

COST Action CA19109 “MedCyclones”**Deliverables D1.6, D2.6 and D3.5**

Yearly internal report on dissemination strategies, stakeholders involvement and products tailored to their needs
(in WG1, WG2 and WG3)

2nd Year: 04 November 2022

Common Communication Activities

The **dedicated website** (<https://medcyclones.utad.pt/>) and social media channels have been updated, populated and disseminated within and beyond the MedCyclones community.

Three mailing lists, one for each WG, and a mailing list for the Management Committee, have been constantly updated with newcomers, to ensure information flows among the Action members:

WG1: medcyc_wg1@cyi.ac.cy

WG2: medcyc_wg3@cyi.ac.cy

WG3: medcyc_wg3@cyi.ac.cy

MC: medcyc_mc@cyi.ac.cy

Clear information on how to join the Action is provided on the website. As soon as the e-COST platform was updated, all the Action members were kindly requested to subscribe to the WGs of their interest.

Moreover, additional social media accounts have been created for MedCyclones community. On a dedicated [YouTube channel](#) we store all the videos related to Mediterranean cyclones:

<https://www.youtube.com/channel/UCPXk3IHU3Q7JnMsEVD05P4A>

The MedCyclones [Twitter](#), [Facebook](#) and [LinkedIn](#) accounts are used to publish news from WG activities and discuss with scientists and the general public events related to Mediterranean cyclones. So far, more than 3.500 users have interacted with the MedCyclones social media accounts.

WWRP endorsement

MedCyclones is still endorsed by the World Weather Research Program (WWRP) of the WMO, in order to connect our research especially with the Tropical Meteorology Research Working Group and the High-Impact Weather Project.

On 26 August 2022, the Action Vice-Chair (Silvio Davolio) reported on Action activities at the WWRP Scientific Steering Committee meeting, held within the WWRP Symposium 2022 in Geneva, Switzerland.

Meetings

During the second year, two **WG meetings** (online) have been organized to provide news on the ongoing research initiatives among the scientific community, to foster new initiatives and in order to better coordinate and steer the research activities of the Action participants, as well as to share new scientific findings and to promote collaborations and further involvements in the network. Moreover, as soon as each research initiative has started to organize, specific meetings with the involved participants have been set up. As shown in the Table below and as detailed in the following, a number of meetings have been held.

On 3 January 2002, a MedCyclones on-line meeting took place, organized by the Weizmann Institute of Science in Israel, by Dr. Shira Rave-Rubin (WG2 leader). Almost 20 oral contributions were presented. Although it was planned as an in-person meeting, Covid emergency situation obliged to make it online.

The first MedCyclones Workshop and a Training School were organized in Athens between 27 June – 02 July 2002. **It has been the first opportunity for the community to meet all together in person.**

In the following table, a list of meetings is provided. More details about the meetings is given below.

2021

Date	Event/activity	N.Participants
2 Nov	WG1-2 Medicane Definition Initiative- Meeting	~15
16 Nov	WG1 Meeting	~50

2022

Date	Event/activity	N.Participants
------	----------------	----------------

3 Jan	MedCyclones Israel Meeting	~ 60
11 Jan	WG1-2 3T Initiative - Meeting	~15
12 Jan	WG1 Model Intercomparison Initiative – Meeting	10
14 Jan	WG1 DynForMed Initiative - Meeting	9
25 Jan	WG1-2 Medicane Definition Initiative - Meeting	~15
10 Mar	WG3 Meeting	30
25 Mar	WG1-Sting jets and Windstorms	~10
8 Apr	WG1 Model Intercomparison Initiative – Meeting	12
26 Apr	WG1-2 Medicane Definition Initiative - Meeting	20
20 May	WG3-Socioeconomic impacts	10
27-29 Jun	1st WORKSHOP	80
27 Jun – 02 Jul	1st TRAINING SCHOOL	45
15 Jul	WG3-Socioeconomic impacts	10
24 Oct	WG1-2 Medicane Definition Initiative - Meeting	25

In the following, some details about the meetings’ scopes and outcomes.

WG Meetings

WG1 16 November 2021 (Florian Pantillon)

The WG1 online meeting was dedicated to foster activities aimed at a better process-based understanding of Mediterranean cyclones at weather time scales. New research initiatives were proposed and started during this meeting, such as the “Medicane Definition”, the “DynForMed” and “Model Intercomparison” initiatives. A few additional initiatives were under discussion, about the impact of cyclones on the sea state and coastal flooding, about the air-sea coupled high-resolution numerical modeling needs, and about a sting jet event during an explosive cyclogenesis in the Ionian Sea. The presentations are publicly available on the website (<https://medcyclones.utad.pt/wg1-2021-meeting/>).

WG3 10 March 2022 (Jonilda Kushta and Samira Khodayar Pardo)

An online meeting was organized by WG3 members in order to present the latest work on the environmental and socio-economic impacts of Mediterranean cyclones. During the ~2.5-hour meeting, several presentations fostered vivid discussions with the community members.

1st MedCyclones Workshop and Training School

A Workshop and a Training School were held at the University of Athens between 27 June and 2 July 2022. The general objectives of the 3-day MedCyclones Workshop were to present and discuss recent scientific progress in understanding processes and impacts of the Mediterranean cyclones, as well as their monitoring and forecasting, from weather to climate time scales. Two round tables were also organized during the workshop to allow discussion among scientists and weather forecasters on two important topics: forecasting Mediterranean cyclones and defining Medicanes. Invited speakers introduced and animated the discussion. Also, parallel sessions allowed the participant to discuss the progresses within each specific research initiative. The workshop successfully established and fostered efficient networking and collaborations between stakeholders, professionals from weather/climate services and academic researchers.

It is worth mentioning that the opening session of the workshop was held in the ceremonial room of the University of Athens and was disseminated in real-time through the streaming channel of the University, reaching a wider audience. During the session, besides the general presentation of the Action aims and progress, the WG leaders presented the main activities and results. Also perspectives in terms of STSMs and grants were described so to foster further participation into the Action.

The 6-day Training School focused on weather-time scale aspects and impacts of Mediterranean cyclones: dynamics, processes, forecasting and predictability. In the first three days (27-29 June) afternoon lectures were given by three renown invited speakers allowing the Trainees to fully attend the workshop activities. The last three days were devoted to full-day courses, practical exercises and interactive discussions. Videos of the lectures and a large volume of material used for the Training School is available on the MedCyclones website. Feedbacks from the students were collected in the days following the school.

All the WG leaders and the core group members also delivered lectures dealing with different aspects of Mediterranean cyclones, e.g. predictability, forecasting, (compound) impacts.

An article describing the Workshop and the School is in preparation and will be submitted soon to the Bulletin of the American Meteorological Society. This will increase the Action visibility towards a much wider audience even oversea.

Peer-reviewed papers

A Review paper entitled “Mediterranean cyclones: Current knowledge and open questions on dynamics, prediction, climatology and impacts” by M. Flaounas and co-authors (all deeply involved in the Action) **was published** on Weather and Climate Dynamics (Copernicus Publ.): Flaounas E., S. Davolio, S. Raveh-Rubin, F. Pantillon, M. M. Miglietta, M. A. Gaertner, M. Hatzaki, V. Homar, S. Khodayar, G. Korres, V. Kotroni, J. Kushta, M. Reale, D. Ricard, 2021: Mediterranean cyclones: Current knowledge and open questions on dynamics, prediction, climatology and impacts. Weather and Climate Dynamics, 3, 173-208, <https://doi.org/10.5194/wcd-3-173-2022>

A second review paper, devoted to the analysis of the socio-economic impact of Mediterranean cyclones is in preparation and will probably be submitted by the end of this year.

Another paper, resulting from a collaboration among 12 Action participants and bridging WG1 and WG3 themes was submitted to Natural Hazards and Earth System Sciences in September 2022. The papers exploited the output of the simulations produced in the Model Intercomparison initiative (WG1) to provide the hazard scenarios of the potential impact of an extreme event (Medicane) to be used in a flood-risk management plan.

A list of recent peer-reviewed papers published by MedCyclones members and related to the scientific topics provides an up-to-date overview of the results of this Action. Recent publications are summarized, continuously updated and available on the website (<https://medcyclones.utad.pt/publications/>).

Short Term Scientific Missions (STSM)

Dissemination of MedCyclones STSM calls and their results are communicated through the network. Despite the pandemic situation, four STSMs were successfully accomplished in 2021 and 2022 and addressed especially the topic of Mediterranean cyclone impacts.

1) Grantee name: Benjamin DOITEAU, who visited the group of Victoria Sinclair (Institute for Atmospheric and Earth System Research - University of Helsinki)

Title: Estimate the impacts of Mediterranean Cyclones

Start and end date: 22/09/2022 to 02/10/2022

The goal of this STSM was to develop metrics to link the intensity of Mediterranean cyclones with the associated impacts. The applicant focused on the impacts related to the wind gusts by calculating the Storm Severity Index (SSI). He calculated the SSI for a wide range of radius (0-2000 km) for 60 storms in the Mediterranean. The first results seemed to indicate a radius of about 1000 km to be relevant to capture the majority of the SSI associated with a Mediterranean cyclone. **These results can be applied to early warning systems with**

targeted outputs aiming at providing useful information to the transport sector (shipping, aviation) and coastal populated areas with relevant infrastructure.

2) Grantee name: Davide Ferranda, who visited the group of Suzana Camargo (Lamont-Doherty Earth Observatory – Columbia University)

Title: Bias Correcting and downscaling re-analyses and climate simulations of Mediterranean tropical-like cyclones

Start and end date: 01/10/2022 to 07/10/2022

The goal of the mission was to exchange ideas, techniques and data to perform **attribution of tropical cyclone and tropical like cyclones to climate change**. Addressing the problem of sparse tropical-like Mediterranean cyclones numbers in past and present data one needs to enhance the data in order to apply recent methodologies for cyclone attribution studies. Therefore this STSM aimed to enlarge sample sizes while maintaining realistic ERA5 boundary conditions by producing synthetic tracks using a method developed in the host institution using a CHAZ/MIT model extension. A collaboration has been set up, and plans to adapt the model to Mediterranean systems, and a publication about the method are preparation. The candidate met with several experts and discussed issues such as **stakeholders' engagement** in understanding climate change for tropical cyclones, cold pools and their roles in triggering precipitations as well as impact models for storm surges. From this visit the granted researcher was able to apply for a one-month program at the Institute Pascal, in Paris-Saclay to work on tropical-like cyclones and medicanes and their attribution to climate change. The applicant aims to expand his method to Mediterranean cyclones such as Cyclone Apollo in October 2021 that caused extensive damage in Sicily and Hurricane Fiona that hit the French Caribbean in 2022.

3) Grantee name: MD Arman Habib, who visited the group of J. M. Person (University of Warwick)

Title: Physical modelling study on the impacts of extreme storm surges on Eco-engineering Interventions

Start and end date: 01/05/2022 to 30/06/2022

This STSM was focused on overtopping as a major derivative of cyclones or windstorms. The mission had two main objectives. The first set of objectives was to acquire hands-on training about the safe operation of a two-dimensional wave flume, a wave generator paddle, generate random set of waves of variable incident heights and observe the wave-structure interaction using a model plain vertical seawall. The second set of objectives was about acquiring data of overtopping quantity, rate and spatial distribution of the overtopping volume under a set of known incident wave conditions and model seawalls with prototype Ecological Interventions. After achieving the technical skills required, the student will continue using the data to train and test Machine Learning algorithms to deduce their applicability to predict overtopping at plain vertical seawalls with EIs. Machine Learning algorithms can be established as time

efficient, less complex but reasonably accurate alternative to empirical and numerical modes of overtopping predictions.

4) Grantee name: Vlad-Alexandru Amihaesei, who visited the group of S. Raveh-Rubin (Weizmann Institute of Science)

Title: The Impact of Mediterranean cyclones on snowfall in Romania: a climatological perspective

Start and end date: 15/07/2022 to 31/07/2022

The aim of the STSM was to analyze snow events related to Mediterranean cyclones. The **contribution of the Mediterranean cyclones to snowfall accumulations over Romania's** territory was calculated. Thus, the fraction of the snow related only to the Mediterranean cyclones was calculated for extended winter season (November-April) of 40 years (1981-2020). The entire synoptic conditions (not only Mediterranean tracks) linked to the first snow cover and the heavy snow event dates were additionally analyzed. The contribution of the Mediterranean cyclones to the snowfall accumulation was calculated for each snow year (November year-1 to April) by selecting the synoptic conditions and the Mediterranean cyclone track when (1) the first snow cover day and (2) heavy snow event (fresh snow depth > 90 percentile) occur. Moreover, the contribution of the Mediterranean cyclones to snowfall accumulations over Romania's territory was calculated. The study showed that Mediterranean cyclones can contribute significantly to the multiannual means of the snowfalls fraction over Romania with more than 50% of the total snowfall amount related to Mediterranean cyclones. In the southern and the eastern parts of Romania this percentage can reach more than 65% of the total snowfalls. The **assessment of snow events due to the Mediterranean cyclones** was a first quantitative analysis of the impacts of Medcyclones on extreme weather over this region. Analysis of the data is underway, and two manuscripts are planned to be submitted in peer-reviewed journals.

Videos

Under the scientific supervision of Stavros Dafis, Emmanouil Flaounas and Silvio Davolio and the involvement of the Core Group and WG leaders, some scientific animations showing the development of particularly intense Mediterranean cyclones have been developed by Daniele Carnevale and Stavros Dafis. This material is intended mainly for supporting teaching at University level and is publicly available on the MedCyclones YouTube Channel:

<https://www.youtube.com/channel/UCPXk3IHU3Q7JnMsEVD05P4A>

Also, some interviews on Italian TV media, have been shared on the MedCyclones Youtube channel. These interviews dealt with a particularly intense tropical-like Mediterranean cyclone (named Apollo) that developed between October and November south of Sicily. It raised lot of

attention within the general public in Italy due its strong impacts in terms of wind and precipitations.

Newsletter

A special Newsletter was published in April 2022 and it is [publicly available in a Dropbox folder](#). The Newsletter summarized all the latest results from the active WGs and promoted funding opportunities for Young Researchers.

Presentations

- Maria Hatzaki was supported by a Dissemination Conference Grant to present recent results concerning her activity in the framework of MedCyclones COST Action at the 6th MedClivar 2022 Conference in Marrakech (Morocco), 4-8 October 2022. Contribution title “Combined climate extremes occurrences driven by multi-scale atmospheric variability and their impacts on Mediterranean metropolis”.

MedCLIVAR (Mediterranean CLImate VARIability and Predictability) is a scientific network dealing -among others- with scientific issues as the connections between the Mediterranean and global climate; feedbacks on the global climate system; regional impacts of climate change. In this context, the 6th MedCLIVAR 2022 Conference brought together scientists from a wide range of disciplines involved in the MedCLIVAR community. Thus, the presence in this conference provided a great opportunity to disseminate recent results of MedCyclones and advertise the Action to attract new members to it. More specifically, the presented research, related with WG2 and WG3, involved the newly developed Mediterranean cyclones tracks dataset based on the multi-tracking method analysis of the 3T initiative of WG2. This important achievement of MedCyclones, along with the recently submitted paper presenting the dataset, were advertised to the scientific community of the Mediterranean climate. In addition, this research provided an example of how this database can be used on a wide range of applications regarding the impacts of Mediterranean cyclones and their variability on the regional and local climate. MedCLIVAR2022 provided a great opportunity to increase the visibility of MedCyclones scope and initiatives and establish new connections.

- Platon Ptalakas was supported by an ITC grant to attend the European Meteorological Society Annual Meeting 2022 in Berlin, 4-9 September 2022. He presented an oral contribution (co-authored by E. Flaounas) titled “A physical basis to SPPT through the identification of weather features as coherent objects of potential vorticity anomalies: application to Mediterranean cyclogenesis”. He presented an innovative methodology aiming at improving Mediterranean cyclone forecasting. Given the wide audience attending the EMS annual meeting, this was a great opportunity to advertise the MedCyclones COST Action and present results developed within the Action activities.

Specific Dissemination and Communication strategies in WG3

On 10 June 2022, an online meeting involving the Chair and Vice Chair was organized to discuss possible collaboration with Risk Management Solutions (RMS) and the Action. RMS is a private company dealing with catastrophe modelling, severe storms especially over Europe. Dr. Phil Haines and Dr. Juergen Grieser presented their main activities connected with risk estimates and expressed interest in understanding the risk of Mediterranean cyclones, to evaluate the possibility of developing a specific modelling approach. Dr. Haines was invited to and attended the Action Workshop in Athens. Collaboration is progressing.

On 24 June 2022, an online event involving the Chair and Vice Chair and Dr. Mario Marcello Miglietta was organized to meet the representatives of CLS – Collecte Localisation Satellite, a private company that in one of its branches develops satellite products at very high resolution. Dr. Husson Romain presented satellite products from Sentinel, aimed at observing tropical cyclones and their possible application to intense Mediterranean cyclones and medicanes. These products are based on SAR active sensors and a dataset is available since October 2021. A discussion about possible collaboration is undergoing.

During the 1st MedCyclones Workshop and Training school Dr. Jonilda Kushta, the Grant Holder scientific representative, along with Dr. Samira Khodayar, co-leaders of Working Group 3, presented the work performed so far on the socio-economic and environmental impacts of Mediterranean cyclones and delivered lectures on MedCyclones impacts over the Mediterranean as well as the links and feedbacks between these extreme weather systems and aerosol processes.

Dr. S Khodayar introduced at the opening of the **1st MedCyclones Workshop WG3** describing the socio-economic interest in Mediterranean cyclones, the aims, and roadmap of WG3 as well as the research initiatives taking presently place within this working group devoted to the improved understanding of the impacts of MedCyclones (please see below parts of the presentation).

Aim of WG3 Medcyclones

1. **Identify** and set a scientific agenda for **addressing new and poorly understood research questions** related to socio-economic and environmental impacts of Mediterranean cyclones
2. **Establish a coordinated interaction between researchers and stakeholders** in order to co-design in detail and to refine the cyclone-related products of weather/climate prediction centres is currently missing
3. **Efficiently communicate and disseminate the knowledge gained to potential interested groups including researchers, stakeholders and the general public.**

WG3 is a **flexible and interdisciplinary team in continuous interaction with WG1 and WG2.**

Scientific roadmap of WG3


- WG3 participants aim to set a scientific agenda that addresses the still uncharted impacts of cyclones on regional climate and the environment, through close collaboration between researchers and forecasters. Therefore, **brainstorming is a core issue** for WG3.
- WG3 aims to **identify and catalogue** different cyclone impacts and will propose **research approaches**.
- In collaboration with WG1 and WG2, WG3 participants will acquire simulations, climatologies and observations to address the identified cyclone impacts and advance the state-of-the-art in the field.
- Involvement of **stakeholders and professionals** from weather and climate prediction centres is crucial for harmonising the research with socio-economic needs.
- The less clearly defined structure of WG3 (in comparison to WG1 and WG2) reflects the fact it is highly innovative and therefore requires more **flexibility**.

Furthermore, during the **Training school** Dr. Khodayar discussed the environmental and socio-economic impacts of Mediterranean cyclones.

COST Action MedCyclones
1st Workshop and Training School
University of Athens, 27-2 July 2022

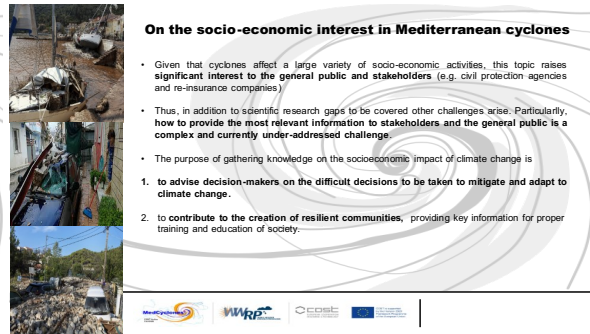
COST MEDCYCLONES
Environmental and socio-economic impacts of Mediterranean cyclones

Samira Khodayar
Mediterranean Centre of Environmental Studies (CEAM)

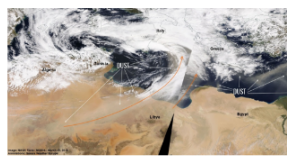


On the socio-economic interest in Mediterranean cyclones

- Given that cyclones affect a large variety of socio-economic activities, this topic raises **significant interest to the general public and stakeholders** (e.g. civil protection agencies and re-insurance companies)
- Thus, in addition to scientific research gaps to be covered other challenges arise: Particularly, **how to provide the most relevant information to stakeholders and the general public is a complex and currently under-addressed challenge.**
- The purpose of gathering knowledge on the socioeconomic impact of climate change is
 - to advise decision-makers on the difficult decisions to be taken to mitigate and adapt to climate change.
 - to contribute to the creation of resilient communities, providing key information for proper training and education of society.



and, Dr. Kushta, the Grant Holder scientific representative, discussed the relationship between Mediterranean cyclones and dust, <https://emme-care.cyi.ac.cy/the-1st-medcyclones-workshop-and-training-school-successfully-implemented-in-athens/>

Scientific background on Mediterranean cyclones and dust	Related scientific missions
<ul style="list-style-type: none"> ➤ Satellite data and model simulations have identified baroclinicity and cyclogenesis processes as significant meteorological patterns that result in dust uplift due to the strong surface wind fields (Schepanski et al., 2009). ➤ In most cases Mediterranean cyclones can develop close to dust sources, with their core being either over the African continent or further north in the Mediterranean Sea (Schepanski and Knippertz, 2011). ➤ Dayan et al. (2008) reported a significant correlation between dust and cyclonic activity in the eastern Mediterranean using 37 years of visibility observations correlated with PM10 dust concentrations. ➤ Varga (2020) reported that well-developed Mediterranean cyclones drive almost a quarter of Saharan dust event, mobilising and transporting dust through the southerly warm advection ahead of the cold front of the eastward moving low pressure systems. ➤ Cyclones have also been identified for facilitating the long-range transport of giant mineral dust particles (> 75 µm in diameter). 	<ul style="list-style-type: none"> ➤ Cases of co-existence of Mediterranean cyclones and desert dust? ➤ Can sea salt be an important factor? ➤ Are cyclone properties significantly affected by the aerosol feedback to meteorological processes? ➤ Are there systematic errors in cyclone modelling when dust is present vs when it is not? ➤ Can aerosols modify cyclone tracks and intensity thus areas of high vulnerability? ➤ Dust properties (size distribution, dust layer height and distance, coarse particles transport, ...) <p>Cyclone Hugo, located in the western Mediterranean kicked up a major dust storm for the central and eastern Mediterranean and southeastern Europe in the next two days (March 2018).</p> 

As future perspectives concerning Mediterranean cyclones impact, the following issues were pointed out from the discussion as priorities:

- 1) An improved knowledge about the intrinsic relationship between Mediterranean cyclones and high-impact weather is needed. In this context, the state of the art suffers from the **lack of systematic quantification of cyclones' contribution to Mediterranean high-impact weather** (Flaounas et al. 2022).
- 2) The need to **step from hazard forecasts** (such as heavy rainfall, wind gusts, etc.) to **impact-based forecasts** is essential (Taylor et al., 2018; Zhang et al., 2019).
- 3) **New research lines** on the socio-economic impacts of Mediterranean cyclones e.g. in relation to fires

- 4) **Mapping stakeholders and establishing a close relationship** is of primary importance for an efficient co-definition and co-design of needs and tools.

