Iniciativa WMO MedCOF de predicción estacional consensuada

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Outline

• Motivation
• WMO infrastructure for Operational Climate Prediction (OCP)
• OCP at regional level: RCCs, RCOFs, NCOFs
• MedCOF: example for the Mediterranean Region
• Future of RCOFs
• MEDSCOPE in support of MedCOF
• Final remarks
Since the creation of the GFCS by WCC-3, the generation and provision of climate services have reached a **new scientific, social and economic relevancy**

The original objective of **building climate resilient societies** (e.g., CSs for Disaster Risks Reduction) have slowly evolved to the subsidiary objective of **developing a market for climate services** (e.g., CSs for improving business)

We may well say that the **current broad meaning of CSs** covers the transformation of climate-related data into customized data that **may be of use for the society at large**.
CSIS Implementation Strategy

Developing and implementing CSIS architecture

- Functional descriptions and product development (Data/Monitoring/Prediction/Projection)
- Operational infrastructure: GPCs, RCCs, RCOFs, NMHSs, NCOFs/NCFs
- Climate Services Toolkit
- Capacity Development
WMO infrastructure for **Operational Climate Prediction**: subseasonal to longer timescales

Centres contributing/using real-time forecasts and hindcasts (manual GDPFS)

<table>
<thead>
<tr>
<th>Timescale</th>
<th>Lead Centres</th>
<th>WWRP/WCRP research</th>
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<tbody>
<tr>
<td>subseasonal</td>
<td>GPC-S2S (?), 2-6 weeks</td>
<td>WWRP/WCRP research</td>
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<tr>
<td></td>
<td>GPC-LRF 1, 2, ... 13, 1-4 months (2006)</td>
<td>Pilot at LC-LRFMME</td>
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<td>LC-SVSLRF (pre-2009)</td>
<td>LC-SVSLRF (pre-2009)</td>
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<td>LRF verification</td>
<td>LRF verification</td>
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<td>1-5 years</td>
<td>Roles/Functions in Manual</td>
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<td>longer</td>
<td>GPC-ADCP 1, 2,..4. (9)</td>
<td>Centennial (CMIP, CORDEX)</td>
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<td>LC-ADCP (2017)</td>
<td>Initial value problem</td>
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<td>annual to decadal</td>
<td>Decadal predictions</td>
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<td>Tyrs as informal exchange</td>
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<td>Seasonal to interannual predictions</td>
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<td>Long term climate change projections</td>
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</table>

RCCs, NMHSs: Regional/national interpretation, expertise-add, tailoring, products

World-wide array of Regional Climate Centres and Networks and RCOFs (2009 ->)

National Meteorological and Hydrological Services

WMO members (most decision-making is here)

(Thanks to R. Graham)
Designated GPC-LRF


Target audience: NMHSs, RCCs and RCOFs
WMO LC for Long-Range Forecast Multi-Model Ensemble (https://www.wmolc.org)

- Maintain a repository of documentation for the system configuration of all GPC systems
- Collect hindcast and forecast data from GPCs
- Display GPCs forecasts in standard format
  - Promote research and experience in MME techniques and provide guidance and support on MME techniques to GPCs, RCCs and NMHSs
  - Based on comparison among different models, provide feedback to GPCs about the models performance
- Blend GPCs forecasts based on standard MME techniques as an additional guidance to GPCs, NMCs, and RCCs, among other existing multi-model products
  - Provide dynamic web pages to satisfy requirements for regional display of forecast information (e.g. regions used by RCOFs)
- Redistribute digital hindcast/forecast data for those GPC's that allow it
- Handle requests for the password for the website and data distribution; maintain a database recording the users who have requested access to data/products and the frequency of access
- Maintain an archive of the real-time GPC and MME forecasts
Consistency Map

Aug2018 + SON forecast

** where, the positive numbers mean the number of models that predict positive anomaly and vice versa. **
WMO Regional Climate Centres (RCC) 
Serving National Meteorological Services in enhancing climate services

WMO RCCs shall perform the following minimum set of mandatory functions covering the domains of long-range forecasting (LRF), climate monitoring, data services and training:

- Interpret and assess LRF products from GPCs
- Generate regional tailored products, including consensus-based seasonal climate outlooks
- Provide online access to RCC products
- Perform regional climate diagnostics
- Develop regional climate datasets
- Establish a regional historical reference climatology
- Provide climate archiving services
- Implement a regional Climate Watch
- Coordinate training for RCC users
- Provide information on RCC products and guidance on their use
RCOFs provide platforms for Climate experts and climate information users to:

- Discuss current climate status
- Exchange views on scientific developments in climate prediction
- Develop consensus-based regional climate outlooks that can feed into national climate outlooks produced by NMHSs
- Engage in user-provider dialogue

An important aspect of RCOFs is the facility to bring together experts in various fields, operational climate providers and end users of forecasts in an environment that encourages interaction and learning.
Steps in a MedCOF session
(http://medcof.aemet.es/)

• Pre-COF Training

• 1.- Verification of previous seasonal forecast.
  Draft prepared by RA VI RCC-CM, NA RCC-CM, AEMET

• 2.- Monitoring ➔ current state of climate system
  Draft prepared by RA VI RCC-CM&LRF, NA RCC-CM&LRF

• 3.- Consensus Outlook
  Draft prepared by RA VI RCC-LRF, NA RCC-LRF, AEMET

• Interaction with users/stakeholders
Online forum
Información empírica sobre los controladores (drivers) del clima

Estado actual de los controladores (drivers) del clima

Evolución controladores:
- Sistemas de predicción estacional (dinámicos y empíricos)
- Asociaciones canónicas/teleconexiones

Evaluación → Consensos

Predicción estacional regional

Servicios Climáticos Regionales
Seasonal scale drivers

2017-18 Winter temperature outlook

### Correlation between teleconnection indices and lagging precipitation

**Domain: Egypt**

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Figure X: Number of stations (as gridpoints) over the Egypt domain (expressed in percentage) with significant correlation coefficient (at 90% confidence level) between a selection of teleconnection indices and lagging precipitation from ERA-Interim (circle) and GPCP (square). Three colors (red, yellow and green) are used to represent the average value of the correlation coefficient (+ ● 0-50%, ● 50-60%, ● 60%). Correlation coefficients are computed for the period 1981-2010. Stove indices are referred to different periods: (*) 1961-2000; (**) 2000-2010. 1 ml. 4 ml. 7 ml and 10ml correspond to teleconnection indices leading 1, 4, 7 and 10 months respectively.
Way forward towards the new generation of RCOFs (RCOF v2.0)

• Mainstreaming of *objective seasonal* climate forecasting underpinning RCOF products,

• New approaches including *expanded product portfolio*, based on standardized operational practices identified during the workshop,

• Follow-up integration of seasonal outlooks in *decision-making process* at country level

• Improved *Partnership and User Engagement* in RCOF process

• Organization of “*centralized*” *training workshops* to better target capacity development efforts associated with RCOFs
Matching between MEDSCOPE and MedCOF

Backgroud information on drivers

Assessment → Consensus

Regional seasonal outlook

Evolution of drivers:
- SFSs
- Canonical associations/teleconn.

Sectoral Climate Services
Some remarks based on current state of knowledge
Performance of seasonal models depends on hindcast period.

Mid-century period of low forecast skill coincides with a negative NAO phase but the relationship between the NAO phase/amplitude and forecast skill is more complex than linear (Weisheimer et al. 2017, doi:10.1002/qj.2976)
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We will work on an approach of ensemble members selection based on their consistent evolution with known drivers (Dobrynin et al. 2016).

The selection of subensembles will be applied the tailored service for water reservoirs management developed in task 4.2.

Is our ensemble member evolving according to the canonical response of winter NAO to October Siberian snow advance?

Objective tools for combining and synthetizing information:

ensemble subsampling or weighting

Contribution of AEMET to MEDSCOPE Task 3.4 [Forecast system combination and selection of sub-ensembles for applications]
Objective tools for combining and synthetizing information: ensemble subsampling or weighting

Contribution of AEMET to MEDSCOPE Task 3.4 [Forecast system combination and selection of sub-ensembles for applications]

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- Is our ensemble member evolving according to the canonical response of winter NAO to October Siberian snow advance?

POSTER: Mejora de las predicciones estacionales de precipitación invernal sobre la península ibérica haciendo uso de algoritmos de estimación óptima de la NAO y pesado de los miembros del ensemble (Eida Sánchez et al.)
Objective tools for combining and synthetizing information:
Low skill of seasonal models still makes empirical approaches relevant

Contribution of AEMET to MEDSCOPE Task 2.4 [Development of empirical forecast systems]

• Developing of a novel empirical forecasting system based on the improved understanding of sources of predictability in the Mediterranean coming from land surface processes and land-atmosphere coupling (Task 2.1), teleconnections with low-latitudes (Task 2.2) and mid-latitudes (Task 2.3).
• This task will synthesize the knowledge gained within WP2.
• This task will expand our current knowledge on predictors relevant for the Mediterranean area.
Objective tools for combining and synthetizing information: Low skill of seasonal models still makes empirical approaches relevant

Contribution of AEMET to MEDSCOPE Task 2.4 [Development of empirical forecast systems]

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PRESENTACION: Desarrollo de un modelo empírico para la predicción estacional sobre el Mediterráneo (Esteban Rodríguez et al.)

First version of the empirical system developed for the Mediterranean region in the frame of the ERA4CS MEDSCOPE Project (EMS 2018)
Conclusions

• The WMO is developing an infrastructure for provision of CS in particular for Operational Climate Prediction (OCP), including GPCs, LCs, RCCs, RCOFs, NCOFs

• MedCOF is an example for the Mediterranean Region. Forum of exchange with users and stakeholders

• After 20 years of history, RCOFs are evolving to more objective methods, more products, development of decision-making tools and improved partnership and user engagement.

• MEDSCOPE is a project coming out the ERA4CS initiative specifically designed as a scientific arm of MedCOF

• Need to revise certain methods/paradigms
Thanks for your attention