

**ACTION 2020-2-21:
COPERNICUS
FOR CULTURAL HERITAGE**


C3S in support of national hydro-meteorological
and climate services and products

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Environmental Protection and Research

13-16.06.2023

PARCO REGIONALE DELL'APPIA ANTICA
Ex Cartiera Latina - Via Appia Antica, 42



**C3S: Copernicus
Climate Change Service**

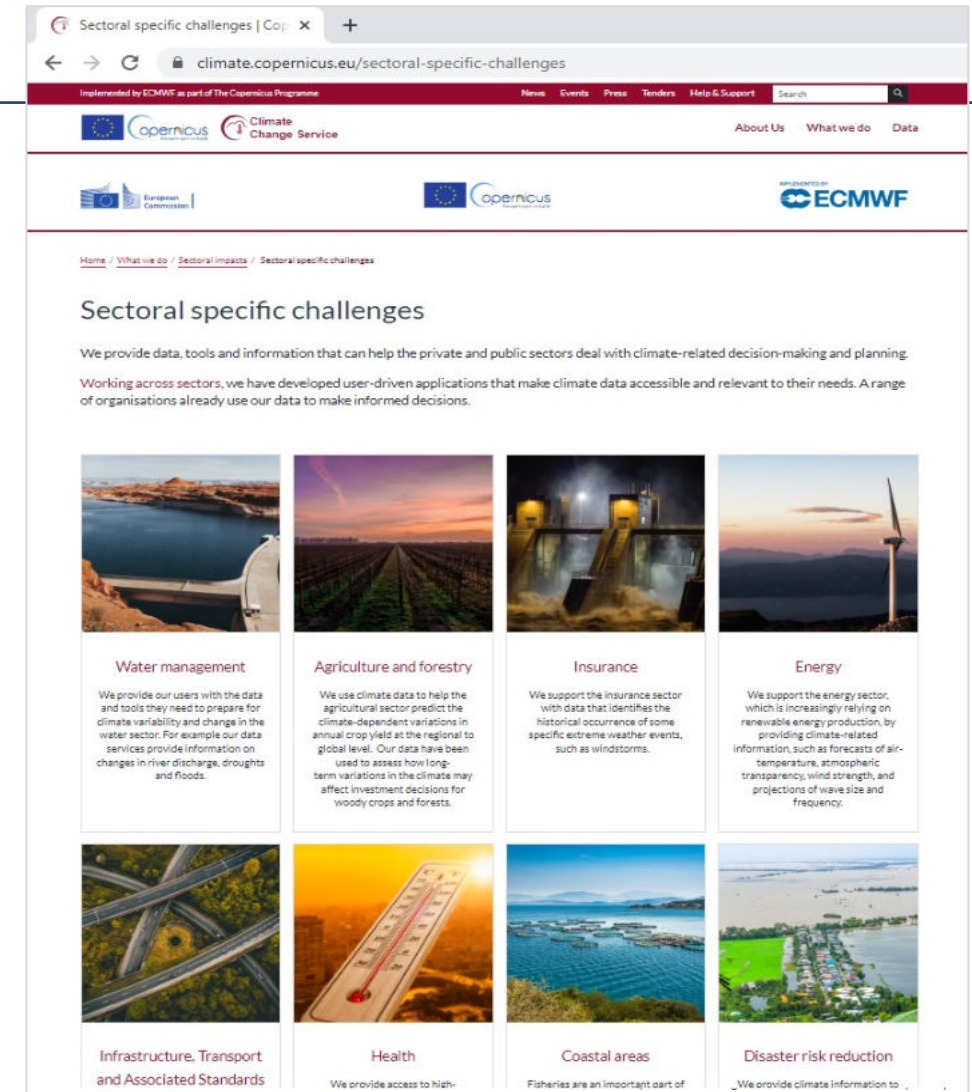


C3S is managed by the [European Centre for Medium-Range Weather Forecasts \(ECMWF\)](#) on behalf of the EC. ECMWF is an independent intergovernmental organization serving its 23 MS and 12 Co-operating States and the broader community.

- ❑ C3S is one of six thematic information services provided by the EU Copernicus EO Programme.
- ❑ It provides information on past, present and future climate in Europe and beyond.
- ❑ The mission is to **support EU climate change adaptation and mitigation policies**, through the supply, in open access mode, of data, information and **user-oriented** products useful to support MS in the process of adapting to current and future effects of climate change and in policies to reduce greenhouse gas emissions.
- ❑ C3S work **complements** the range of meteorological and environmental services that each European country already has in place.
- ❑ National climate service providers and relevant academic communities are also involved in the implementation of C3S products.
- ❑ C3S service elements are implemented by about 260 companies and organizations.

What can C3S provide to users?

- ❑ C3S provides climate data and information on impacts on a range of topics and [sectoral areas](#) through our [Climate Data Store \(CDS\)](#). The CDS is designed to enable users to tailor services to more specific public or commercial needs.
- ❑ Its aim is to provide products – developed in collaboration with national climate service providers and academic communities – that can complement what is already present at national level in terms of meteorological, climate and environmental services.
- ❑ C3S shares updates on developments to our service at many [meetings and workshops](#), including our annual [General Assemblies](#). These meetings also allow members of the climate change community to join networking and brainstorming sessions to contribute to future developments of C3S.
- ❑ C3S also offers [technical support](#) as well as [training](#) to users of the CDS, combining online learning with face-to-face events in most countries across Europe.





C3S portfolio

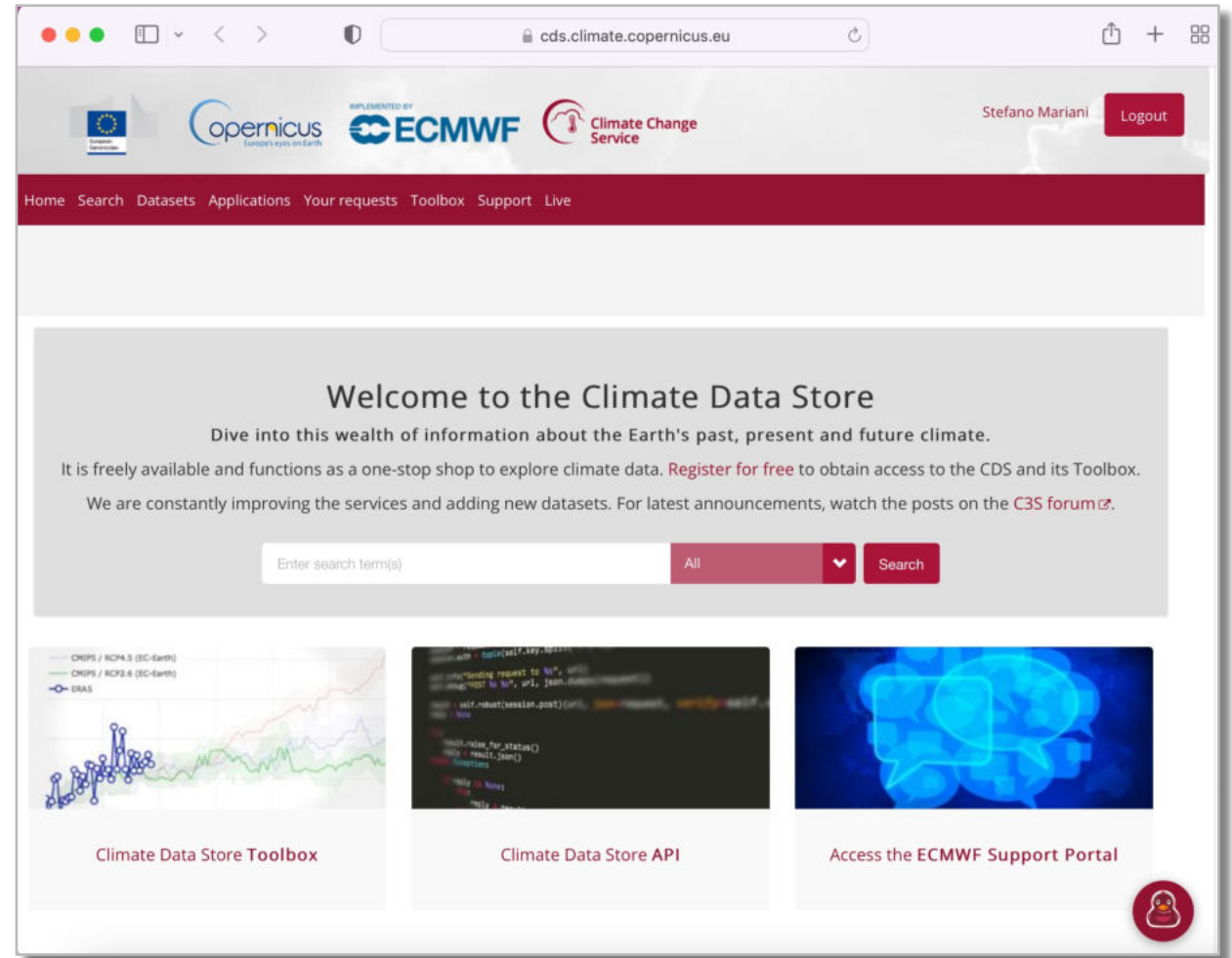
CDS – Climate Data Store

Modalità di accesso al CDS

1. Ricerca per parola chiave nelle categorie:
 - Dataset
 - Application
 - Provider
 - ALL
2. CDS Toolbox
3. CDS API (servizio ad hoc di interfaccia di programmazione)

Accesso al portale di supporto gestito dall'ECMWF

Virtual Assistant: Knowledge Duck



The screenshot shows the homepage of the Climate Data Store (CDS) website. The browser address bar displays 'cds.climate.copernicus.eu'. The page features the Copernicus logo, the ECMWF logo, and the Climate Change Service logo. A navigation menu includes 'Home', 'Search', 'Datasets', 'Applications', 'Your requests', 'Toolbox', 'Support', and 'Live'. A search bar is present with the text 'Enter search term(s)' and a 'Search' button. Below the search bar, there are three main sections: 'Climate Data Store Toolbox' with a line graph, 'Climate Data Store API' with a code snippet, and 'Access the ECMWF Support Portal' with a blue abstract image. A 'Logout' button is visible in the top right corner.

Sectoral Information

Agriculture and forestry | Copernicus

climate.copernicus.eu/agriculture-and-forestry

Implemented by ECMWF as part of The Copernicus Programme

News Events Press Tenders Help & Support Search

About Us What we do Data

Home / What we do / Sectoral impacts / Sectoral specific challenges / Agriculture and forestry

SECTORAL INFORMATION

Agriculture and forestry

Agriculture and forestry will be affected by climate change. Plant growth will be impacted and, in turn, agriculture and food production. We provide data to help the agri-forestry sector predict how these changes will affect crop yield, and ultimately return on investment.

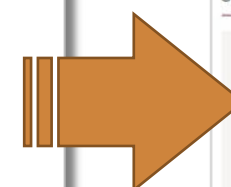
DEMONSTRATOR PROJECTS | SHOWCASES

COPERNICUS CLIMATE CHANGE SERVICE AND THE AGRICULTURE SECTOR

Related news


18TH MAY 2021
European Climate Data Explorer: C3S data supports climate adaptation in Europe

29TH JANUARY 2021
New C3S app lets you discover current and future fire danger




Demonstrator projects

JULY 2018
Global Agriculture project
The Global Agriculture Sectoral Information System (SIS) project aims to develop climate services in support of decision-making in agriculture.

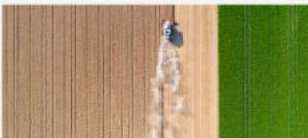


JANUARY 2018
Climate Advisory Services for Agriculture
The Agricultural Climate Advisory Services (AgriCLASS) combined climate and agriculture data and models to generate region-specific products for the agricultural sector.




Showcases


MAY 2021
Decadal predictions for agriculture
This prototype service provides global drought forecasts for the next 5 years to users from the agriculture sector.



DECEMBER 2020
The impact of climate change on the cotton industry
EOXPLORE and Terranea are using data and tools from the C3S Climate Data Store (CDS) to develop novel information sources to help the cotton industry understand and adapt to changes in the environment and climate.



NOVEMBER 2020
Climadjust, a Bias-Adjustment service for the Climate Data Store
Climadjust is a user-friendly web service that provides ready-to-use GCM and CORDEX climate projections by applying state-of-the-art



Sectoral Information

SECTORAL APPLICATIONS OF DECADAL PREDICTIONS

Decadal predictions for agriculture

Home / What we do / Sectoral impacts / Data in action / Decadal predictions for agriculture

[f](#)
[t](#)
[in](#)

OVERVIEW | PROTOTYPE SERVICE FOR AGRICULTURE

Overview

The agriculture sector is heavily influenced by changes in the frequency and severity of extreme weather events. The climate can affect crop management, the crop yield and quality, and the development of crop diseases and pests. Future climate information is thus essential for adaptation to the effects of climate variability, improving production quality and quantity.

In the short-to-medium term, weather, sub-seasonal and seasonal forecasts can inform decisions on the best planting and harvest dates, the selection of crops, use of fertilisers and crop rotations. In the long term, climate predictions and projections can help with decisions on whether new crop varieties should be developed, or whether new water management and irrigation infrastructure might be needed in the future.

While decadal predictions are still not widely used in the field of agriculture, they are recognised as potentially important in supporting planning decisions that require several years to be implemented, such as equipment purchase (e.g. for irrigation), emergence of new pests/diseases, use of new varieties etc. Climate information for the next 1-5 years can also be useful for planning supply chain contracts. Finally, decadal forecasts can have an impact on strategic policies related to agriculture, from regional to the EU's common agricultural policy (CAP).

Prototype service for agriculture

A prototype service was developed to provide users with multi-year predictions of drought conditions over global wheat harvesting areas for the following 5 years. The full prediction products and further information can be found below:

- Forecast for 2020-2024, started in November 2019
- Forecast for 2021-2025, started in November 2020

The development of this prototype service was carried out by the Barcelona Supercomputing Center.

PROTOTYPE SERVICE MAIN PAGE >

OTHER PREDICTION PRODUCTS

ENERGY >

INFRASTRUCTURE >

INSURANCE >

USER GUIDANCE

TECHNICAL APPENDIX

2021-2025 Drought

Forecast based on decadal predictions

This document provides decadal predictions of drought conditions coming five years to address the needs of the agriculture sector. Predictions for the Standardised Precipitation Evapotranspiration Index (SPEI) are computed over the global wheat producing regions (colours in Figure 1). Drought predictions shown are focused on the six months prior to the local harvest month (indicated by the colorbar in Figure 1). Each particular area, which is a suitable indicator for the critical development of the plant, and the grain filling and size.

Outlook for 2021-2025:

- There is a high probability of dry conditions over most wheat harvesting areas, as indicated by the below-normal category of SPEI6.

Multi-year SPEI6 forecast

SPEI6 is the standardised estimate of climate water balance (the transpiration) accumulated over the six-month period prior to the provides information on the most likely tercile category for multi-year of occurrence (shown as %). Below and above normal categories respectively. For instance, the most likely category for the selected area is the below normal category with a 64% likelihood of occurrence. Darker shades of red, yellow and blue correspond to a high and above normal category of SPEI6, respectively.

Forecasted SPEI6 over wheat growing areas

Figure 2: Decadal predictions of multi-year averaged SPEI6 for the years 2021-2025 corresponding to the wheat harvesting season (Figure 1), in which the category. The regions where the wheat is not harvested and where forecasts return a score of 1 (on the left side map) is represented on the right hand side of the figure.

For the years 2021-2025, most of the wheat-growing regions present an increase in dry events prior to the wheat harvest months globally.

is issued only for the areas where decadal predictions are better than using the observed climatology as an estimate of the future drought conditions over the wheat harvesting regions [that is, only areas with Ranked Probability Skill Score (RPSS) > 0 are coloured; see the Technical Appendix for further information on the forecast quality assessment].

While global forecasts help in providing information that could potentially benefit the users, the users might also be interested in knowing how the forecasts have performed in predicting the most likely category of SPEI6 in the past years and if the provided prediction of a particular likely category is skillful. To illustrate this, the predicted most likely category of multi-year averaged SPEI6 in the past years for the selected area (Granada, Spain; grid box 1 in Figure 2) is presented in Figure 3 as red, yellow and blue boxes, along with the category in which the observation actually fell (black dots). The decadal predictions discriminate well the observed transition between the wet (above normal, blue boxes) and dry (below normal, red boxes) events, and the prediction of the most likely category matched the observation for 28 out of 55 years (corresponding to the total number of black dots in the red, yellow or blue boxes). The decadal predictions are found to have skill in predicting the above and below normal categories over the selected area, which is indicated by positive values of the relative operating characteristic (ROC) skill score. A score ≤ 0 corresponds to a forecast with no skill, as in the case of the normal category.

Most likely predicted tercile categories of multi-year averaged SPEI6 over Granada, Spain

Category	ROC skill score
Above normal (top row)	0.71
Normal (middle row)	-0.09
Below normal (bottom row)	0.53

Most likely category prediction matches the observation for 28 years

Figure 3: Performance of decadal predictions in forecasting the most likely category of multi-year averaged SPEI6 in the past years. The multi-year averaged forecast (forecast years 1-5) of SPEI6 with decadal prediction for each year from 1961 to 2021 is displayed by a coloured square: blue, yellow and red boxes indicate that the most likely category of SPEI6 during the wheat harvesting period over Granada is above normal, normal and below normal, respectively. The black dots correspond to the category in which the observation falls. When the black dot falls on the red, yellow or blue box, the forecast matches the observation. The skill of the forecast system in predicting individual categories is presented with the ROC skill score (categories presenting skill represented with bold values).

Background information


The forecasts in this document are based on a multi-model ensemble of four decadal prediction systems (BSC, UKMO, MPI and CMCC), with 42 ensemble members in total. The decadal prediction data used were produced as part of the Coupled Model Intercomparison Project Phase 6 (CMIP6). ERA5 reanalysis is used as the observational reference. SPEI6 is evaluated over the wheat-producing areas for both the predictions and observations, using the wheat harvest calendar information retrieved from MIRCA2000 dataset. The forecast quality in predicting the probabilities of the categorical events (tercile in our case) of the estimated index is investigated using RPSS and ROC skill score. We found that the decadal predictions exhibit an added value with respect to a simple climatological multi-year approach in predicting terciles of SPEI6 distribution over several wheat-growing areas, which is discussed in greater detail in the technical appendix along with additional information on the data and methodology used to provide the forecast.

Further information can be found in the Technical Appendix.

This work was produced with funding from the Copernicus Climate Change Service (C3S) which is implemented by ECMWF on behalf of the European Commission.

Produced 1st July 2021

General Assemblies



REGISTER NOW!
Copernicus Climate Change Service
Conference & General Assembly (online)

Dates: 18-20 May 2021



The C3S Conference & General Assembly is an event implemented in collaboration with the Italian Copernicus National Forum.

More information coming soon.

C3S CONFERENCE
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support a r...

Topics inclu...

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- Climate
- Operat
- Future



<https://climate.copernicus.eu/c3s-conference>
(Presentations, video-posters & registration)



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Sept 2023**

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Leonid Andronov / iStock / Getty Images Plus



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<https://climate.copernicus.eu/6th-c3s-general-assembly>

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TAKING OF OUR FROM

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in the **MEDITERRANEAN**

25-26 October, 2021
Online event

Working together to meet data needs and address climate challenges

EUROPEAN UNION Copernicus IMPLEMENTED BY ECMWF Climate Change Service



MEDIA WORKSHOP
INTERNATIONAL COMMUNICATION
ON CLIMATE CHANGE

17-18 JUNE 2021 – VIRTUAL MEETING

EVENT CO-ORGANISED WITH EUMETSAT

#FIMC2021

WORLD METEOROLOGICAL ORGANIZATION ipcc copernicus ECMWF esa

Cultural and Natural Heritage
and **CLIMATE CHALLENGES**

1-2 July 9.30 – 13.00 CEST

Bringing together Cultural and Natural key challenges related to climate change and work towards solutions

EUROPEAN UNION Copernicus IMPLEMENTED BY ECMWF Climate Change Service

“C3S e il Programma Mirror Copernicus,” 20 Maggio 2021 9.30 – 12.30 CEST

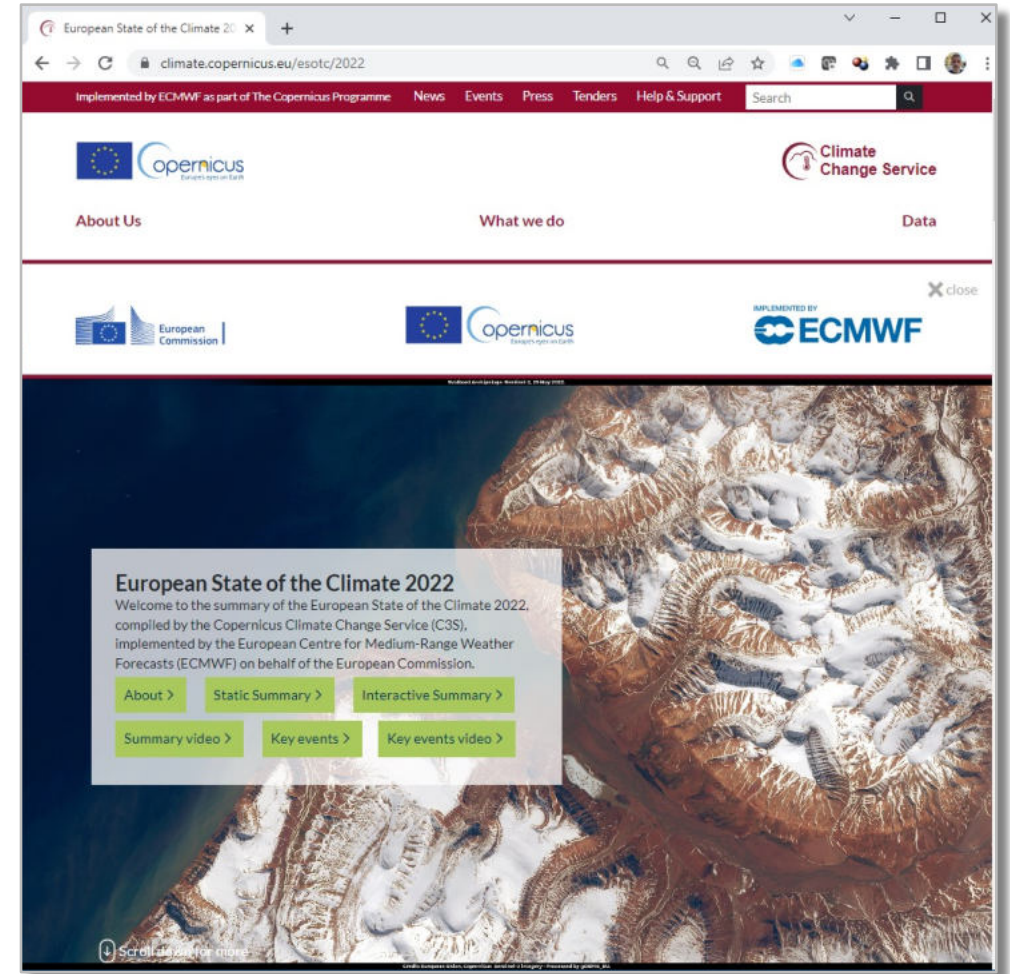
Promuovere l'utilizzo di dati climatici a sostegno delle comunità degli utenti italiani

EUROPEAN UNION Copernicus IMPLEMENTED BY ECMWF Climate Change Service

CON IL SOSTEGNO DEL FORUM NAZIONALE DEGLI UTENTI ITALIANI DI COPERNICUS

European State of the Climate

- ❑ The **ESOTC-European State of the Climate** is the CS3 annual report that provides an **analysis of climate trends** during the last year, with descriptions of climatic conditions and events occurred, and explores the **variations found** for those that are considered the key climatic variables.
- ❑ The ESOTC presents an overview of the global context and the European context (the latter, with greater details) and a focus on the Arctic (similar to what is reported in the monthly Climate Bulletins and in the C3S Climate Indicators).
- ❑ **The report is essentially based on C3S products.** Data and reports from other monitoring activities are also included when considered informative and complementary.
- ❑ Data used to produce the ESOTC statistics as well as the statistics themselves are freely available to users through the C3S website and then **they can be downloaded and deployed to derive the same analysis at the local level and/or to compare them against the information available at the local level.**



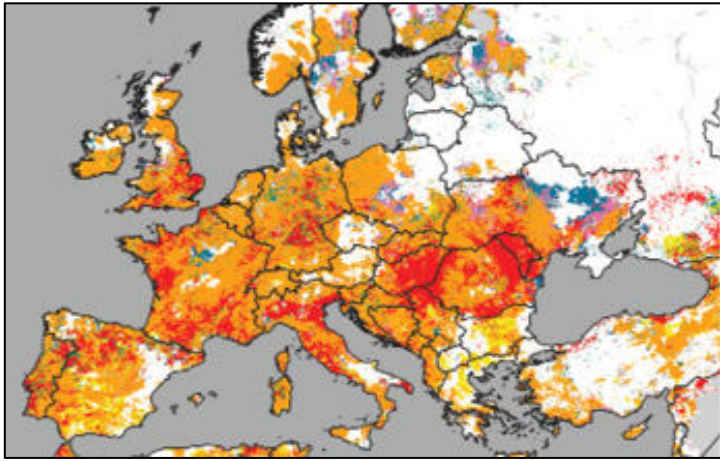
ESOTC 2022 is the 6th in a series of annual reports



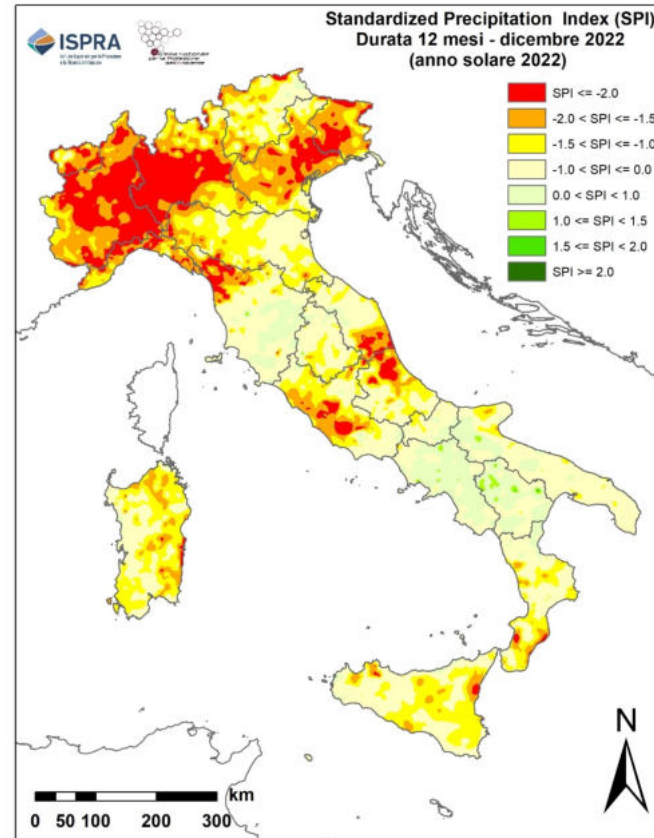


C3S-based applications: present & future

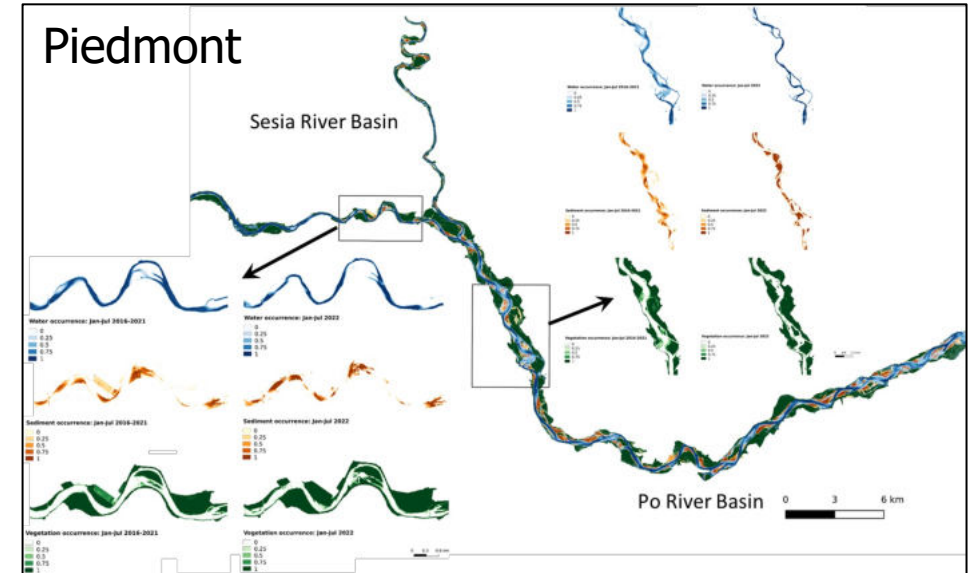
Integrating ESOTC info with local detailed analyses



Drought analysis over EU,
based on data & model at the
EU-spatial scale



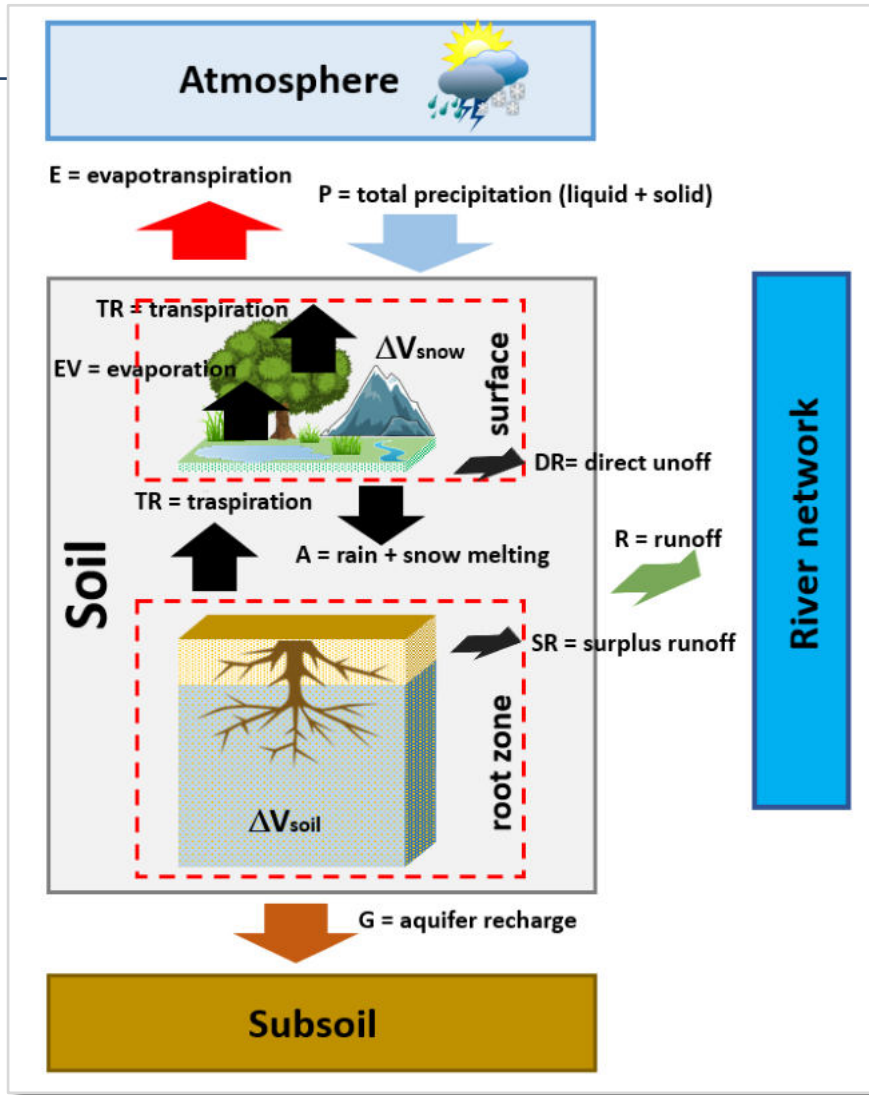
Drought analysis over IT, based on rain
gauge data / [BIGBANG](#) elaborations



Local qualitative-quantitative assessment
of drought impacts on hydromorphological
classes derived from Sentinel-2 data
(JAN-JUL 2022 vs. JAN-JUL 2016–2021)

- [I Servizi nazionali del Mirror Copernicus – Ecoscienza n. 5/2021](#)
- [Dall'elaborazione statistica di immagini Sentinel-2 al monitoraggio quantitativo della siccità: primi risultati di ISPRA](#)

BIGBANG: Hydrological water budget model

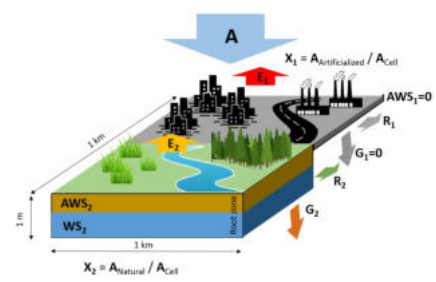
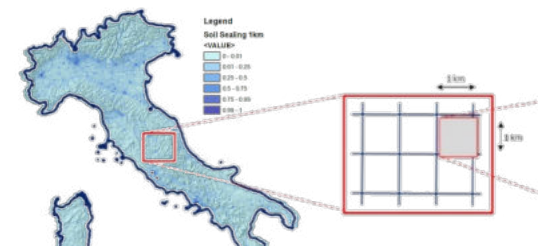


BIGBANG provides 1-km monthly GIS-based estimates over Italy of water budget components and hydrological variables (currently from 1951 to 2022).

HYDRO-METEO DATA FROM REGIONS & AUT. PROVINCES + HISTORICAL DATA FROM SIMN

TEMPERATURE LAYERS FROM ISPRA SCIA SYSTEM

NATIONAL LAYERS FOR SOIL AND HYDROGEOLOGICAL CHARACTERISTICS & SOIL-SEALING RATE LAYER BASED ON COPERNICUS DATA



Braca, G., Bussetini, M., Lastoria, B., Mariani, S., and Piva, F., 2021: Rapporto ISPRA n. 339/21.

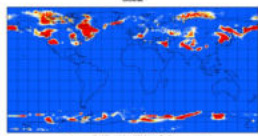


Using climate projections to evaluate future renewable water resource (RWR) availability in Italy

CMIP5 daily data on single levels

Overview Download data Quality assessment Documentation

This catalogue entry provides daily climate projections on single levels from a large number of experiments, models, members and time periods computed in the framework of the fifth phase of the Coupled Model Intercomparison Project (CMIP5). The term "single levels" is used to express that the variables are computed at one vertical level which can be surface (or a level close to the surface) or a dedicated pressure level in the atmosphere. Multiple vertical levels are excluded from this catalogue entry.



CMIP5 data are used extensively in the Intergovernmental Panel on Climate Change Assessment Reports (the latest one is IPCC AR5, which was published in 2014). The use of these data is mostly aimed at:

- addressing outstanding scientific questions that arose as part of the IPCC reporting process;
- improving the understanding of the climate system;
- providing estimates of future climate change and related uncertainties;
- providing input data for the adaptation to the climate change;
- examining climate predictability and exploring the ability of models to predict climate on decadal time scales;
- evaluating how realistic the different models are in simulating the recent past.

The term "experiments" refers to the three main categories of CMIP5 simulations:

- Historical experiments which cover the period where modern climate observations exist. These experiments show how the GCMs performs for the past climate and can be used as a reference period for comparison with scenario runs for the future. The period covered is typically 1850-2005;
- Ensemble of experiments from the Atmospheric Model Intercomparison Project (AMIP), which prescribes the oceanic variables for all models and during all period of the experiment. This configuration removes the added complexity of ocean-atmosphere feedbacks in the climate system. The period covered is typically 1950-2005.
- Ensemble of climate projection experiments following the Representative Concentration Pathways (RCP) 2.6, 4.5, 6.0 and 8.5. The RCP scenarios provide different pathways of the future climate forcing. The period covered is typically, 2006-2100 some extended RCP experimental data is available from 2100-2300.

In CMIP5, the same experiments were run using different GCMs. In addition, for each model, the same experiment was repeatedly done using slightly different conditions (like initial conditions or different physical parameterisations for instance) producing in that way an ensemble of experiments closely related. Note that CMIP5 GCM data can be also used as lateral boundary conditions for Regional Climate Models (RCMs). RCMs are also available in the CDS (see CORDEX datasets).

The data are produced by the participating institutes of the CMIP5 project. The latest CMIP GCM experiments will form the CMIP6 dataset, which will be published in the CDS in a later stage.

DATA DESCRIPTION	
Data type	Gridded
Projection	Regular latitude-longitude grid

Contact
ECMWF Support Portal

Licence
CMIP5 - Data Access - Terms of Use

Publication date
2016-06-14

Related data
CMIP5 daily data on pressure levels
CMIP5 monthly data on pressure levels
CMIP5 monthly data on single levels
CMIP6 climate projections

Name	Radiative forcing	CO ₂ equiv (p.p.m.)	Temp anomaly (°C)	Pathway	SRES temp anomaly equiv
RCP8.5	8.5 Wm ² in 2100	1370	4.9	Rising	SRES A1F1
RCP6.0	6 Wm ² post 2100	850	3.0	Stabilization without overshoot	SRES B2
RCP4.5	4.5 Wm ² post 2100	650	2.4	Stabilization without overshoot	SRES B1
RCP2.6 (RCP3PD)	3Wm ² before 2100, declining to 2.6 Wm ² by 2100	490	1.5	Peak and decline	None

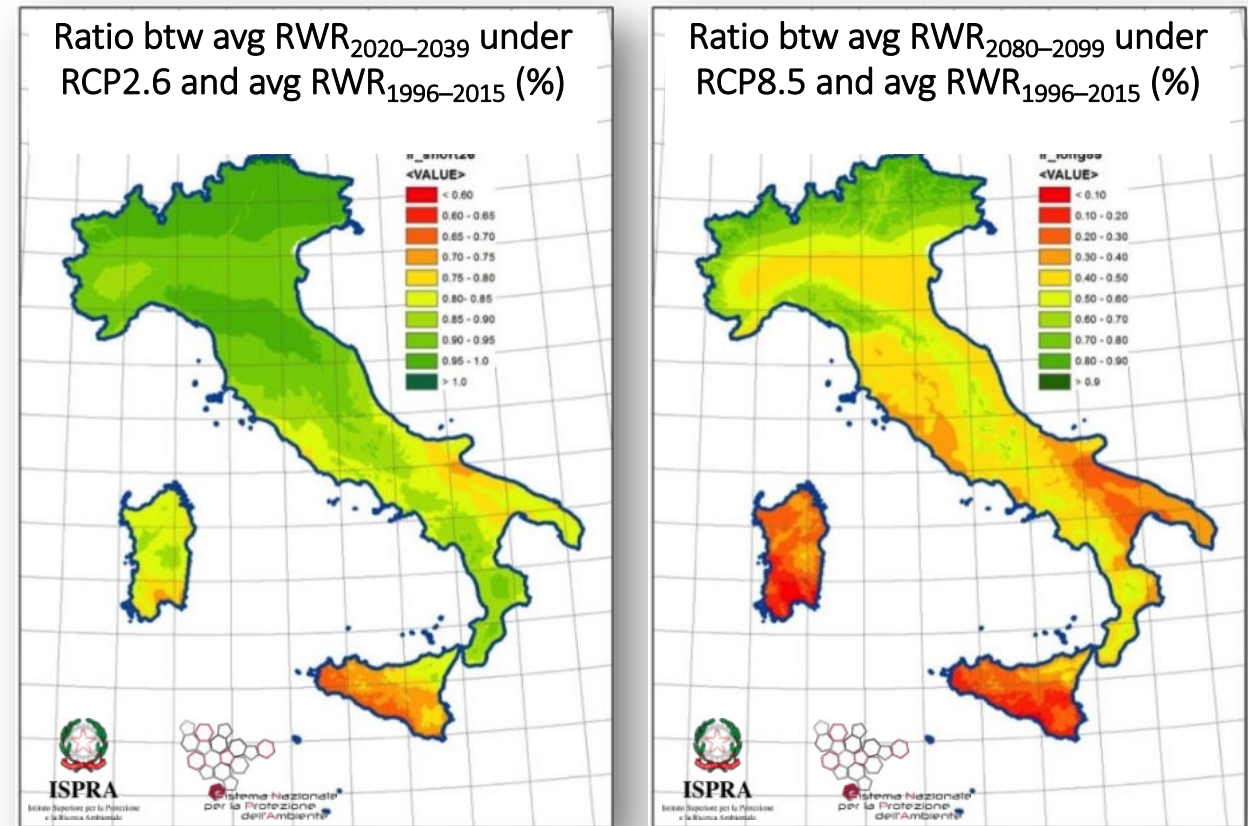


- ❑ ISPRa ([Braca et al., 2019](#)) conducted by means of the BIGBANG model a "proof of concept" study to address, at the national level, the possible impacts on water balances and on renewable water resource (RWR) for future situations in which global changes may affect the hydrological cycle.
- ❑ Ensemble average simulations (temp & precip) provided by the IPCC AR5 CCSM4 model according to 4 different future GHG emission scenarios (RCP2.6, RCP4.5, RCP6.0, RCP8.5) and 3 time horizons (2020–2039, 2040–2059 and 2080–2099) were considered.

Use of climate projections to evaluate the renewable water resource (RWR) availability in Italy

- ❑ RWR reduction in terms of RCP2.6 is quite constant over Italy for all time horizons: $\approx 10\%$ avg. RWR reduction by 2040.
- ❑ RWR reduction is critical for the RCP8.5 scenario, the worst in terms of GHG emissions: $\approx 40\%$ avg. RWR reduction at long-term time horizon ($> 90\%$ over Southern IT).

Work under consideration: Using different high-res GCMs projections available through C3S to address uncertainty and to improve temporal and spatial variability. This will provide a robust evaluation of CC potential impacts on RWR to better respond to water managers' needs.



Braca et al., *Rend. Fis. Acc. Lincei*, 2019, [DOI:10.1007/s12210-018-00757-6](https://doi.org/10.1007/s12210-018-00757-6)
Mariani et al., GL on drought & water scarcity, 2020, <https://bit.ly/3gtld3e>

Extension of the BIGBANG analyses over transnational basins

Need to collect precipitation and temperature data on territories outside the Italian territory.

E-OBS daily gridded meteorological data for Europe from 1950 to present derived from in-situ observations

Overview Download data Documentation

E-OBS is a daily gridded land-only observational dataset over Europe. The blended time series from the station network of the European Climate Assessment & Dataset (ECA&D) project form the basis for the E-OBS gridded dataset. All station data are sourced directly from the European National Meteorological and Hydrological Services (NMHSs) or other data holding institutions. For a considerable number of countries the number of stations used is the complete national network and therefore much more dense than the station network that is routinely shared among NMHSs (which is the basis of other gridded datasets). The density of stations gradually increases through collaborations with NMHSs within European research contracts.

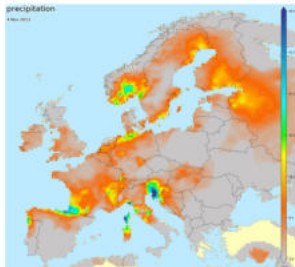
Initially, in 2008, this gridded dataset was developed to provide validation for the suite of Europe-wide climate model simulations produced as part of the European Union ENSEMBLES project. While E-OBS remains an important dataset for model validation, it is also used more generally for monitoring the climate across Europe, particularly with regard to the assessment of the magnitude and frequency of daily extremes.

The position of E-OBS is unique in Europe because of the relatively high spatial horizontal grid spacing, the daily resolution of the dataset, the provision of multiple variables and the length of the dataset. Finally, the station data on which E-OBS is based are available through the ECA&D webpages (where the owner of the data has given permission to do so). In these respects it contrasts with other datasets.

The dataset is daily, meaning the observations cover 24 hours per time step. The exact 24-hour period can be different per region. The reason for this is that some data providers measure between midnight to midnight while others might measure from morning to morning. Since E-OBS is an observational dataset, no attempts have been made to adjust time series for this 24-hour offset. It is made sure, where known, that the largest part of the measured 24-hour period corresponds to the day attached to the time step in E-OBS (and ECA&D).

DATA DESCRIPTION	
Data type	Gridded
Projection	Regular latitude-longitude grid

precipitation



Contact

[ECMWF Support Portal](#)

Licence

[E-OBS product licence](#)

Publication date

2020-02-15

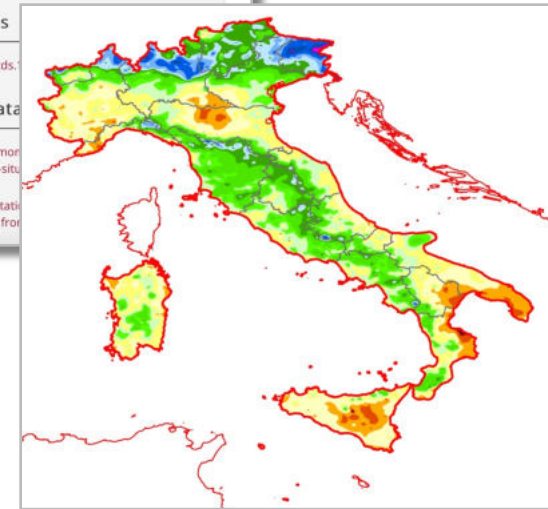
References

DOI: [10.24381/cds](#)

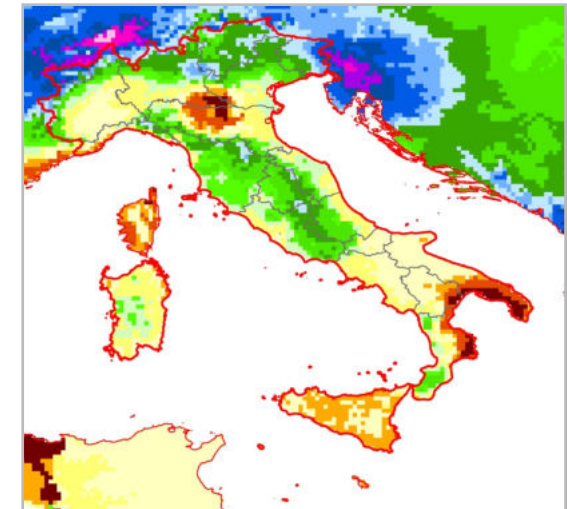
Related data

[Alpine gridded mor derived from in-situ](#)

[Extreme precipitati European cities fro](#)



Precipitation over Italy in April 1970
ISPra BIGBANG gridded data (1 km x 1 km)



Precipitation over Europe in April 1970
E-OBS gridded data (10 km x 10 km)

For Italy, E-OBS dataset may be useful for collecting gridded data over foreign territories (**PROS**), but it may not be equally useful for detailed analyzes at the national/sub-national level (**CONS**), as the ground stations considered (to generate the products) are not uniformly distributed throughout the country → Under-sampling issue/lack of data.

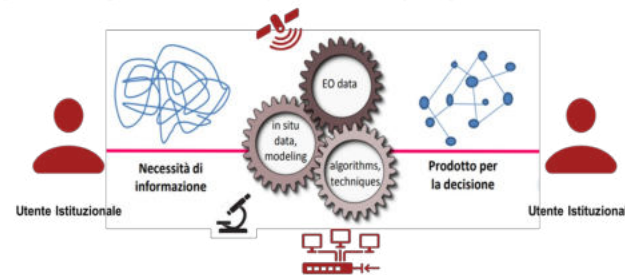
User needs & climate services already available

MIRROR COPERNICUS

Analisi dei fabbisogni del buyers group:
Identificazione dei servizi tematici di riferimento

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- Mappatura dei **potenziali buyers del settore privato** presenti sul mercato (attuali e prospettici).
- Individuazione dei **possibili "Use Cases"** abilitati dai prodotti/servizi.
- Analisi degli **fabbisogni richiesti dai potenziali buyers privati**.



- Costituisce la base dei fabbisogni identificati dagli utenti istituzionali nazionali ai fini dell'ottemperamento della normativa di riferimenti;
- Individua specifici Servizi operativi di interesse nazionale, i relativi obiettivi funzionali ed operativi, lo stato dell'arte ed i requisiti minimi.

CENSIMENTO SERVIZI CLIMATICI

IL TAVOLO CLIMATOLOGIA OPERATIVA
DELLO USER FORUM COPERNICUS

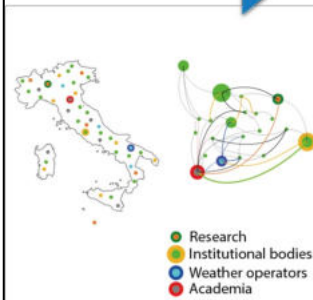
Gruppo Clima

Survey (aggiornamento al 2020) dei servizi e dei prodotti di climatologia operativi a livello nazionale e regionale

Censiti:

- 23 Monitoring/data services
- 26 Climate bulletins
- 17 Monthly-to-seasonal forecasts and long-term climate projections

Scheda di dettaglio per ciascun prodotto e servizio



NATIONAL CLIMATE SERVICE NETWORK OF ITALY (NCSNI)









Description of available climate services, June 2020
Edited by Antonello Provenzale and Carlo Cacciamani

Outline

1. Background
2. Goals and user needs
3. The ItaliaMeteo Agency (AIM) and climate services
 - Part 1: Operational climatology and climate data provision in Italy (contributions by Carlo Cacciamani, Susanna Corti, Alessandro Dell'Aquila, Silvia Guadè, Just van Hanzenberg, Stefano Mariani, Evaristo Marletto, Antonio Parodi, Valentina Pavan, Massimiliano Pavesi, Renato Pelicci, Antonello Provenzale, Silvia Piva, Giovanni Santolini)
4. Climate monitoring
 - 4.1 Surface meteorological observations
 - 4.2 Other surface parameters
 - 4.3 Climate altering atmospheric components
 - 4.4 Data archives
5. Observational Analysis, climate variability and current trends
 - 5.1 Data assimilation systems and analysis
6. Climate Projections
 - 6.1 Monthly and sub-seasonal predictions
 - 6.2 Seasonal predictions
 - 6.3 Decadal predictions
7. Long-term Climate Change Projections
 - 7.1 Global projections
 - 7.2 Regional projections
 - 7.3 Projections at local scale
- Part 2: List of operational climate services currently available in Italy
8. Operational climate services in Italy
 - 8.1 Monitoring/data services
 - 8.2 Climate bulletins
 - 8.3 Monthly-to-seasonal forecasts and long-term climate projections

Mirror Copernicus

- ❑ Definition of 8 thematic services at national level to support Italian public institutions and agencies.
- ❑ One service devoted to hydro-meteorological and climate products.
- ❑ Links among services and some sub-services are based on climate change scenarios.
- ❑ Services (mainly) under development through PNRR initiatives (PNRR IRIDE; PNRR SIM; PNRR MER).

<p>Fascia costiera e monitoraggio marino-costiero</p>  <ul style="list-style-type: none"> ✓ Monitoraggio e previsioni marino costiere ✓ Identificazione e previsione della dinamica di eventi di <i>Oil spills</i> ✓ Monitoraggio geomorfologico della fascia costiera ✓ Monitoraggio di Habitat, Ecosistemi e servizi connessi ✓ Reti in situ (mareografi, ondametri) 	<p>Qualità dell'aria</p>  <ul style="list-style-type: none"> ✓ Monitoraggio e previsioni qualità dell'aria ✓ Monitoraggio di episodi di inquinamento atmosferico causati da fenomeni naturali e attività antropiche (polvere del deserto, eruzioni vulcaniche, incendi, rilasci industriali accidentali) ✓ Rianalisi della composizione atmosferica ad alta risoluzione 	<p>Movimenti del terreno</p>  <ul style="list-style-type: none"> ✓ Monitoraggio dei movimenti del terreno su area vasta in tempo differito (media risoluzione o alta risoluzione) ✓ Monitoraggio dei movimenti del terreno su specifiche aree di interesse in tempo quasi reale, ad alta risoluzione ✓ Monitoraggio strutture e infrastrutture 	<p>Copertura e uso del suolo</p>  <ul style="list-style-type: none"> ✓ Monitoraggio stato/cambiamenti di copertura e uso del suolo ✓ Monitoraggio di Habitat, Ecosistemi e servizi connessi ✓ Valutazione perturbazioni, fenomeni e conseguenti danni, dovuti a cause antropiche o naturali che alterano copertura e/o uso del suolo ✓ Agricoltura ✓ Foreste
<p>Idro-meteo-clima</p>  <ul style="list-style-type: none"> ✓ Monitoraggio idro-meteorologico e previsioni meteo (<i>nowcasting</i> e previsioni a breve e medio termine; prodotti di previsione meteo) ✓ Servizi climatici (indicatori climatici, ECV e gas a effetto serra, rianalisi, previsioni stagionali e proiezioni climatiche) ✓ Servizi agro-meteorologici ✓ Rete e modello per i fulmini 	<p>Risorsa Idrica</p>  <ul style="list-style-type: none"> ✓ Modellistica idrologica e idraulica, previsione delle piene e gestione dei sedimenti ✓ Monitoraggio idromorfologico e dinamica d'alveo ✓ Servizi per la gestione integrata della risorsa idrica ✓ Mappatura di habitat di specie target e valutazione dello stato ambientale dei corpi idrici 	<p>Emergenza</p>  <ul style="list-style-type: none"> ✓ Servizio sismico ✓ Servizio alluvioni ✓ Servizio eruzioni vulcaniche 	<p>Sicurezza</p>  <ul style="list-style-type: none"> ✓ Monitoraggio ad alta ed altissima risoluzione di aree di interesse ✓ Mappe di densità di popolazione ✓ Servizi di <i>Tracking & Surveillance</i> ✓ Servizi di Analisi del rischio ✓ Intelligence ambientale: Incidenti e Reati (Discariche, scarichi a terra, mare e fiumi)

MoU UFN Copernicus & ECMWF

Stipulato il 24 ottobre 2022 un **Memorandum of Understanding** tra l'Italia, attraverso lo UFN Copernicus, e l'ECMWF in qualità di *Entrusted Entity* del C3S e del CAMS–Copernicus Atmosphere Monitoring Service.

L'obiettivo è il supporto dell'ECMWF come "Market uptake Advisory Expert" per lo sviluppo dei Servizi del Mirror Copernicus e, in particolare, per quanto relativo a:

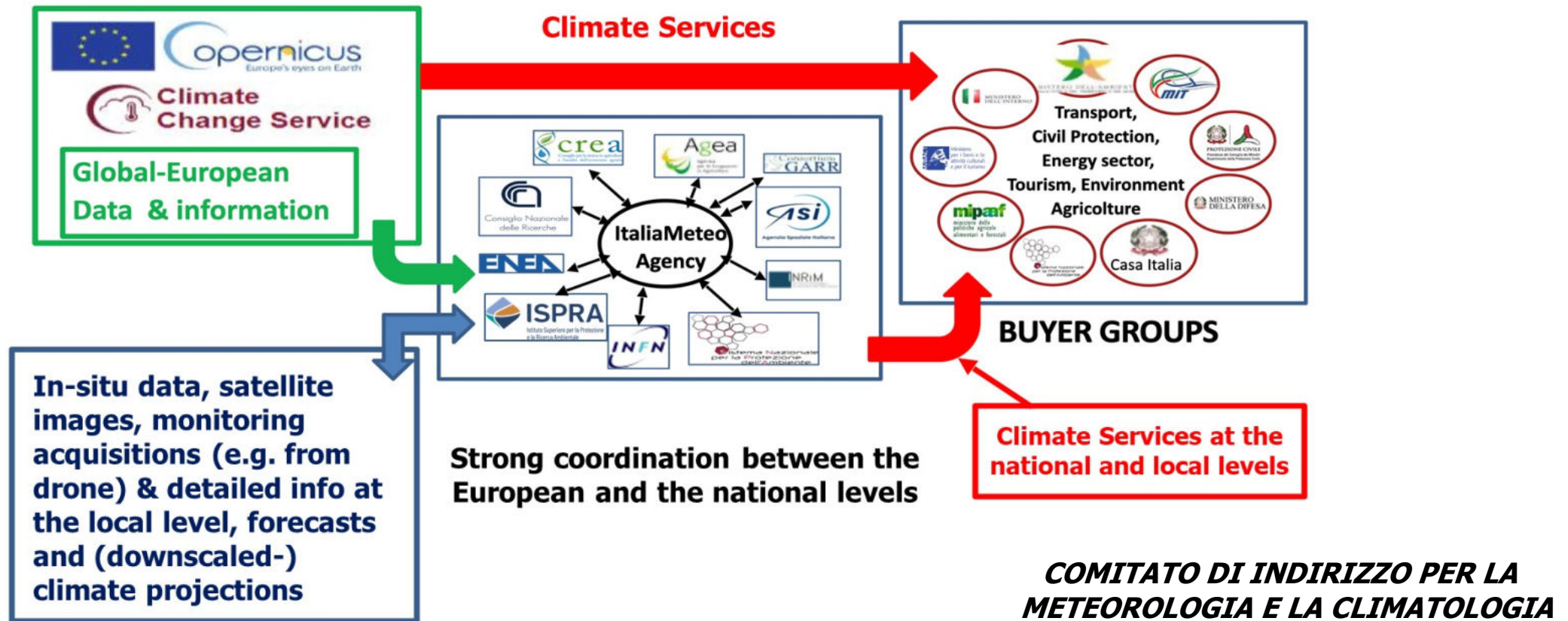
- idro-meteo-clima (indicatori, previsioni, proiezioni climatiche, servizi climatici, ecc.);
- composizione atmosferica (qualità aria);
- monitoraggio delle emissioni dei gas serra;
- valutazioni sulla risorsa idrica (e.g., impatto cambiamenti climatici sulla disponibilità di risorsa) e sul ciclo idrologico e i suoi estremi;
- attività di emergenza.

→ Next step: **National Collaboration Program** con ECMWF, strumento finalizzato all'uptake nazionale dei Climate Services erogati dal Servizio C3S

Fascia costiera e monitoraggio marino-costiero 	Qualità dell'aria 	Movimenti del terreno 	Copertura e uso del suolo 
<ul style="list-style-type: none"> ✓ Monitoraggio e previsioni marino costiere ✓ Identificazione e previsione della dinamica di eventi di <i>Oil spills</i> ✓ Monitoraggio geomorfologico della fascia costiera ✓ Monitoraggio di Habitat, Ecosistemi e servizi connessi ✓ Reti in situ (mareografi, ondametri) 	<ul style="list-style-type: none"> ✓ Monitoraggio e previsioni qualità dell'aria ✓ Monitoraggio di episodi di inquinamento atmosferico causati da fenomeni naturali e attività antropiche (polvere del deserto, eruzioni vulcaniche, incendi, rilasci industriali accidentali) ✓ Rianalisi della composizione atmosferica ad alta risoluzione 	<ul style="list-style-type: none"> ✓ Monitoraggio dei movimenti del terreno su area vasta in tempo differito (media risoluzione o alta risoluzione) ✓ Monitoraggio dei movimenti del terreno su specifiche aree di interesse in tempo quasi reale, ad alta risoluzione ✓ Monitoraggio strutture e infrastrutture 	<ul style="list-style-type: none"> ✓ Monitoraggio stato/cambiamenti di copertura e uso del suolo ✓ Monitoraggio di Habitat, Ecosistemi e servizi connessi ✓ Valutazione perturbazioni, fenomeni e conseguenti danni, dovuti a cause antropiche o naturali che alterano copertura e/o uso del suolo ✓ Agricoltura ✓ Foreste
Idro-meteo-clima 	Risorsa Idrica 	Emergenza 	Sicurezza 
<ul style="list-style-type: none"> ✓ Monitoraggio idro-meteorologico e previsioni meteo (<i>nowcasting</i> e previsioni a breve e medio termine; prodotti di previsione meteo) ✓ Servizi climatici (indicatori climatici, ECV e gas a effetto serra, rianalisi, previsioni stagionali e proiezioni climatiche) ✓ Servizi agro-meteorologici ✓ Rete e modello per i fulmini 	<ul style="list-style-type: none"> ✓ Modellistica idrologica e idraulica, previsione delle piene e gestione dei sedimenti ✓ Monitoraggio idromorfologico e dinamica d'alveo ✓ Servizi per la gestione integrata della risorsa idrica ✓ Mappatura di habitat di specie target e valutazione dello stato ambientale dei corpi idrici 	<ul style="list-style-type: none"> ✓ Servizio sismico ✓ Servizio alluvioni ✓ Servizio eruzioni vulcaniche 	<ul style="list-style-type: none"> ✓ Monitoraggio ad alta ed altissima risoluzione di aree di interesse ✓ Mappe di densità di popolazione ✓ Servizi di <i>Tracking & Surveillance</i> ✓ Servizi di Analisi del rischio ✓ Intelligence ambientale: Incidenti e Reati (Discariche, scarichi a terra, mare e fiumi)

Towards a new cooperation

USER FORUM NAZIONALE DI COPERNICUS / MoU con ECMWF TAVOLO CLIMATOLOGIA



Thanks for your kind attention

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