ECOMS-UDG. A User-friendly Data access Gateway to seasonal forecast datasets allowing R-based remote data access, visualization-validation, bias correction and downscaling


http://www.meteo.unican.es/udg-wiki

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The User Data Gateway (UDG) is a THREDDS server with two in-house layers for:

1) **Authentication**
2) **R-based data access.**

Public and **restricted data** via virtual catalogs, allowing **homogenization** (a single vocabulary) and **data collocation**.
UDG provides (homogeneous) access to locally stored daily data:
- **observations** (ECA, GSN, WFDEI),
- **reanalysis** (NCEP-R1, JRA55, ERA-Interim) and
- **CMIP5** data (several GCM projections).
and also to any other OPENDAP remote data.

ECMOS-UDG is an extension for seasonal forecasting data, including hindcasts from state-of-the-art seasonal forecasting models: ECMWF-System4, NCEP-CFSv2, UKMO-Glosea5.

**User-tailored** design (SPECS and EUPORIAS) including variables needed for impact studies, mostly at surface level:
**Precip.**, **temperatures**, **10m wind speed**, **specific humidity**, **short/longwave radiation**, **SLP**, but also **upper-air** information at 1000, 850, 700, 500, 300, 200 mb (for statistical downscaling).
# login in UDG.
# request user at http://www.meteo.unican.es/udg-tap
loginUDG(username = "???", password = "???")

# loading observations for Brazil (precip for MAM)
tpWF <- loadGridData(dataset = "WFDEI", var = "tp", vocabulary = T, lonLim = c(-60, -30), latLim = c(-20, 10), season = 3:5, years = 1981:2010)

For remote datasets no need to login and no homogenization (vocabulary = F by default).

An example with E-OBS precipitation

ds<-"http://opendap.knmi.nl/knmi/thredds/dodsC/e-obs_0.25regular/rr_0.25deg_reg_v12.0.nc"
loadGridData(dataset = ds, var = "RR", …)

plotMeanGrid(tpWF)
downscaleR has been designed to work with daily data (seasonal predictions, multidecadal projections). Extends the loadeR capabilities for data manipulation

- Regridding/interpolation, subsetting and aggregation
- PCA/EOF analysis

Bias correction/calibration (including cross-validation)

- Scaling, IS-MIP, qq-mapping (various forms), parametric.

Perfect-prog downscaling (including cross-validation)

- Analogs, regression (linear and generalized linear), weather typing.

Parallel execution options

https://github.com/SantanderMetGroup/downscaleR
A multidisciplinary approach to weather & climate

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Worked example

Downscaling

# Loading NCEP and System4
NCEP <- loadECOMS(dataset = "NCEP", var = ptor,
                   lonLim = c(-60,-30), latLim = c(-20,10),
                   season = 3:5, years = 1981:2010)

S4 <- loadECOMS(dataset = "System4_15", var = ptor,
                 lonLim = c(-60,-30), latLim = c(-20,10),
                 season = 3:5, years = 1981:2010)

# Computing EOFs and PCs
Ncep.eof <- computeEOF(ncep, n.eofs = 15)

# Interpolating S4 to the NCEP grid, and rescaling
S4 <- interpData(S4, getGrid(NCEP))
S4.sc <- rescaleMonthlyMeans(pred = NCEP, sim = S4)

# Downscaling with Generalized Linear Models
down <- downscale(obs = tp.wfdei, pred = ncep.eof,
                  sim = s4.sc, cross.val = "loocv",
                  method = "glm", n.pcs = 15,
                  parallel = TRUE, ncores = 3)

# Analysis of results
quickDiagnostics(down)

down
obs  S4
• **visualizeR** package (ECOMS initiative). Visualization of probabilistic forecasts

• **easyVerification** package (ECOMS initiative). Common validation scores for seasonal forecasting. Tutorials and worked examples for integration with loadeR and loadeR.ECOMS

Available documentation of the integration with worked-out examples

Verification of seasonal forecasts from the ECOMS User Data Gateway: a worked example

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ioadeR relies on the powerful capabilities of the Unidata's netCDF-Java libraries.

Function *makeAggregatedDataset* to create virtual datasets (file collections) using the NetCDF Markup Language (NcML):

- Combine data from multiple files
- Add/delete/edit metadata
- Add/delete/rename/edit variables

This allows creating a one-stop entry point for datasets, aggregating multiple files from the same (or different) resources.

Further details and worked examples:

https://github.com/SantanderMetGroup/ioadeR/wiki/
UDG wiki with instructions for registration
http://www.meteo.unican.es/udg-wiki

Link to data access and downscaling packages:
https://github.com/SantanderMetGroup/loadeR
https://github.com/SantanderMetGroup/downscaleR