The ENSEMBLES downscaling portal
Beyond the ENSEMBLES project

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Santander Meteorology Group
A multidisciplinary approach for weather & climate

http://ensembles-eu.metoffice.com/

ENSEMBLES
Climate change and its impacts at seasonal, decadal and centennial timescales

https://www.meteo.unican.es/ensembles

Web portal for reanalysis data access and statistical downscaling

One of the Ensemble's project aims is maximizing the exploitation of the results by linking the outputs of the ensemble prediction system to a range of applications, including agriculture, health, food security, energy, water resources, insurance and weather risk management, which use high resolution climate inputs to feed their models. To cover the gap between the global coarse simulations and the regional high-resolution needs, downscaling techniques are required, both dynamical and statistical.

This portal provides user-friendly web access to statistical downscaling techniques and simulations (global and regional model outputs) produced in ENSEMBLES.
The ENSEMBLES downscaling portal allows to friendly perform statistical downscaling (advanced interpolation) for GCM.

The following elements need to be defined for a particular experiment:

- **Predictors** (large scale reanalysis fields)
- **Predictands** (local variables of interest for impact studies)
- **Statistical** downscaling methods

Statistical methods based on historical data to link large scale circulation to local climates.

Variables for impact studies: **Precipitation**

Temperature
ENSEMBLES datasets included in the portal: All of them are at least daily, some are 6-hourly.

Observations (3D):
- ECA stations + GSOD
- E-OBS 50km + Spain02
- E-OBS 25km + Personal Obs.

Reanalysis (4D global coverage):
- ERA40
- NCEP

Other reanalysis (but restricted access):
- MERRA, CFS, 20thC, JRA25 and INTERIM

GCM scenarios (4D global coverage):
- ENSEMBLES Stream1 (CMIP3):
  - BCM2.0, CNRM-CM3, ECHAM5, ECHO-G, HADGEM, IPCM4
- ENSEMBLES Stream2:
  - CNRM-CM33, ECHAM5c, HADCM3C, HADGEM2, IPCMv2

Seasonal 2 Decadal simulations (4D Europe, SA and Africa):
- DEMETER and ENSEMBLES S2D Stream2 dataset

• These datasets are locally stored and made CDM compliant to be read by netcdf-java library (no for obs)
• Some datasets are be accessed by OPeNDAP (S2D).
The activities started in ENSEMBLES have a follow on in several EU-funded and international projects, involving different impact communities.

Impacts in forest **fires**

Impacts in **health**

**Impacts** in tourism, energy, and natural hazards

**Appropriate** metadata for GCMs and downscaling.

**Integration** with impact tools: crop + hydrology + economy
The downscaling portal has been recoded using Spring, Struts, JMX, … frameworks to include new additional features and larger flexibility and integration capabilities.

Appropriate metadata for GCMs and downscaling.

Integration with impact tools: crop + hydrology + economy
FAO-MOSAICC (for MOdelling System for Agricultural Impacts of Climate Change) is a system of models designed to carry out each step of the impact assessment from climate scenarios downscaling to economic impact analysis at national level.
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Authentication has been synchronized between MOSAICC and downscaling. Several web-services have been developed to download downscalings data and metadata from MOSAICC. The Downscaling Portal view has been adapted in order to be embedded into the MOSAICC portal. New custom functionalities have been developed for MOSAICC users (e.g., different ways of visualization). MOSAICC observations data has been loaded into the Downscaling Portal. A module to make this process online is being developed.
The SDS Portal of FAO-MOSAICC allows creating downscaling experiments selecting a region of interest and the predictors to be used (Z500 and T1000 in this example).
It also allows selecting a local variable of interest (e.g. max. Temp.) in a number of stations from any of the available historical datasets (in this case a dataset developed for the project **FAO_Morocco**).
It also allows selecting a particular downscaling algorithm from the different families of methods:

- **Analogs**
- **Regression + GLMs**
  - From CPs
  - From grid-points
- **SOM weather types**
- **Weather generators**

and defining a particular configuration:
- Number of analogs
- Number of CPs.
- Etc.
Finally, it allows selecting a downscaling method (from the list of available ones, including regression, analogs, weather typing, etc.) and obtaining a cross-validation in present climate using renalysis data.
Once the method is defined and validated it can be used to downscale GCM models for future scenarios (e.g. A1B), decade by decade.
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SD Portal:
Global vs. Local
These portals should not be used as a black-box tool (particularly the downscaling portal) to avoid wrong applications and errors. Some background knowledge is required and the limitations should be known (e.g. the different assumptions of the statistical downscaling methodology). The users are requested to collaborate with downscaling experts. In some cases of mutual interest we provide support and/or training.

User tutorials and indications and recommendations for downscaling are provided and referred to, e.g. in the ENSEMBLES web site.
Future work and conclusions

- **AR5 datasets** to be integrated: how to do it? ESGF Service?
- **OPeNDAP** connections to the different datasets could be included, **but performance issues** has to be overcome.
- New developments regarding **RCM calibration** (with the available observations) and **MOS-like statistical downscaling** to be used in the CORDEX initiative.
- Integration of **METAFORE services** for GCM and downscaling metadata.
- Migration of **new downscaling techniques** and calibration is and active on-going work.
- **Improvement on visualization and management of downscaled data** is required.
- The portal is **open to any user**, but **limits on resource usage** are imposed.