

Integrated approach for the Development across Europe of user oriented climate indicators for GFCS high-priority sectors: agriculture, disaster risk reduction, energy, health, water and tourism

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INDECIS Software	Description
INDECIS QC (INQC) software	Designed to quality control large datasets in ECA&D format
Quality Control Software Suite for Tall Tower Data	Designed to quality control wind mast data
Software Suite for Indices Calculation	Designed to compute 136 sectorial indices.
Software Suite of Atmospheric Circulation Indices Calculation	Designed to compute standard large-scale circulation indices
Software for intercomparison of reanalysis datasets (INTERDECIS)	Designed to analyse climatic datasets performance by using E-OBS gridded dataset and ERA5 reanalysis.

Software

Indices

- Definition of 136 sector-oriented climate indices.
- Compilation of sectorial data.
- Release of software suite and calculation of climate indices by using E-OBS and ERA5 Dataset.

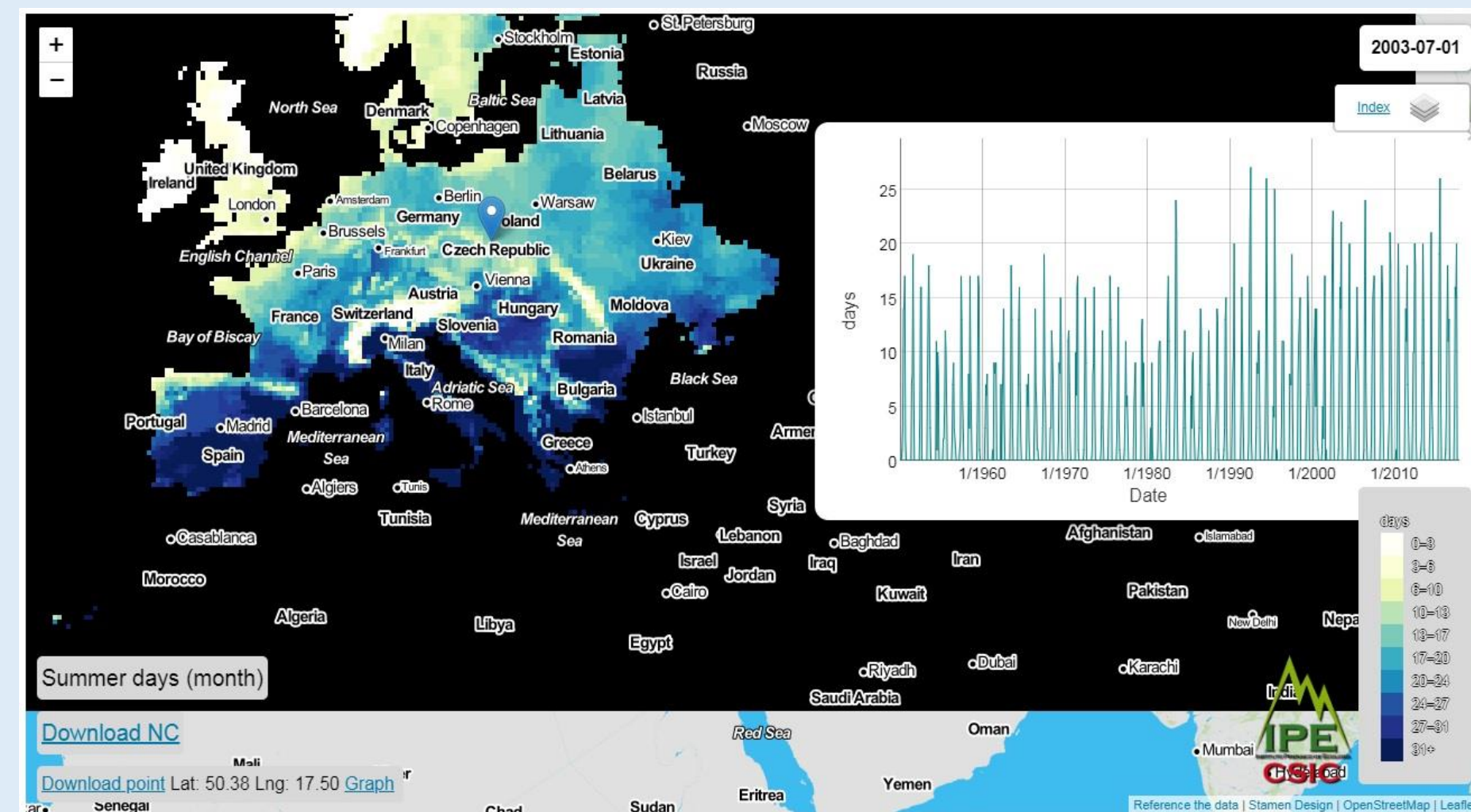


Fig. 2: Climate Index monitoring tool, available at <http://www.indecis.eu/indices.php>

Analysis

- A catalogue of atmospheric circulation metrics was compiled.
- Links between impact relevant metrics and atmospheric circulation indices are being investigated together with the time of climate change emergence for observed variables.

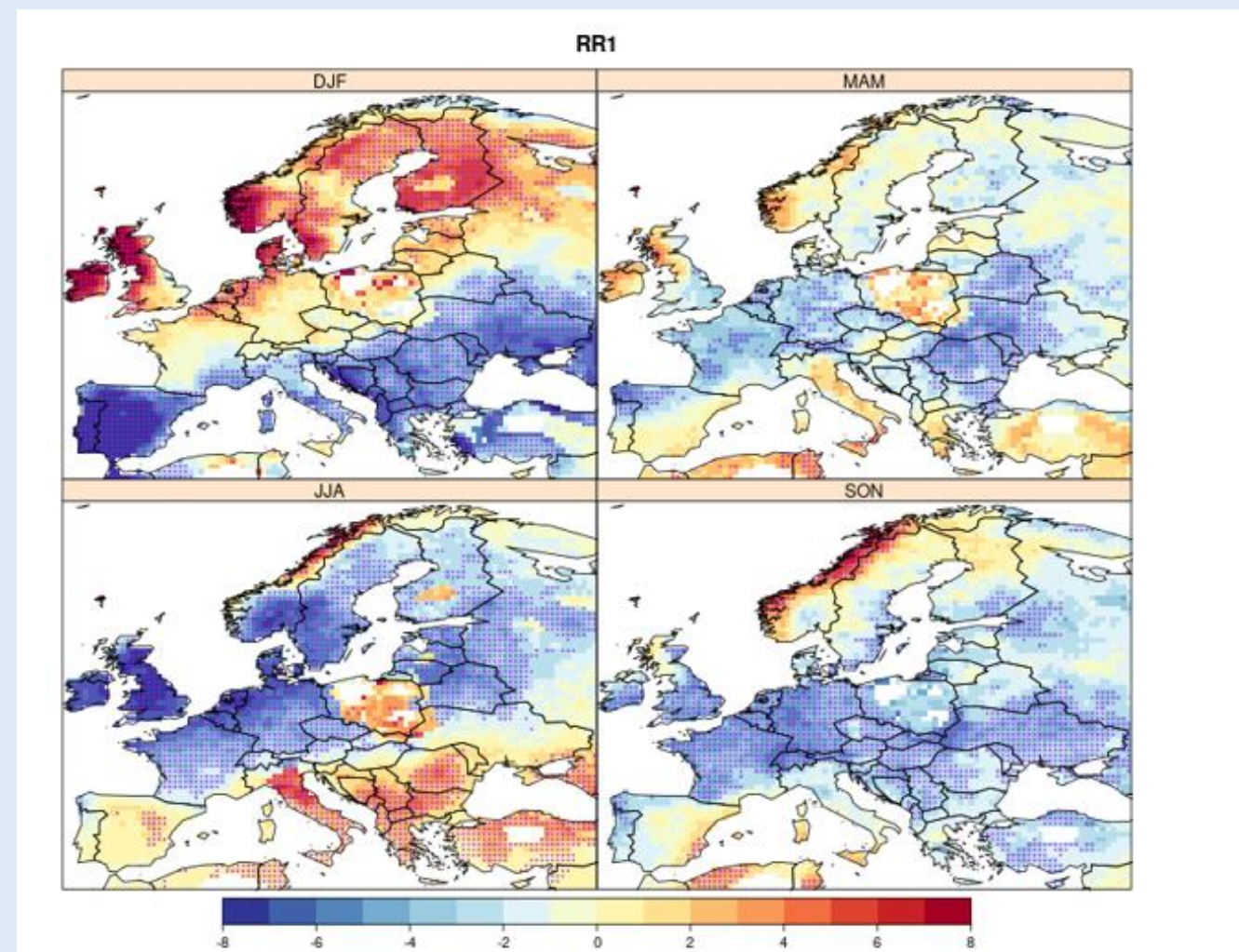


Fig. 3: Regression coefficients for PR1 ~ NAO (days/season). Statistically significant values (p-value < 0.05) are depicted in purple.

INDECIS Datasets	Description
Expansion of INDECIS Core Climate Datasets	610K daily observations were rescued 339 Italian climate series were gathered 577 series of global radiation were added
Tall Towers Dataset	311 global wind tall mast stations were compiled
Quality Controlled version of ECA&D	ECA&D raw data were quality controlled by using the INQC software
Benchmark Datasets	Designed to identify the capabilities of QC and homogenization methods with the associated uncertainties.
Indices Datasets	Sectorial indices computed using E-OBS dataset and reanalysis data

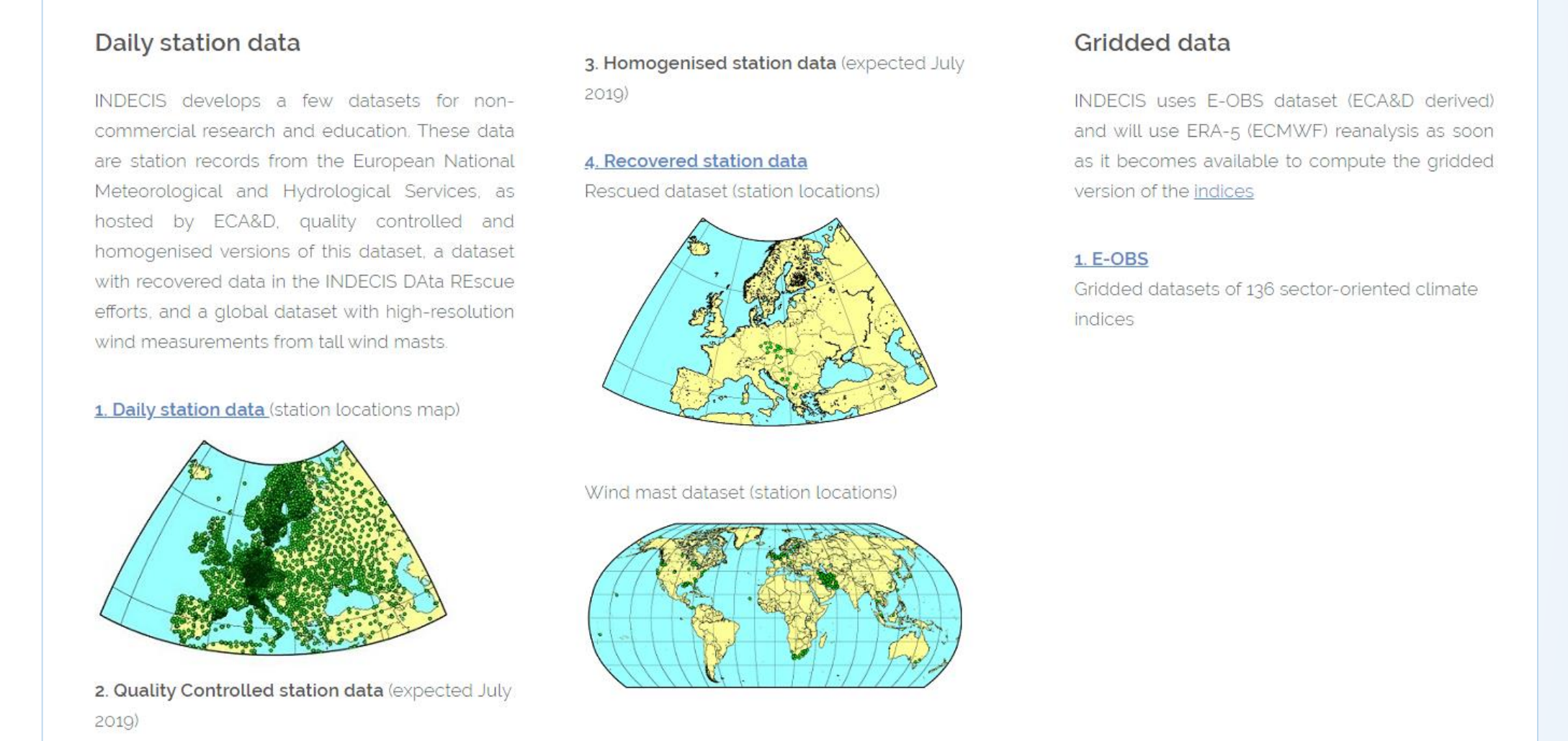
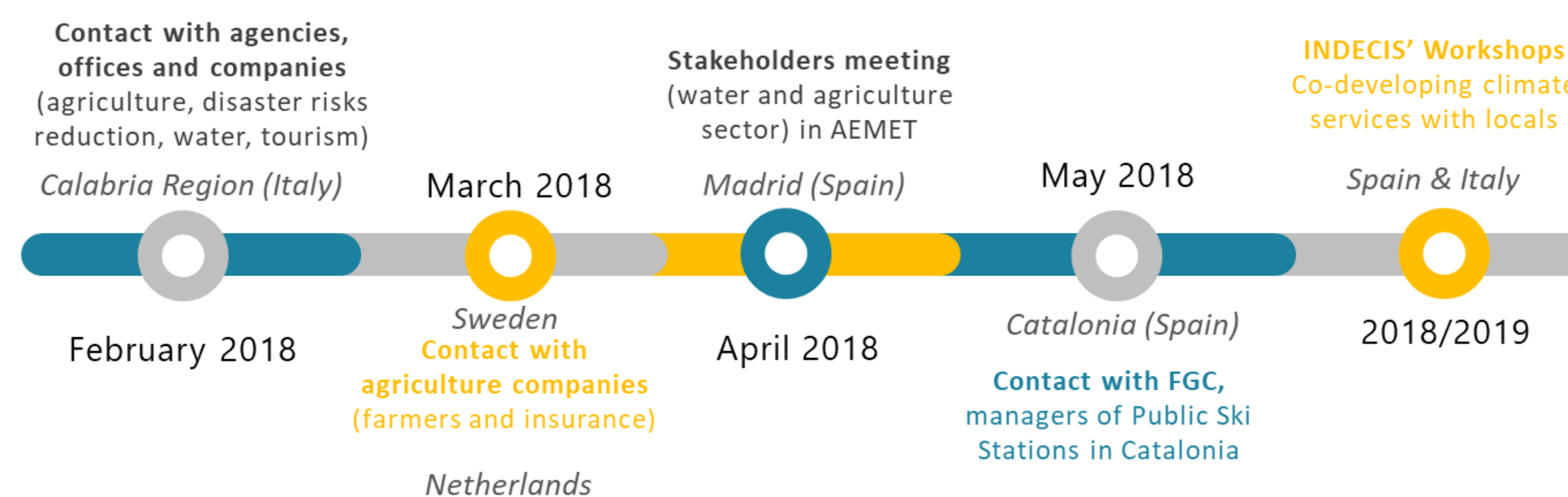


Fig. 1: INDECIS Data portal, available at <http://www.indecis.eu/data.php>

SERVICE

Users



Forecast of optimal conditions and adaptive strategies for different tourism activities derived from co-creation methodology with local agents.	INDECIS Tourism Indices
	Snow Tourism Index
	Beach Index
	Outdoor Tourism Index
	Cultural Tourism Index
	MICE Tourism Index

WORKSHOPS CO-CREATING CLIMATE SERVICES FOR TOURISM



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PROJECT OVERVIEW

The INDECIS project (www.indecis.eu and @Indecisproject for social media) includes 16 institutions from 12 countries and constitutes a pan-European effort focused on the development and production of climate indices, specifically targeting the priority sectors of the GFCs plus tourism and their conversion into climate services. The main objective of the project is to develop historical high quality and dense climate networks across Europe based on long-perspective time series of different stations-based meteorological variables from which accurate and robust climate indices can be calculated to create user-oriented climate products and services. INDECIS is starting its second half of the project and the tasks and results achieved during the first half are summarized below for each Work Package (WP).

WP2

IDENTIFICATION AND CATALOG OF CLIMATE DATA SETS AND PORTAL

WP2 contributed to expand ECA&D Dataset, as core dataset of the project (<https://www.ecad.eu/dailydata/>). Main tasks and results:

- Discrepancies between ECA&D and GHCN/GSOD Global data repositories were solved.
- 610K daily observations were rescued (Fig. 1) for the Balkans and Central Europe <https://doi.pangaea.de/10.1594/PANGAEA.896957>.
- 339 Italian climate series were gathered.
- 311 wind tall mast stations were compiled (Fig. 2).
- 577 series of global radiation for Europe were added.

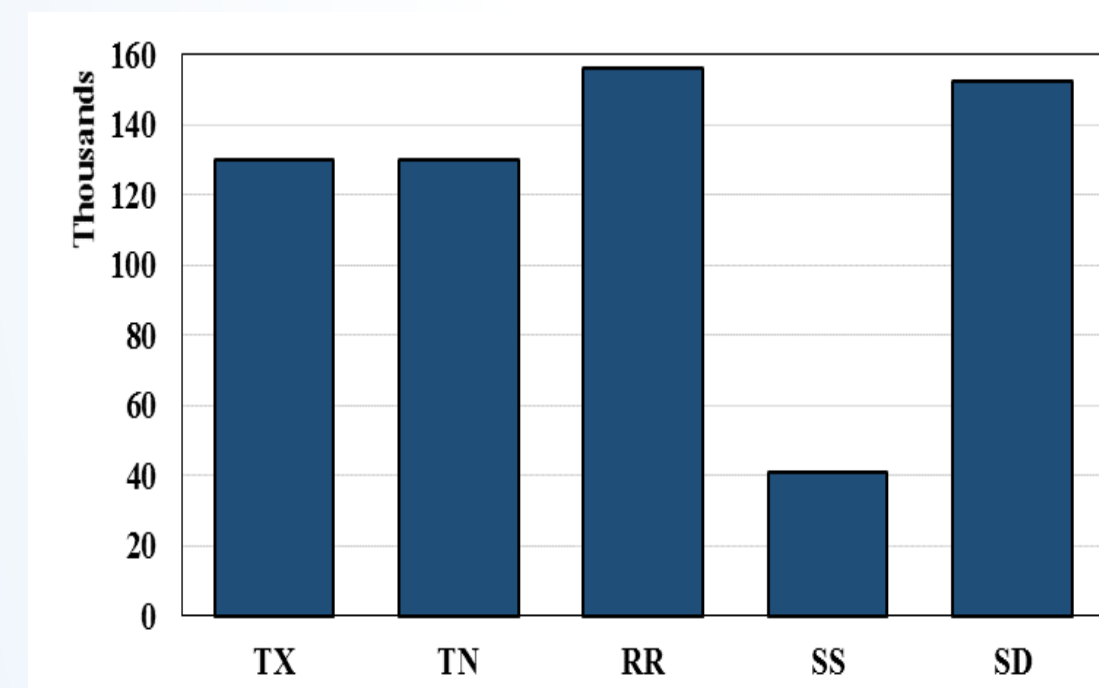


Fig. 1: Total amount of digitized values by variables.



Fig. 2: Global distribution of wind tall mast stations.

WP5

INDICES TIME EVOLUTION AND RELATIONS WITH THE ATMOSPHERE

WP5 aims to quantify the variability and change in indices and establish a link to atmospheric circulation patterns. Main tasks and results:

- A catalogue of atmospheric circulation metrics was compiled.
- Links between impact relevant metrics and atmospheric circulation indices are being investigated together with the time of climate change emergence for observed variables.

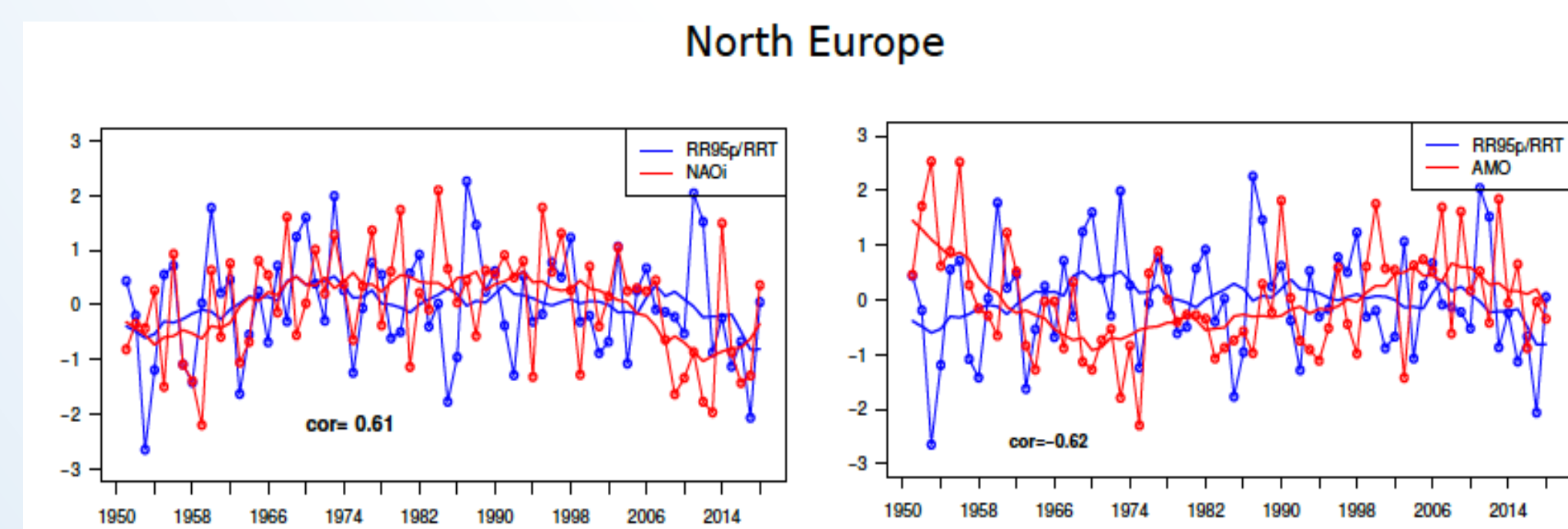


Fig. 5: Variability of summer extreme rainfall compared with NAO and AMO indices

WP3

DATA QUALITY AND HOMOGENEITY

WP3 designed methodologies and software to quality control (QC) and homogenize ECA&D variables at daily scale. Main tasks and results:

- Release of QC software: INQC <https://github.com/INDECIS-Project/INQC> for ECA&D daily data and QCSS4TT for tall masts wind data <https://earth.bsc.es/gitlab/jramon/INDECIS-QCSS4TT/>
- First QC run was applied to ECA&D (INQC) (Fig. 3) and tall mast wind data are being quality controlled (QCSS4TT).
- INDECIS Benchmark datasets: Main purpose is to identify the capabilities of QC and homogenization methods with the associated uncertainties. Two benchmarks were created based on RCMs data and are available at: <http://www.indecis.eu/benchmarking.php>

Category	Flag	Total values	Percentage (over non-missing)
Valid	0	612765181	98,53
Error	1	463972	0,07
Most likely Error	2	410616	0,07
Suspect	3	489694	0,08
Collective Error	4	7805667	1,26
Missing	9	260963456	
Total		882898586	

Fig. 3: Summary of QC results over ECA&D at daily scale.

WP6

EVALUATION OF GRIDDED DATASETS, REANALYSES AND MODEL OUTPUT

WP6 provides a solid basis to use alternative datasets for computing specific climate indices in the absence of observational data across Europe. Main tasks and results:

- A catalogue of datasets was produced with fine spatial and/or temporal sampling as alternatives for computing climate indicators.
- Interdecis software (<https://github.com/alexandum/interdecis>) was released for datasets inter-comparison purposes by using specific statistical metrics.
- Next step will focus on identifying differences and similarities between selected datasets and the reference ones (i.e. E-OBS and ERA5) for the Essential Climate Variables selected in the project.

WP4

INDICES CATALOG, DEFINITION AND IMPLEMENTATION

WP4 dealt with the inventory and catalog of indices datasets to be validated with sectorial data. Main tasks and results:

- Definition of 136 sector-oriented climate indices.
- Compilation of sectorial data.
- Release of software suite and calculation of climate indices by using E-OBS Dataset (Fig. 4).

<http://www.indecis.eu/indices.php>

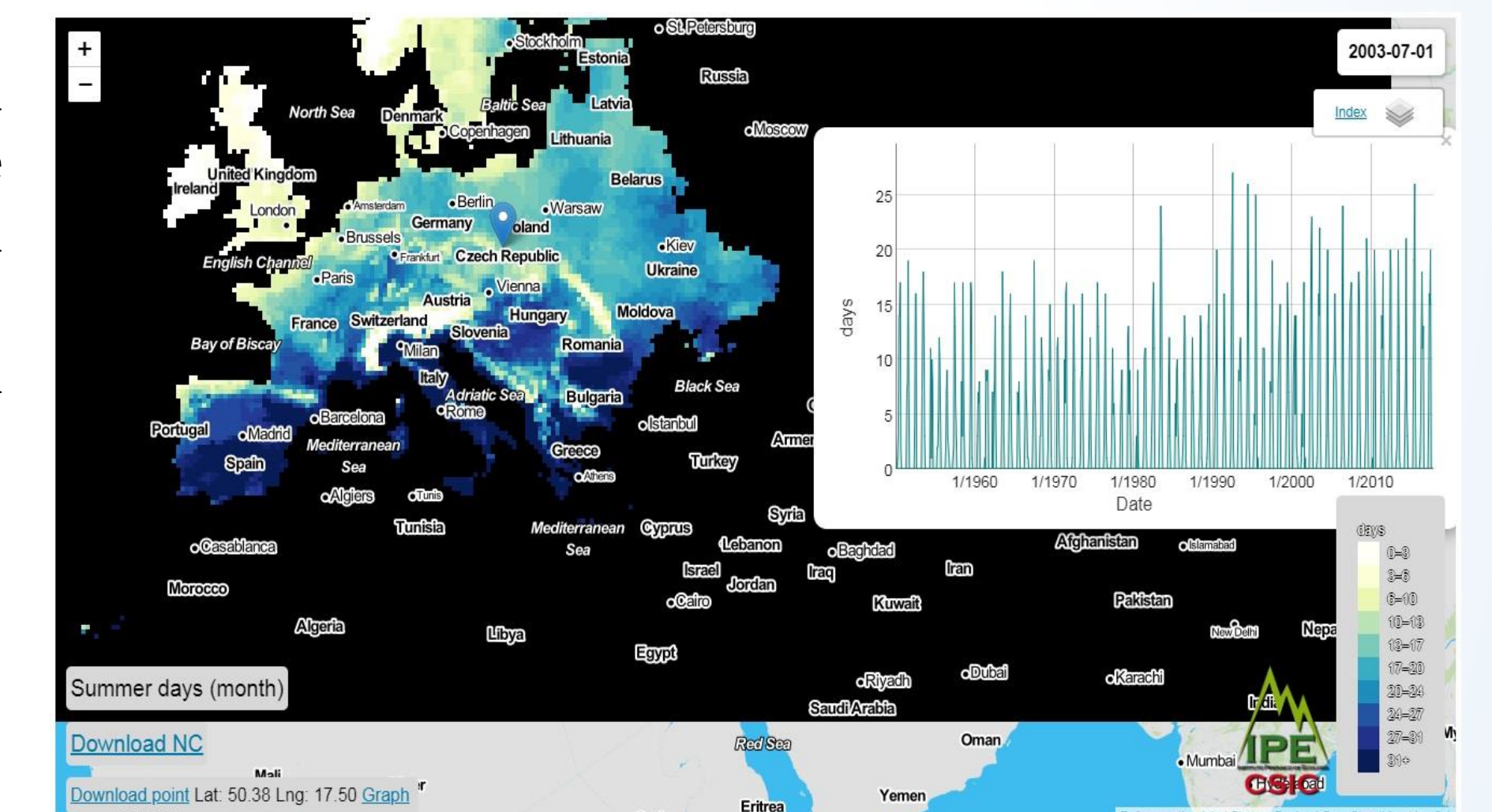


Fig. 4: Example index, extracted from <http://www.indecis.eu/indices.php>

WP7

GENERATION AND COMMUNICATION OF CLIMATE SERVICES

WP7 aims to transform INDECIS' climate datasets and indices into climate services targeting a wide range of stakeholders. Main tasks and results:

- A communication strategy to deliver climate services was defined.
- Four workshops are planned related to the tourism sector (Jaca-Spain, Calabria-Italy, Calvià-Spain, Barcelona-Spain) to engage users and stakeholders in the delivery of climate services.
- A software suite is underway to be integrated into INDECIS Portal (Fig. 6).

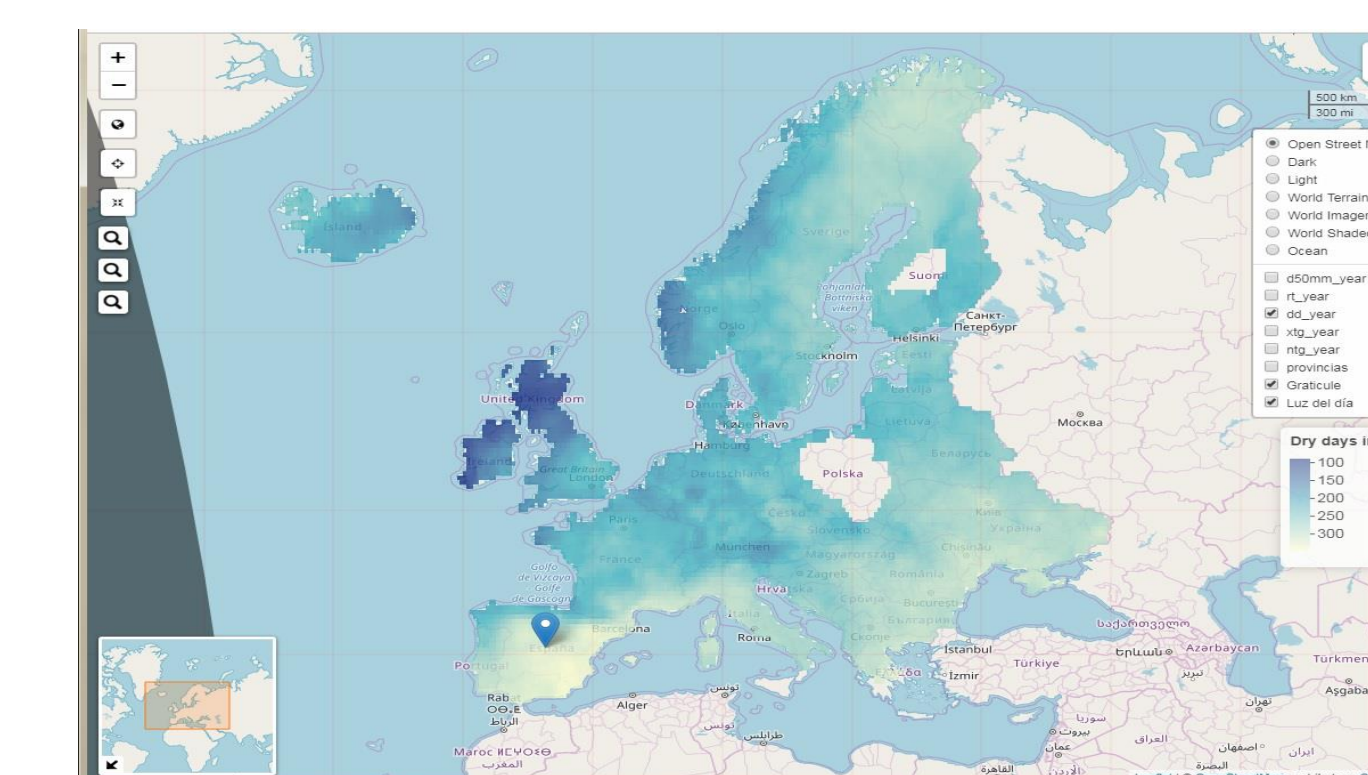


Fig. 6: Visualisation example of the INDECIS Portal: Number of dry days (precipitation >1mm) across Europe in 2017.



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