

10th HyMeX Workshop

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The Hydrological Cycle in the Mediterranean Experiment (HyMeX) is a 10-year (2010–2020) GEWEX Hydroclimatology Panel Regional Hydroclimate Project to improve the understanding of the water cycle, with emphasis on extreme events by monitoring and modeling the Mediterranean atmosphere-land-ocean coupled system and its variability. Building upon the 5-year review of HyMeX achievements conducted in 2015 (see report on page 20 of the November 2015 issue of *GEWEX News*), more than 160 scientists from over 10 countries participated in the 10th HyMeX Workshop to present first results related to the new science plan developed at the last workshop. Emphases included more integrated transdisciplinary studies, including water resources, droughts and their impacts, the water cycle and renewable energy resources, flash floods and social vulnerabilities and an attempt to integrate forecasting of heavy precipitation, flash floods and their impacts. The workshop also aimed at preparing the second Mediterranean Coordinated Regional climate Downscaling Experiment (MED-CORDEX-2) and upcoming field campaigns.

Continuum Scale and Integrated Analysis

One hundred talks and 69 posters presented scientific results on the main HyMeX topics in plenary and parallel sessions. The session themes included heavy precipitation, ocean circulation processes, cyclones and strong winds, flash floods and vulnerability, flash-flood prediction, water budgets, drought and water resources and integrated prediction. Seventeen parallel working sessions of the different HyMeX science teams enabled transdisciplinary discussions and promoted dialogue on the three future field campaigns, and on the preparation of the second MED-CORDEX exercise. The workshop program, presentations and more information about HyMeX are available at: <http://www.hymex.org>.

Preparation of MED-CORDEX2

The workshop was also an opportunity to confer over the implementation of the MED-CORDEX flagship pilot studies, which can be seen as the follow-up of the first MED-CORDEX exercise (Ruti et al., 2016). This discussion was carried out in one full day, held before the official start of the HyMeX workshop, and in several parallel working sessions during the workshop. These sessions aimed to identify the participants of each MED-CORDEX flagship pilot study and the models, and to define the numerical protocol and the agenda. There are three MED-CORDEX flagship pilot studies.

One flagship pilot study is dedicated to convection and is shared between MED-CORDEX and EURO-CORDEX. Its objective is to investigate convective-scale events, their processes and their changes in a few key regions of Europe and the Mediterranean using convection-permitting regional climate models (RCMs), statistical models and available observations. It also strives to provide a collective assessment of modeling capacity at the convection-permitting scale and to shape a coherent and collective assessment of the consequences of climate change on convective event impacts at local to regional scales.

The second MED-CORDEX flagship pilot study focuses on air-sea interactions, with special emphasis on the role of small scale ocean processes and waves. The selected region is the area surrounding the Mediterranean Sea, which is often referred to as an ocean in miniature, due to the variety of processes occurring therein. These include strong air-sea interactions, active mesoscale and submesoscale dynamics and a permanent thermohaline overturning circulation. A detailed analysis of how air-sea coupling at high resolution can modify the regional climate, and consequently the global climate is still missing in the literature. There are some indications that it could provide an added value to RCMs in both the present climate and future scenarios, but the mechanisms underlying such impacts are not completely understood.

The third MED-CORDEX flagship pilot study is dedicated to the role of natural and anthropogenic aerosols in the Mediterranean region. Aerosols strongly affect the Mediterranean Basin, which is located at the crossroads of air masses carrying both natural and anthropogenic particles, making it an ideal testbed for aerosol effects on climate. They are currently not taken into account well in RCMs. The use of RCMs with explicit aerosol representation will help us understand the role of Mediterranean aerosols on past regional climate variability. It will also help to determine the role of regionally born aerosols in the future climate sensitivity of the Mediterranean region and to address the role of aerosols in shaping extreme events (continental heat waves, heavy precipitation events, ocean heat waves, strong regional winds, droughts) in the Mediterranean.

These flagship pilot studies will contribute to several WCRP Grand Challenges, especially on climate extremes and water availability. They also contribute to one of the identified CORDEX Challenges on coupled regional climate models.

Future Field Campaigns

Three campaigns are also planned in the frame of HyMeX to complement the completed field experiments from the Enhanced Observation Period (Braud et al., 2014) and Special Observation Periods (SOP1, Ducrocq et al., 2014; Ferretti et al., 2014; and SOP2, Estournel et al., 2016) (see Drobinski et al., 2014 for a full overview). The field experiments in preparation (shown in the figure on the next page) are:

- EXploiting new Atmospheric Electricity Data for Research and the Environment (EXAEDRE)—an experiment planned for September 2018 on atmospheric electricity, complementing activities from SOP1 (Defer et al., 2015)



Location of the future field campaigns planned within the frame of HyMeX.

- The Pelagic Ecosystem Response to dense water formation in the Levant Experiment (PERLE)—an oceanic experiment planned for October 2018, February 2019 and June–July 2020, supplementing SOP2 (Estournel et al., 2016), but in the Levantine region in the eastern Mediterranean.
- Land surface Interactions with the Atmosphere over the Iberian Semi-arid Environment (LIAISE)—an experiment planned from April 2020 to March 2021, focusing on land surface interactions over the Iberian semi-arid environment.

trique Tridimensionnelle Totale de l’Atmosphère (SAETTA) Network and the Météorage Operational Network,

2. the development of a new lightning detector based on the principle of very high frequency interferometry, and
3. a field campaign in Corsica, associating the SAETTA Network with the French Service of Instrumented Aircraft for Environmental Research (SAFIRE) Falcon20, carrying the RASTA radar, primary marine aerosol microphysics probes and the AMPERA platform for measuring the electric field along three axes.

The workshop provided an opportunity for in-depth discussions on implementing the field campaigns, including funding issues, instrumental set-up, deployment strategies and more.

All this is accompanied by ground instrumentation sensitive to the phenomenon of electrification of clouds and to the properties of natural electric discharges, and by ground and spatial remote sensing to monitor environmental conditions.

The EXAEDRE field campaign aims to improve knowledge by combining observation and modeling, not only for the various physical phenomena that accompany lightning, but also to study the contribution of “flash” information for applications to monitor extreme phenomena and to quantify the improvement of weather forecasts by introducing the “flash” data into an assimilation chain. This approach anticipates the use of powerful “all-weather” lightning detectors placed in geostationary orbit as part of the Meteosat Third Generation program. EXAEDRE revolves around the following observation components:

The PERLE action, shared between HyMeX and the Marine Ecosystems Response in the Mediterranean Experiment (MerMeX), aims at describing the formation and spread of Levantine Intermediate Water and determining its role on the distribution of nutrients and on the structuring of planktonic ecosystems in the eastern Mediterranean. It is a complement to the SOP2 experiments conducted in the northwestern Mediterranean with similar objectives. The Levantine Intermediate Water is one of the most crucial water masses of the Mediterranean—it contributes to most of the subsurface water and salt transport between the eastern and western basins of the Mediterranean, it plays a key role in the deep convection both in the northwestern Mediterranean and in the South Adriatic and it fills nearly all the intermediate layers of

1. observations already collected in SOP1 (Defer et al., 2015) and permanent measurements of electrical activity by the three-dimensional light detection Suivi de l’Activité Elec-

the eastern basin, where it is prone to vertical exchanges with the surface layer that supplies nutrients to the photic layer and supports a significant fraction of the primary production. The PERLE strategy is based on intensive field work concentrating all of the observation methods (cruises, moorings, gliders, profilers and satellites) of key physical and biogeochemical parameters in an experiment lasting one full annual cycle, and on the use of longer-term observations from existing and future observation systems. It is complemented by a massive modeling effort, which includes the implementation, validation and improvement of physical-biogeochemical coupled models to simulate recent trends on the basis of observations and future scenarios.

Finally, the LIAISE field campaign will explore the surface/atmosphere interactions over the Iberian Peninsula. Specifically, it aims to create a better understanding of the dry-down of soils after the winter rainfall has ended, as this is a critical season for the Mediterranean climate. It determines the water resources that will be available for the crop growing period, the state of the natural vegetation and it probably holds predictive value for atmospheric conditions for the summer. In a changing climate, the period of an annual cycle will be critical for managing water resources and adapting our societies to a warmer world. Fundamental knowledge also needs to be built on the impact of water and environmental management on local climatic processes. Field campaigns are planned, combining ground-based in-situ and remote sensing measurements at different sites (among those the Ebro Basin) as well as airborne measurements.

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GEWEX/WCRP Calendar

For the complete Calendar, see: <http://www.gewex.org/events/>

- 18–20 September 2017—4th Satellite Soil Moisture Validation and Application Workshop and CCI Soil Moisture User Workshop—Vienna, Austria
- 18–22 September 2017—COSPAR 2017—Jeju, Republic of Korea
- 25–28 September 2017—CFMIP Meeting on Clouds, Precipitation, Circulation, and Climate Sensitivity—Tokyo, Japan
- 9–12 October 2017—Annual GEWEX Data and Assessment Panel (GDAP) Meeting—Boulder, Colorado, USA
- 9–13 October 2017—32th Session of WGNE and Pan-WCRP Modeling Groups Meeting—Exeter, United Kingdom
- 16–18 October 2017—25th SPARC Scientific Steering Group Meeting—Seoul, Republic of Korea
- 17–19 October 2017—GEWEX Hydrometeorology Panel (GHP) and Third Pole Experiment (TPE) Workshop—Kathmandu, Nepal
- 25–26 October 2017—7th GEWEX Global Water Vapor (GVAP) Assessment Workshop—Leicester, United Kingdom
- 13–17 November 2017—5th International Conference on Reanalysis (ICR5)—Rome, Italy
- 27–30 November 2017—23rd Session of CLIVAR SSG—Rome, Italy
- 7–11 January 2018—98th AMS Annual Meeting—Austin, Texas, USA
- 6–8 February 2018—HEPEX Workshop on Breaking the Barriers—Melbourne, Victoria, Australia
- 8–9 February 2018—3rd International Network for Alpine Research Catchment Hydrology (INARCH) Workshop—Zugspitze, Germany
- 26 February–2 March 2018—2nd Pan-GASS Conference—Lorne, VIC, Australia
- 6–11 May 2018—2018 GEWEX Science Conference—Canmore, Alberta, Canada
- 11–15 June 2018—2nd Baltic Earth Conference—Helsingoer, Denmark
- 11–15 July 2018—COSPAR 2018: 42nd Scientific Assembly of COSPAR—Pasadena, CA, USA

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