionale delle Ricerche Istituto di Scienze Marine:** Katrin Schroeder, Jacopo Chiggiato
- **Università degli Studi di Napoli Parthenope:** Giannetta Fusco, Yuri Cotroneo
- **Alma Mater Studiorum Università di Bologna – Dipartimento di Fisica e Astronomia**: Paolo Oddo
- **UC San Diego - SCRIPPS Institution of Oceanography:** Luca Centurioni, Anna Wilson, Marty Ralph

7. If your project;/event has a website, please provide the link or just state "not available'' *

https://argo.ogs.it/medsvp/project.php?id_project=141

8. Which WWRP Project does the proposed project/event align with, as outlined in the WWRP Implementation Plan (2024 – 2027) community.wmo.ingen/projects-1 *

☐ Polar Coupled Analysis and Prediction for Services (PCAPS)

☐ Sub-seasonal Applications for Agriculture and Environment (SAGE)

☐ Urban Prediction

☐ Integrated Precipitation and Hydrology for Early Action (InPRHA)

☒ Progressing EW4AII Oriented to Partnerships and Local Engagement (PEOPLE)

☐ Aiding Decision-making in Vulnerable Africa with Nowcasting of ConvEction (ADVANCE) project

9. Which WWRP Working Group or Expert Team does the proposed project/event align with, as outlined in the WWRP Implementation Plan (2024 - 2027)? Look at our website for more information on the Working Groups: community.wmo.int/en/activity-areas/wwrj *

☐ Nowcasting and Mesoscale Research

☐ Predictability, Dynamics and Ensemble Forecasting 1 if applicable a second option

☐ Forecasting Verification Research ☒ second option (if applicable)

☒ Data Assimilation and Observing Systems

☐ Weather Modification ☒ third option (if applicable)

☐ Societal and Economic Research Applications

☐ Tropical Meteorology Research

10. Which overarching goal of WWRP does the project;/event address, as outlined in the WWRP Implementation Plan (2024 - 2027)? *

☐ Advance research of the Earth system on timescales from minutes to months and, through the science-for-services value cycle approach, transition this research to provide local and regional actionable weather information that is needed for communities to reduce vulnerability to hazards, and advance applications such as renewable energy, agriculture and health

☐ Enhance the warning process to account for compounding and cascading risk, and the evolving nature of weather impacts of hydrometeorological events in a changing climate;

☒ Quantify and reduce uncertainty in predictions on timescales from minutes @ months, increase the understanding of decision- making under uncertainty, and develop active communication sPategies of uncertainty for informed decision-making

11. Which of the **AW4R3E** (Advancing Weather Research to Reduce Risk to Societies) principles does the project/event adhere to, as outlined in the WWRP Implementation Plan (2024 - 2027) *

☐ Ensure that people are atau of threat and mitigation ations

☐ Be aware of all people and their needs

☒ Increase forecasters' and decision makers' awareness of appropriate tools and techniques

☐ Ensure that researchers are aware of each other's work

12. Are you applying for a partner or endorsed project or an event? *

☒ Endorsed Project

☐ Partner Project

☐ An event/workshop/initiative. (with or without confirmed funding source yet)

13. Please provide the name of the points of contact (POCs) to liaise with WWRP regarding all communications between the project and WWRP? *

Pierre-Marie Poulain

Please note:

- The POC has the obligation to inform WWRP of change» and update» annually.
- The POC musL also acknowledge I/I/I/I/RP endorsement in project publications with the following statement: 'Thiz work iz a contribution to the World Weather Research Programme (I/I/I/I/RP) of the World Netearological Organization (WNO)'
- There is agreement that a summary of the planned activities of the endorsed project (including their logos, if applicable) will be made public through the website of the WWRP and other appropriate meansof communication (e.g. WWRP e-newsletter).

14. Please provide details in terms of funding and indicate whether the funding is in hand, promised, or pending a proposal. *

In hand

15. Do you accept if the research data of the project relevant to WWRP will be made available in accord with the WMO data sharing policy and if yes, how will you adhere to this policy? *

YES,

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XXXXXX Summaries for all Projects, events and Proposals

16. Please provide a short summary of the project;/event. (Maximum 250 words) *

Extreme weather events in the Mediterranean, such as the 2019 Acqua Alta in Venice, Storm Alex (2020), Storm Daniel (2023), and the devastating floods in Emilia-Romagna (2023–2024), have highlighted the urgent need for improved forecasting to mitigate damages across the region. A key scientific question arises: could enhanced observations of oceanographic conditions, sea surface properties, and air–sea interactions improve forecasts of such high-impact storms?

In early 2026, the Global Atmospheric River Reconnaissance Campaign (GARRP) will assess whether additional observations over the North Pacific and North Atlantic can increase medium-range forecast skill. Under this umbrella, the Mediterranean Marine Meteorological Experiment (M3E) is proposed to extend GARRP's scope to the Mediterranean Sea, a region where air–sea interactions strongly influence cyclogenesis and extreme weather events. The project focuses on the increase of sea surface in situ observations combined with atmospheric and oceanographic forecasting activities to show the benefits.

Two target areas are identified: the Ionian Sea and the Tyrrhenian Sea. The Ionian, under-monitored by surface drifters, plays a central role in cyclonic activity, including Medicanes, while both seas are hotspots of cyclone occurrence and persistence. Systems originating here often trigger severe precipitation and flooding, even far inland, as observed in the recent Emilia-Romagna floods.

The objectives of M3E are threefold: (1) improve forecasts of extreme Mediterranean weather, including Medicanes and their coastal impacts; (2) better understand rapid cyclone development and atmospheric river activity in the region; and (3) contribute Mediterranean-specific expertise and data to the broader GARRP initiative.

17. Please provide details on the methodology of your project. (Maximum 450 words) *

The Mediterranean Marine Meteorological Experiment (M3E) will combine targeted in-situ observations and numerical modeling to assess the role of ocean–atmosphere interactions

in the development of extreme atmospheric and oceanic weather events in the Mediterranean Sea. The methodology follows three complementary approaches:

1) Observational Campaign Design and implementation: M3E observational campaigns will focus on two key areas: the Ionian Sea and the Tyrrhenian Sea. These regions were selected due to their high cyclone occurrence and persistence, and their role as hotspots for cyclogenesis, Medicanes, and moisture transport. Drifting buoys equipped with barometers, thermometers, and GPS will be deployed to capture sea-level pressure and surface temperature variability. Special emphasis will be placed on the Ionian Sea, where observational coverage is currently sparse.

Two campaigns are initially planned: the first during September-October 2025 and the second one at the beginning 2026 during which several drifters will be deployed in different areas: the Sicily Channel and the Ionian Sea in 2025, and the Tyrrenian Sea in 2026.

2) Atmospheric Data Assimilation and Forecast Sensitivity Studies**:** All observations collected during M3E will be transmitted in near-real time to the WIS2 system. The new data will be assimilated into numerical atmospheric prediction systems to test their impact on forecast skill. Specific emphasis will be given to assess changes in the prediction of cyclone genesis, intensity, and track as well as to evaluate improvements in the representation of extreme events.

3) Ocean impact Forecasting and sensitivity analysis: the Copernicus Marine Service regional ocean forecasting model (MedFS) will be used to study the impact of cyclones in the regions of interest on the ocean circulation in terms of coastal sea level and sea temperatures, at the surface and at depth. The MedFS could also be run with and without the surface drifter data assimilated in the atmospheric models to show the impact of atmospheric forecast accuracy on sea level and marine temperatures.

4) Atmospheric Diagnostic and Modeling Analysis**:** Using both observational data and high-resolution regional models, M3E will analyze the physical mechanisms driving rapid cyclone development in the Mediterranean. Case studies of recent events (e.g., Emilia-Romagna floods, Storm Daniel, Medicane Ianos) will provide a baseline for comparison.

The expected outcomes are as follows. The integrated methodology will allow the quantification of atmospheric forecast improvements linked to additional Mediterranean ocean surface observations. Results will provide guidance on the optimal observing system design for the specific goal of the project and contribute to the global GARRP effort. Ultimately, M3E aims to demonstrate how more accurate air–sea observations in the Mediterranean have an impact on extreme events both in the atmosphere and ocean systems.

18. Please provide more detail about the project/initiative and how it relates to WWRP - including how you will facilitate interaction with the related WWRP groups. (Maximum 450 words)

The Mediterranean Extreme Events Experiment (M3E) is designed to complement the objectives of the World Weather Research Programme (WWRP), which promotes

international cooperation in advancing the science of weather prediction, with a focus on surface ocean measurements for atmospheric and oceanic forecast improvements, ultimately supporting resilience in vulnerable regions.

M3E aligns strongly with WWRP's mission by addressing one of the most critical forecasting challenges in the Mediterranean basin: extreme cyclonic activity and associated heavy precipitation and extreme storm surge events. These phenomena, such as Medicanes, stationary cyclones, and multi-day rainfall episodes, storm surge and inundation often lead to high socioeconomic impacts. The experiment directly responds to WWRP priorities by:

- Enhancing the understanding of atmospheric mesoscale and regional processes, especially air–sea interactions influencing Mediterranean cyclogenesis.
- Connecting atmospheric forecast predictability and accuracy to oceanic circulation changes and storm surges;
- Testing how targeted observations and data assimilation strategies can reduce uncertainties in medium-range atmospheric forecasts and how this affects ocean predictability.

M3E will also operate under the umbrella of the Global Atmospheric River Reconnaissance Campaign (GARRP), itself closely linked with WWRP's emphasis on coordinated global field campaigns. By proposing the Mediterranean as an additional focal region, M3E ensures that the unique dynamics of semi-enclosed seas are represented within this global initiative. If proven successfully in 2026 we could propose this as a contribution to the UN Ocean Decade for Sustainable Development.

19. Any additional comments, you consider relevant. *