Climate predictions in the Mediterranean region to be used in agriculture, water management and renewable energy sectors

Silvio Gualdi (CMCC) + MEDSCOPE Partner Team
Seasonal forecasts provide information about the probability of occurrence of climate anomalous conditions in the coming seasons helping to tackle possible severe impacts.

**Seasonal forecasts are an extraordinary source of data and information for climate service activities**
MedCOF aims at enhancing the collaboration and joint contribution of National Hydro–Meteorological Centres from WMO Regional Associations I and VI in developing capacities for climate services based on seasonal predictions.

National Hydro–Meteorological Centres from more than 30 Mediterranean countries collaborate to produce and disseminate a consensus seasonal forecast every winter and summer seasons.
The background

MedCOF  Mediterranean Climate Outlook Forum

2018–19 Winter Consensus Forecast

Temperature outlook
lower / normal / upper

Precipitation outlook
lower / normal / upper
Overall scope of the MEDSCOPE project

MEDSCOPE

Research community and seasonal forecast producers (e.g. Copernicus)

MedCOF community and national users
MEDSCOPE is a **three-year project** that, by leveraging on previous experiences (e.g. CLIMRUN, EUPORIAS, ...), wants to **enhance the exploitation of climate predictions**, particularly seasonal forecast, maximising the potential of their **application in different economic sectors**, public and private, of relevance for the **Mediterranean region**.

Working in close relation with a wide basin of users in the Mediterranean area, **MEDSCOPE develops methodologies and tools aimed at improving climate forecast capabilities and related services**, maximising the societal benefit of climate predictions in the Mediterranean.

**MEDSCOPE** mainly focuses on the **seasonal timescale using the wealth of forecasts that is already available**. However, the project explores also the potential of predictions at longer time–scales (multiannual).
The MEDSCOPE Project
MEDSCOPE Objectives

- **Improve comprehension of the mechanisms** driving the climate variability in the Mediterranean area (e.g. teleconnections, land surface–atmosphere feedbacks, ...).

- **Provide a set of methods and ready-to-use tools** for verification and skill assessment, downscaling, calibration and bias adjustment of the forecasts.

- **Provide prototypes of end-user tailored products/services**, based on seasonal forecasts, in relevant economic sectors for the Mediterranean, such as wind energy, water management (hydrology), agriculture and forestry (including fire risk).
The MEDSCOPE Project

Project’s structure:

WP1 (Management and Coordination): ensure the overall project monitoring, internal and external communication as well as administration and reporting. It will supervise and facilitate the collaboration and interactions among project WPs and within the team.

WP2 (Processes and Sources of Predictability): explore the mechanisms of variability and predictability in the Mediterranean, focusing on those linked with predictable signals in the oceans or associated with land-atmosphere interaction processes (teleconnections) → sensitivity experiments.

WP3 (Forecast Calibration, verification and information synthesis): develop methodologies to extract usable information from predictions. It will produce tools for prediction verification, calibration, downscaling, ensemble member combination and selection that will be publicly released via a toolbox and shared among partners and users.

WP4 (Sectoral Climate Services): demonstrate the feasibility of climate services and generate prototypes for three important sectors for the Mediterranean: renewable energy, hydrology (including water resources management) and agriculture and forestry.
Understanding Mechanisms

WP2 (Processes and Sources of Predictability): explore the mechanisms of variability and predictability in the Mediterranean, focusing on those linked with predictable signals in the oceans or associated with land-atmosphere interaction processes (teleconnections) → sensitivity experiments.

Physical processes driving possible sources of predictability for the Mediterranean region

- ENSO teleconnections
- Soil moisture
- Sea–ice and snow cover
Understanding Mechanisms

Preliminary Results

**PDO** (Pacific Decadal Oscillation) modulation of the **ENSO effects** on the DJF European and Mediterranean climate

50 member ensemble mean differences with the **reference PDO state** (climatological SST/PDOP/PDON)
Understanding Mechanisms

Soil moisture experiments
preliminary results

Heat wave duration index (as hwdi* in Lorenz 2010)

Effect of **decoupling land and atmosphere** =>
**shorter heat waves** in central Med

Effect of **drier IC** => **longer heat waves**
in Southern Europe
In conclusion, MEDSCOPE ...

... provides **advancements of scientific understanding** of the climate predictability in the Mediterranean region.

... develops and release **advanced tools** to improve the extraction of relevant information from climate prediction systems and assess their robustness and uncertainty.

... serves as a **community builder** for future **climate service** activities based on climate predictions in the **Mediterranean**, contributing to the building of a common and shared knowledge.
In conclusion, MEDSCOPE ... needs high–quality observational data (remote sensing products) for initialization of the climate predictions and not only ocean data (soil moisture, snow cover, sea-ice ...) and not only in the Mediterranean.

... needs high–quality observational data (remote sensing products) for forecast verification and for the development of post–processing statistical tools to improve the forecasts (high-res. precipitation, evapo–transpiration, SST, SSS, SSH ...)

... needs high–quality observational data (remote sensing products) to complement climate predictions to provide climate services in the Mediterranean.
Thank you

www.medscope-project.eu
Q1: Who are the users and how to involve them …?

**A1:** Climate prediction community and the users of climate predictions. Both these communities could be involved through demonstrators projects (similar to the SIS Copernicus) to foster and sustain the uptake of the remote sensing products (providing feedbacks).

Q2: What are the key scientific gaps, application areas and data exploitation …

**A2:** Land surface parameters (e.g. soil moisture). In the past decade, impressive improvements in the ocean also thanks to ocean analyses based on the assimilation of satellite data. Similar effort should be done for land surface.

Q3: What are scientific/applicative projects …

**A3:** Demonstrators of how information from climate predictions improve when complemented by high–quality observational data from remote sensing.

Q4: Would a Mediterranean Region Office help …?

**A4:** Depends … if not the Nth bureaucratic layer to go through, but a real effective tool for integration between community and disciplines, maybe yes!
**Expected (main) impacts:**

- **MEDSCOPE** steers collaboration and networking between climate prediction providers and specialized users in the **Mediterranean region** → **building a community that shares knowledge, methodologies, paractices, tools and data**

- **MEDSCOPE** contributes to demonstrate the feasibility and usefulness of **climate predictions** for the three considered priority sectors. The use of the tools produced within MEDSCOPE could easily **extend benefits to other areas** of the and to a **wider number of sectors**.

- **MEDSCOPE** societal **impacts will be channelled** mainly through the already **existing network of experts** (National Hydro–Meteorological Services) operating under the umbrella of the MedCOF.
Matching between MEDSCOPE and MedCOF

Current consensus practice in MedCOF

**Background information on drivers**

Drivers evolution:
- SPSs
- Canonical associations/teleconn.

**Current state of drivers**

**Assessment**

**Consensus**

**Regional seasonal outlook**

**Sectoral Climate Services**

courtesy of Ernesto Rodriguez
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