



XI Jornadas Ibéricas de
Infraestruturas de Dados Espaciais
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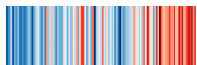


CLIMATE DATASETS AND SERVICES IN SUPPORT TO CLIMATE CHANGE ADAPTATION AND ENVIRONMENTAL MANAGEMENT

MULTI-SOURCE DATA INTEGRATION, EVALUATION AND DISSEMINATION

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Acknowledgements: DivCA researchers and research fellows



Divisão de Clima e Alterações Climáticas
Instituto Português do Mar e da Atmosfera



PLAN

1. (New) Climate model reanalysis global datasets

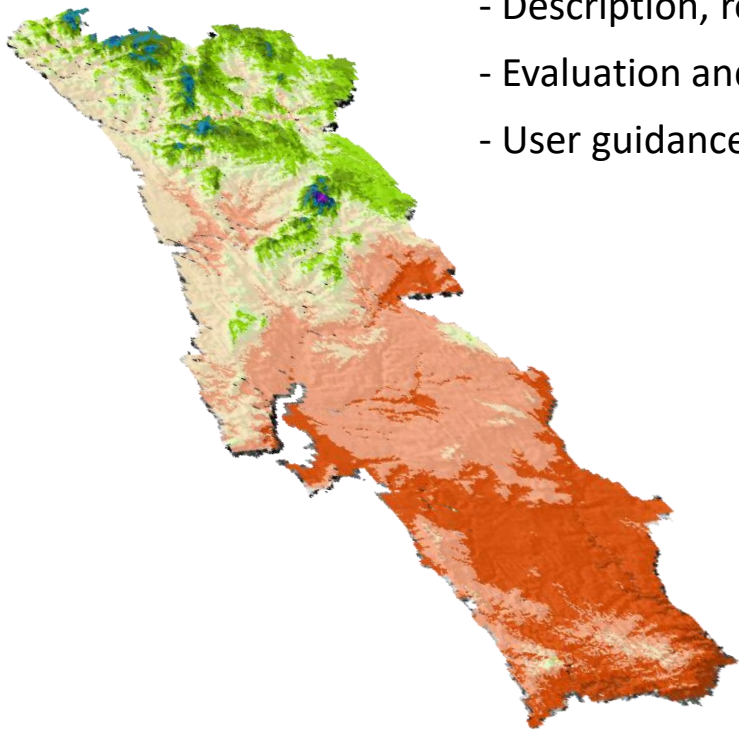
- Description, resolution, variables, period
- Evaluation and validation
- User guidance

2. Adding value for mainland Portugal

- Dynamical downscaling
- Bias correction

3. Services and applications (SDI)

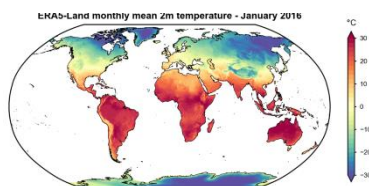
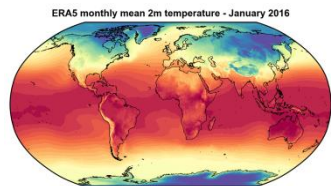
- Climate services and applications
- Data platform and map services



1. ECMWF/C3S GLOBAL CLIMATE MODEL REANALYSIS

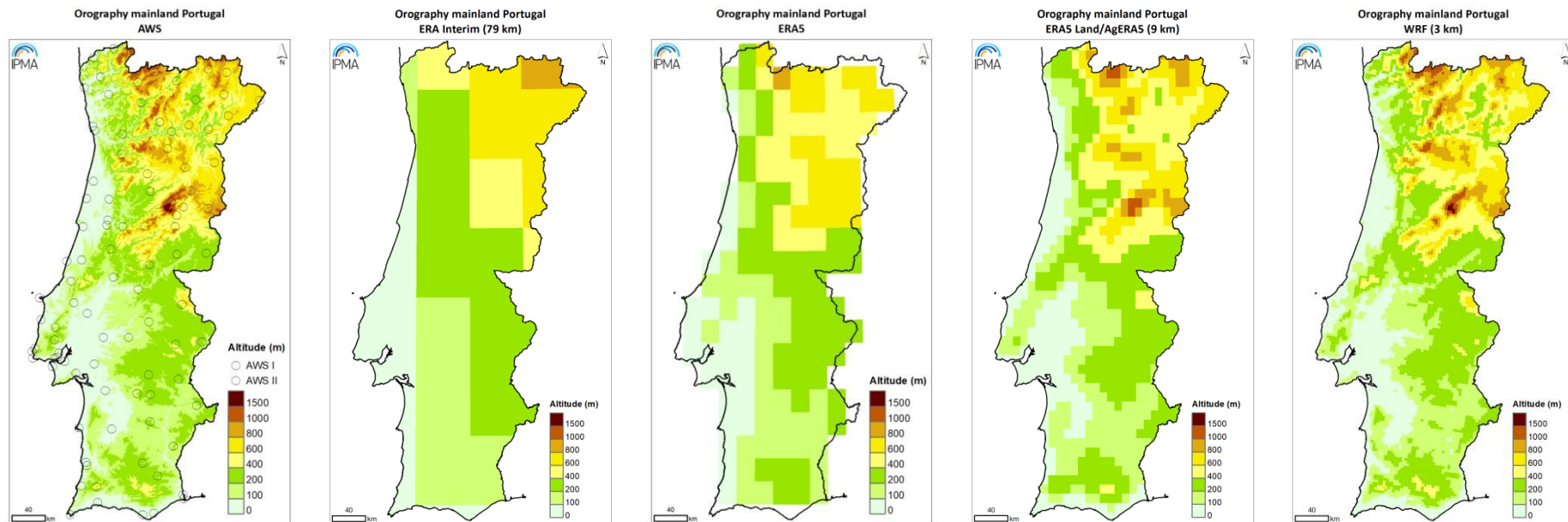
Description, resolution, variables, period

Name	Horizontal resolution	Temporal resolution	Temporal coverage	Update	Note
ERA5	≈32 km	Hourly	1979 to present	Near real time (up to 5 days delay)	Surface and pressure levels
ERA5Land	≈9 km	Hourly	1981 to present	About 3 months	Surface
AgERA5	≈9 km	Daily	1979 to 2018	No updates expected	Surface and agrometeorological indicators derived from reanalysis
<i>ERA Interim</i>	≈79 km	6-hourly	1979 to 2019	Replaced by ERA5	Surface and pressure levels



1. GLOBAL/REGIONAL CLIMATE MODEL REANALYSIS

Orography – mainland Portugal



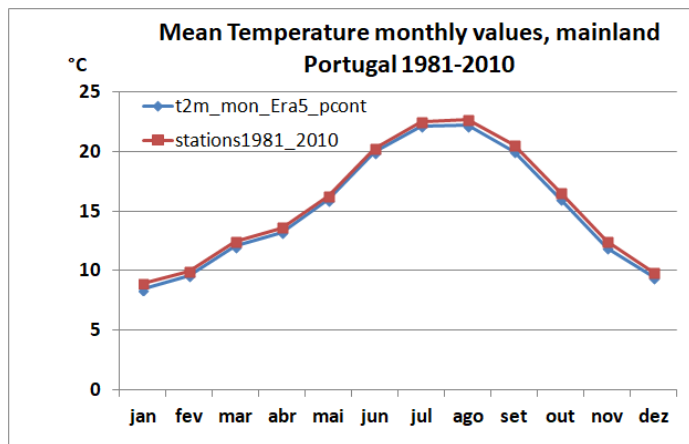
Altitude (m)	DEM (SRTM4) 90 m	#90 AWS (2018)	ERA Interim	ERA-5	ERA5 Land / AgERA5	ERA Interim-WRF
Max	1991	1380	800	812	1119	1772
Mean	322	280	324	311	318	319
Min	0	4	24	15	0	0

1. GLOBAL/REGIONAL CLIMATE MODEL REANALYSIS

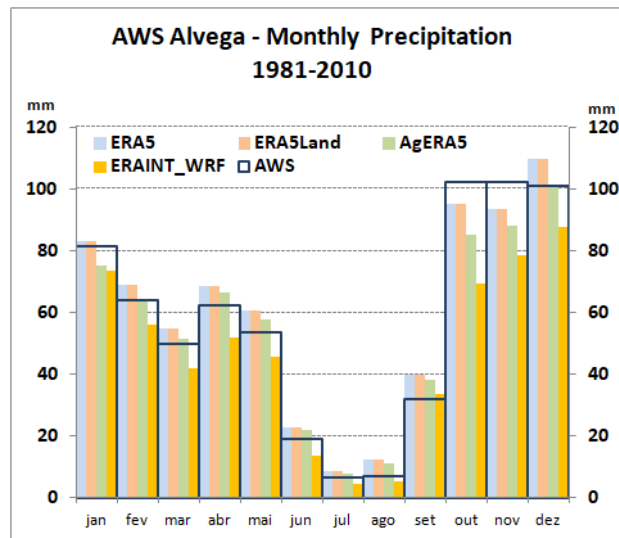
Evaluation and validation:

- Use *in situ* data (surface weather stations), error metrics (Bias, RMSE, r2...)
- Absolute values and anomalies
- Regional statistics
- Expert analysis
- Future use of external datasets (satellite, radar...)

USER GUIDANCE

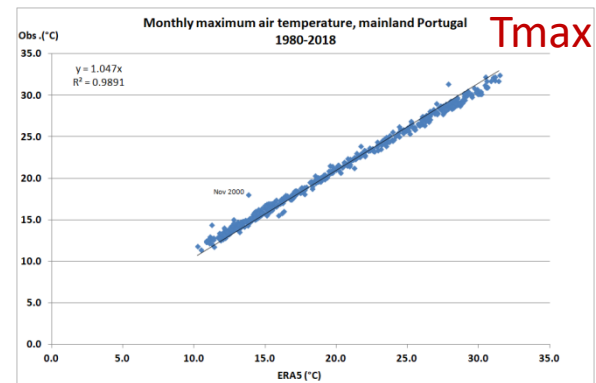
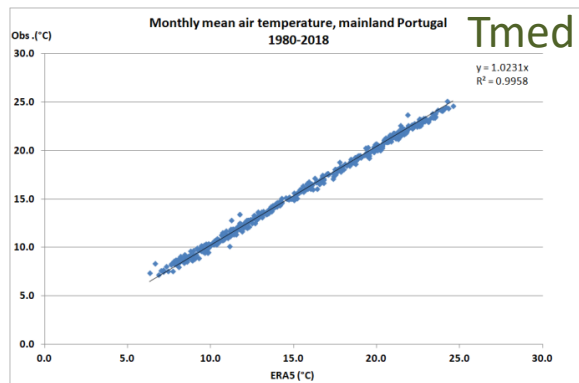
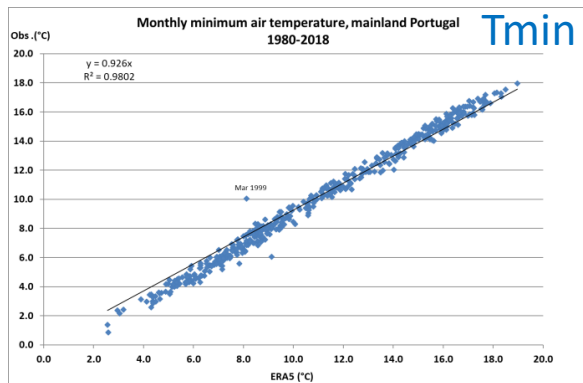


Climate normals

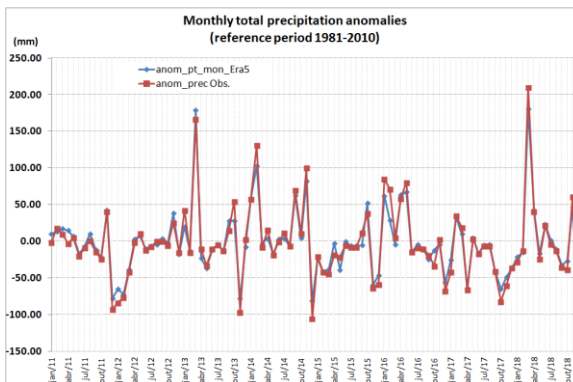
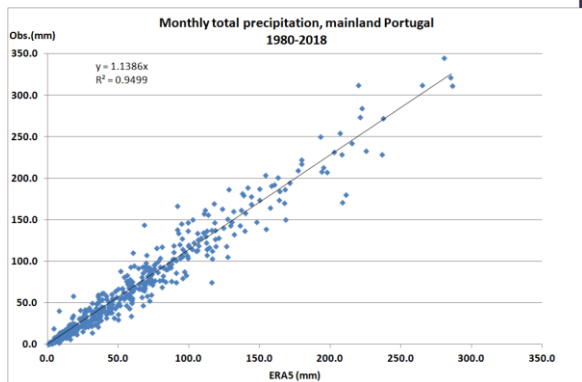


1. GLOBAL/REGIONAL CLIMATE MODEL REANALYSIS

ERA5 monthly air temperature and precipitation evaluation for Portugal mainland



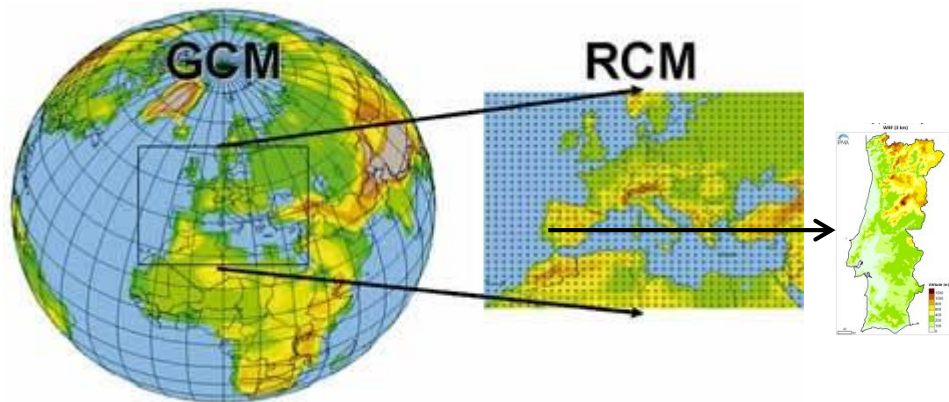
Precipitation



1980-2018	Tmin	Tmed	Tmax	Prec
r^2	0.982	0.996	0.989	0.949
Bias	0.97 °C	-0.10 °C	-1.07 °C	-8.19 mm
RMSE	1.28 °C	0.37 °C	1.19 °C	16.0 mm

2. ADDING VALUE FOR PORTUGAL MAINLAND

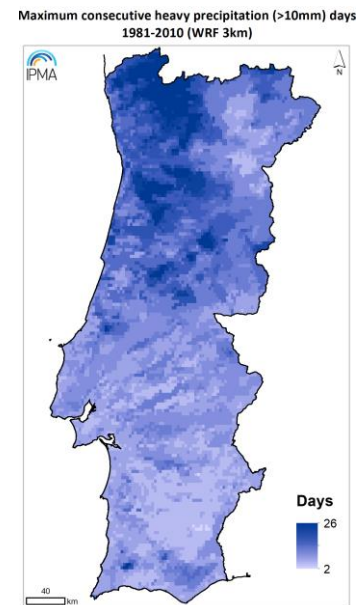
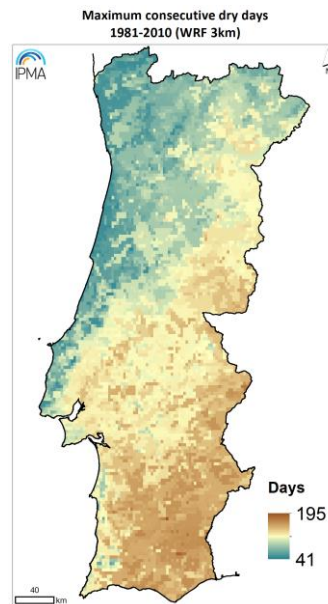
Dynamical downscaling (local area NWP models)



WMO Bulletin n° : Vol 57 (2) - 2008

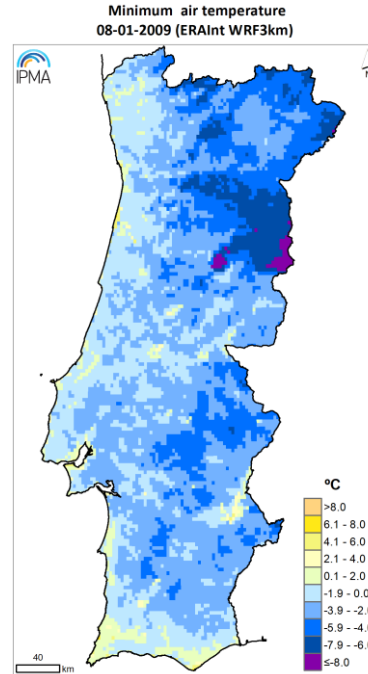
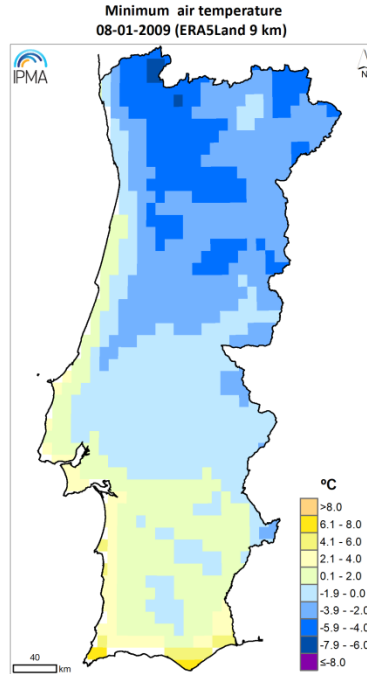
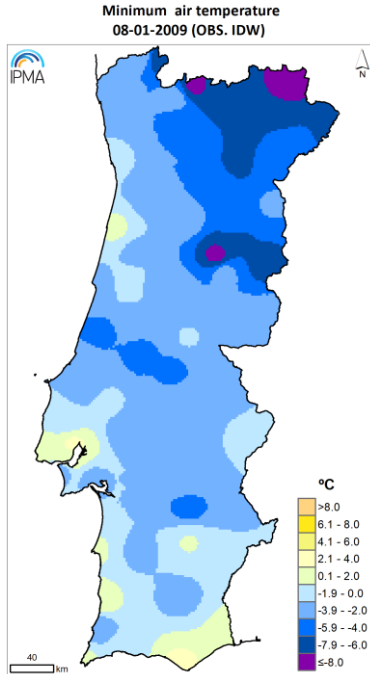
- Better representation of dynamicsmeso-scale systems
- Better spatial resolution with physical coherence.

Regionalization of Climate Information for Impact Assessment and Adaptation

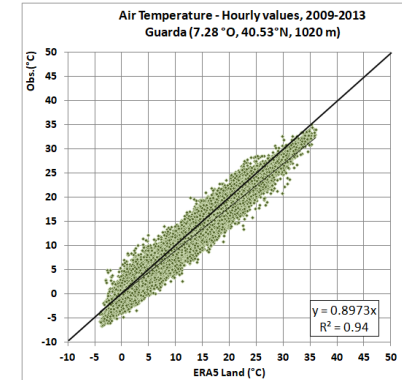


2. ADDING VALUE FOR PORTUGAL MAINLAND

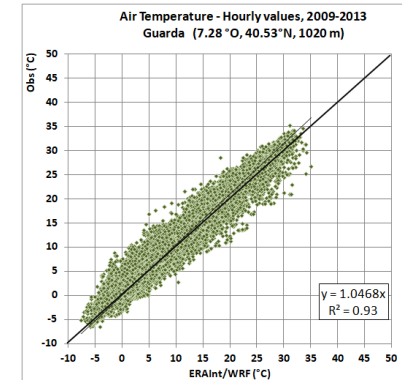
Mountain regions and complex terrain



ERA 5 Land 9 km



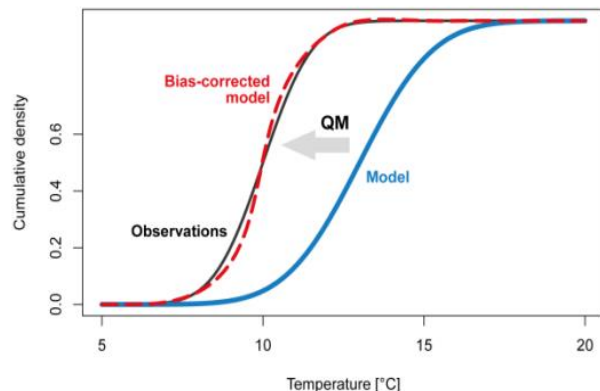
WRF 3 km



2. ADDING VALUE FOR PORTUGAL MAINLAND

Bias correction

Mean bias shift and quantile mapping

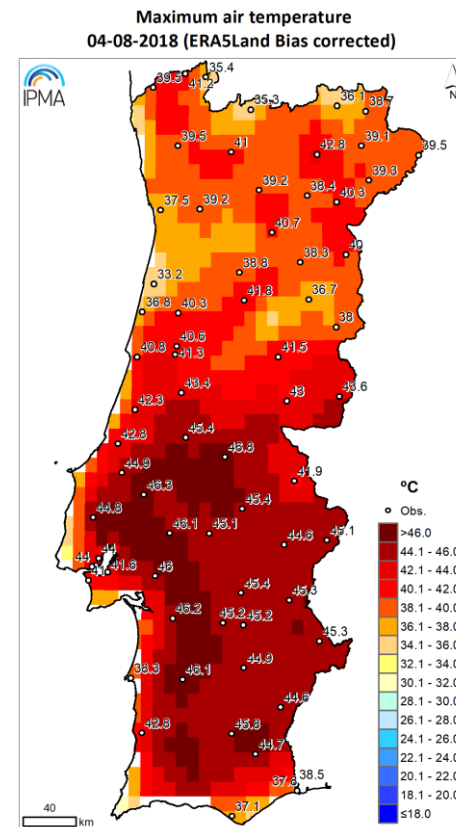
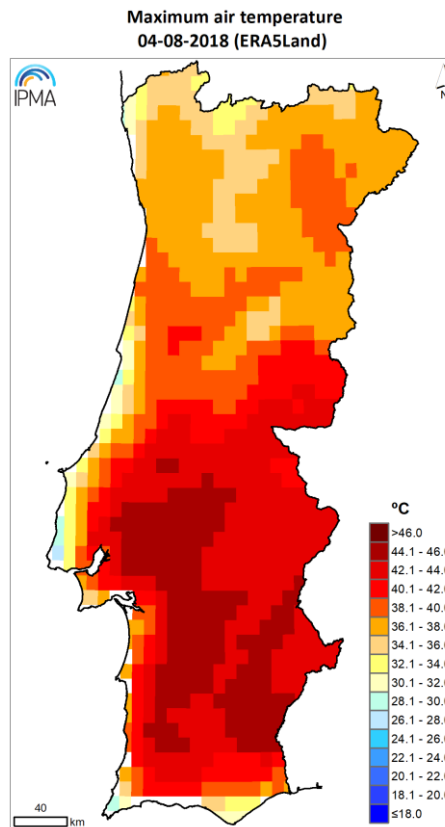


MeteoSwiss, TR270

Bias correction is important for:

- Threshold analysis,
- Quantitative analysis;
- Extremes

But, model bias correction must be based on solid knowledge about the relevant climatic phenomena.



2. SERVICES AND APPLICATIONS

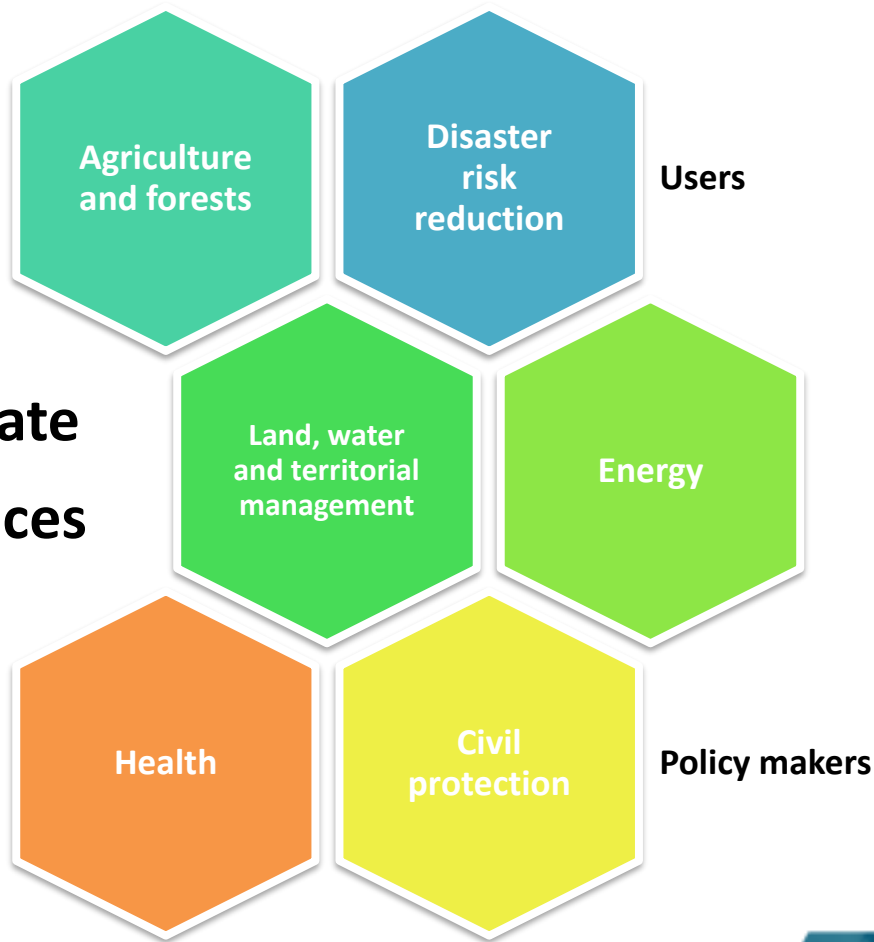
Climate variables and indicators for different users

- Air Temperature
- Precipitation
- Solar radiation
- Wind
- Other...

Temporal scale (since 1981)

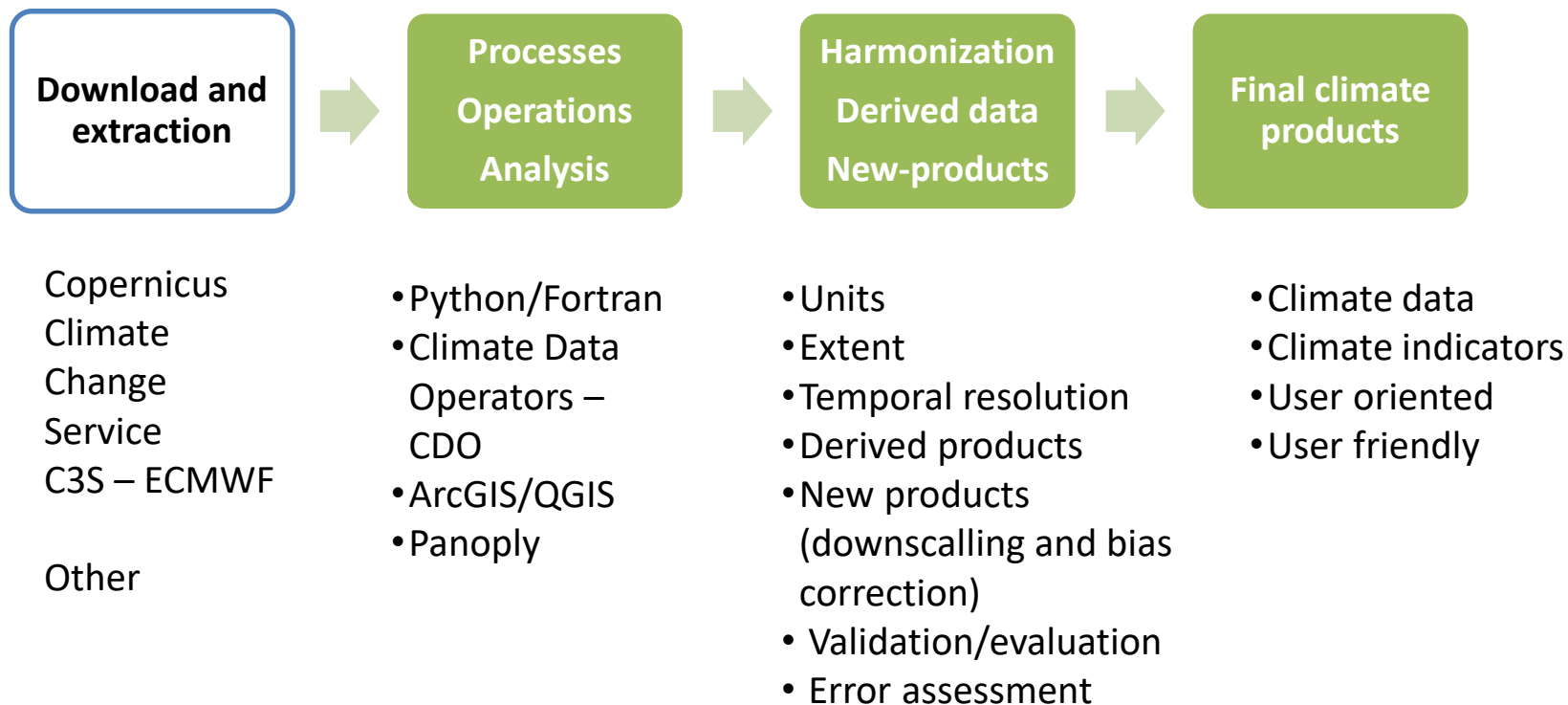
- Hourly
- Daily
- Monthly
- Annual
- Long term
- Other...

Daily/monthly updated



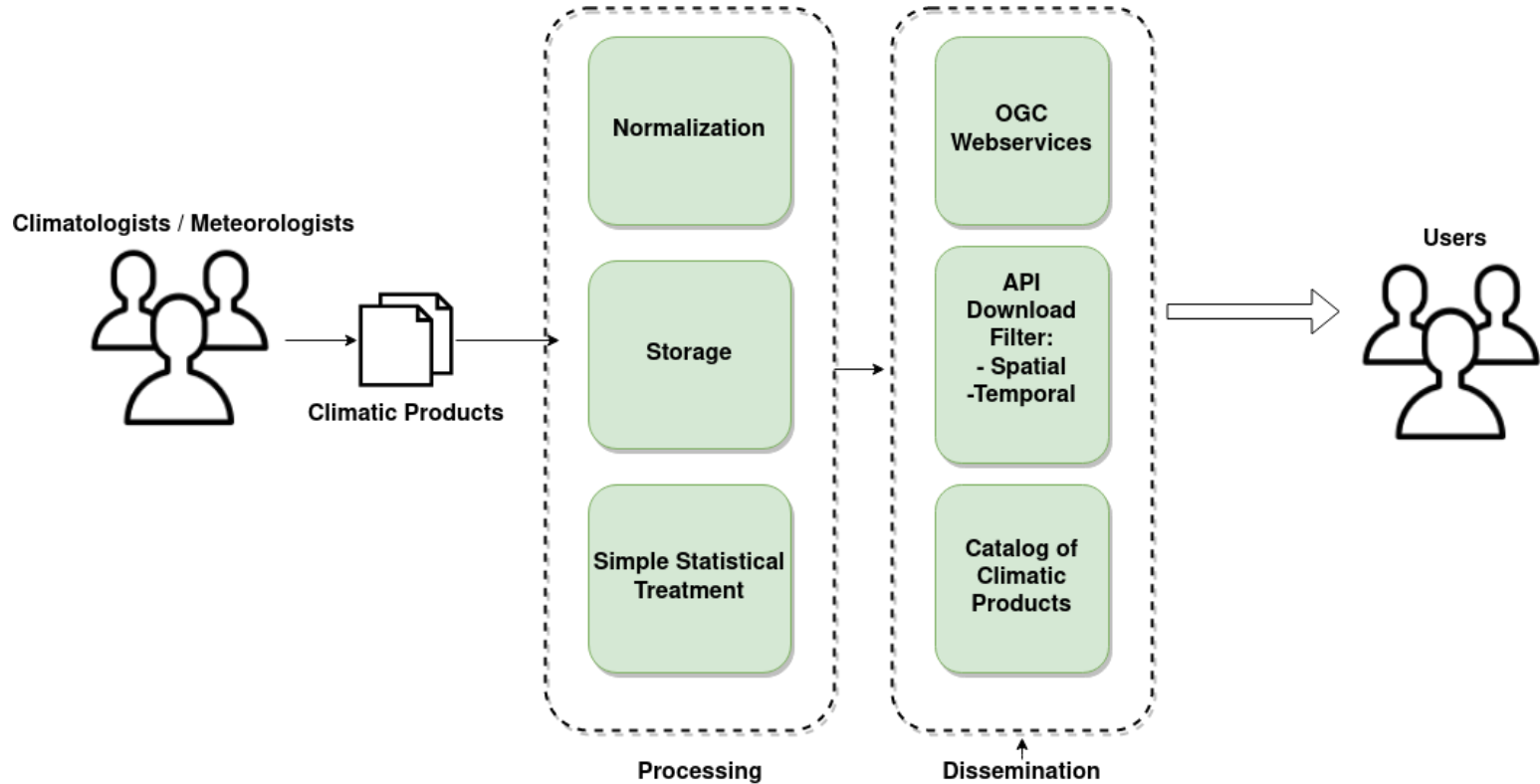
2. SERVICES AND APPLICATIONS

Implementation scheme – Climate product



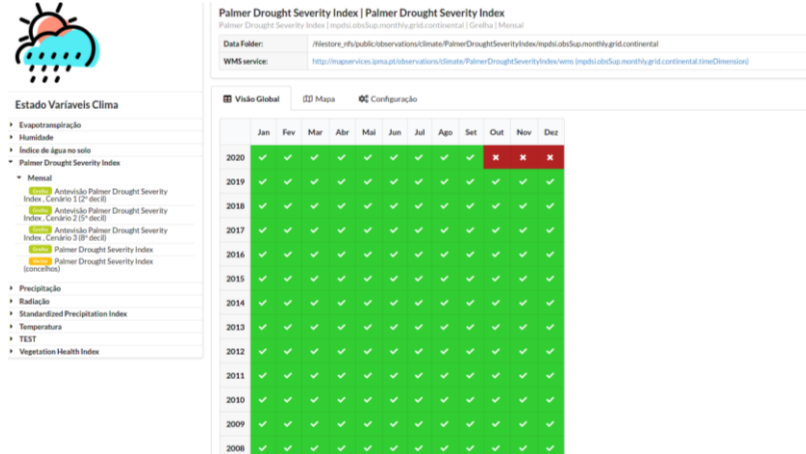
3. SERVICES AND APPLICATIONS

Implementation scheme – Web service



3. SERVICES AND APPLICATIONS

Example: Interface management

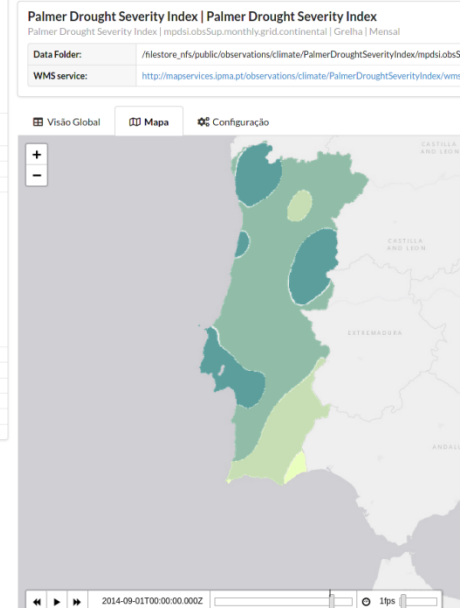


Product management



Estado Variáveis Clima

- Evapotranspiração
- Humidade
- Índice de água no solo
- Palmer Drought Severity Index
 - Mensal
 - Antevisão Palmer Drought Severity Index, Cenário 1 (2º decil)
 - Antevisão Palmer Drought Severity Index, Cenário 2 (5º decil)
 - Antevisão Palmer Drought Severity Index, Cenário 3 (8º decil)
 - Palmer Drought Severity Index (conceitos)
 - Palmer Drought Severity Index (conceitos)
- Precipitação
- Radição
- Standardized Precipitation Index
- Temperatura
- TEST
- Vegetation Health Index

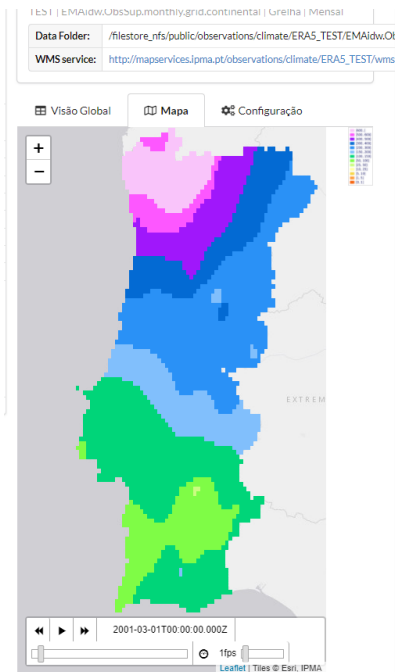


Visualization

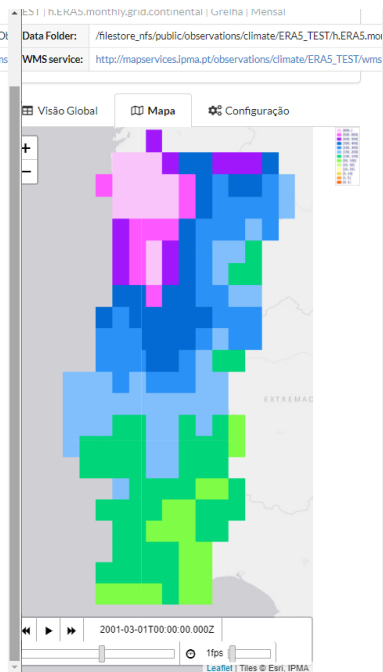
3. SERVICES AND APPLICATIONS

Example: Total Precipitation - March 2001

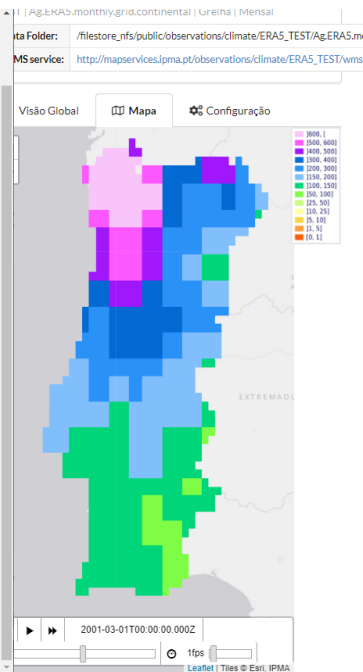
Obs IDW



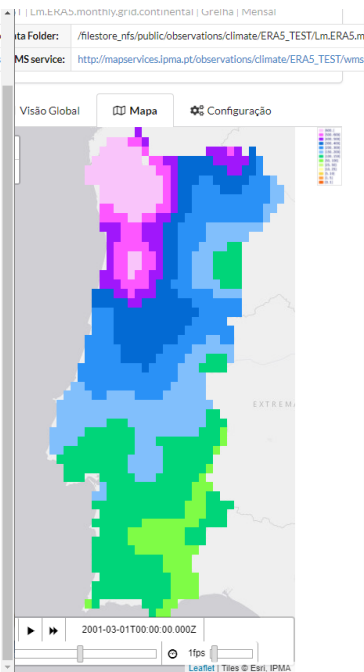
ERA5



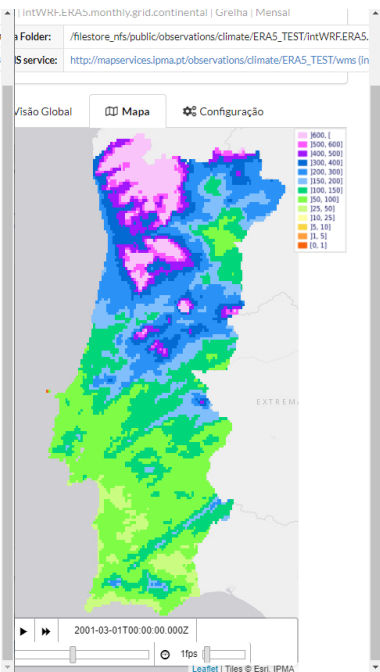
AgERA5



ERA5Land



WRF



FINAL REMARKS

- Initial phase development of a Climate SDI for mainland Portugal
- Uniform data access interface to a collection of multi-source grid data
- Harmonized and consistent data
- Derived and new climate products/services
- User guidance (error assesement, oriented search)
- Focus on usability and scalability
- View, query and download
- OGC standards compliant
- Climate data to support the needs of different users