Seasonal forecasting of extreme events

with S2dverification

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Presentation of data

MODEL DATA: ENSEMBLES prediction system

ENSEMBLES Multi-model:

- INGV's ECHAM5/OPA
- IFM Kiel's ECHAM5/OM1
- ECMWF's IFS/HOPE
- Météo-France's ARPEGE/OPA
- UK Met Office's HadGEM2

9 members each, with different initial conditions.

Seasonal forecasts between 1979 until 2005

1 start dates: May June July August

ERA-interim reanalysis data

Period 1979-Now.
Seasonal forecasting of extreme events

Climate Forecasting Unit

Calculate monthly extreme variables

2 bash scripts developed at the IC3
(based on cdo and nco):

- ERA-interim: monthly extreme ERAINT.sh
- ENSEMBLES: monthly extreme ENSEMBLES.sh

→ 4 variables (10m wind module, precipitations, tasmin, tasmax)
Seasonal forecasting of extreme events

Climate Forecasting Unit

Extreme variables

6 hourly and 12 hourly data

6-hourly temperature
Jan 2013 BCN

Calculate daily values
Tasmin/Tasmax
Total precipitations

Monthly extreme variables

90th percentile
10th percentile
Seasonal forecasting of extreme events

Climate Forecasting Unit

Diagram:
- **Load**
  - Clim
  - Ano
    - Ano_crossvalid
  - Trend
  - Smoothing
  - Filter
  - Regression
Seasonal forecasting of extreme events

Climate Forecasting Unit

- Load
  - Clim
  - Ano
  - Ano_crossvalid
- Trend
- Smoothing
- Filter
- Regression
- Spectrum
- Eno
- EnLarge
- LeapYear
- InsertDim
- Mean1Dim
- MeanListDim
- Season
Seasonal forecasting of extreme events

- Load
  - Clim
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    - Ano_crossvalid
  - Trend
  - Smoothing
  - Filter
  - Regression
  - Spectrum
  - Eno
- EnLarge
- LeapYear
- InsertDim
- Mean1Dim
- MeanListDim
- Season
- Corr
- ACC
- RMS
- RatioRMS
- RatioSDRMS
- RMSSS
- Spread
Seasonal forecasting of extreme events

Climate Forecasting Unit

Corr
ACC
RMS
RatioRMS
RatioSDRMS
RMSSS
Spread
PlotVsLTime
PlotACC
PlotClim
PlotAno
PlotClim
PlotAno_crossvalid
Clim
Filter
Load
Trend
Smoothing
Regression
Spectrum
Eno
PlotSection
ColorBar
PlotEquiMap
Plot2VarsVsLTime
EnLarge
LeapYear
InsertDim
Mean1Dim
MeanListDim
Season

Regression
Seasonal forecasting of extreme events

Climate Forecasting Unit

Model 1

- Nleadtimes
- Nmembers
- Longitude
- Latitude

Model 2

- Nleadtimes
- Nmembers
- Longitude
- Latitude

Load

Startdates
Seasonal forecasting of extreme events

Model 1

- Nleadtimes
- Nmembers
- Longitude
- Latitude

Startdates

Model 2

- Nleadtimes
- Nmembers
- Longitude
- Latitude

Startdates

Load

Observation 1

- 1979 January
- Longitude
- Latitude

- 1979 February
- Longitude
- Latitude

- 1998 January
- Longitude
- Latitude

Observation 2

- 1979 February
- Longitude
- Latitude

- 2005 November
- Longitude
- Latitude

- 2005 December
- Longitude
- Latitude

- 2005 November
- Longitude
- Latitude

- 2005 December
- Longitude
- Latitude
Seasonal forecasting of extreme events

Climate Forecasting Unit

Load

Model 1

Startdates

Nleadtimes
Nmembers
Longitude
Latitude

Model 2

Startdates

Nleadtimes
Nmembers
Longitude
Latitude

[ nbmodel/nobs, nbmember,
  nbstartdates, nbleadtime, nblat, nblon... ]
Seasonal forecasting of extreme events

Load

Data$lon

Data$lat

Data$obs

Data$mod

[nbmodel/nobs, nbmember, nbstartdates, nbleadtime, nblat, nblon...]

Seasonal forecasting of extreme events

Climate Forecasting Unit

Load

Data$lon

Data$lat

Data$obs

Data$mod

[nbmodel/nobs, nbmember, nbstartdates, nbleadtime, nblat, nblon...]

Corr

ACC

RMS

RatioRMS

RatioSDRMS

RMSSS

Spread

Trend

Smoothing

Regression

Filter

Clim

Ano

Ano_crossvalid
Presentation of data

MODEL DATA: ENSEMBLES prediction system

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9 members each, with different initial conditions.

Seasonal forecasts between 1979 until 2005

1 start dates: May
June July August (1month leadtime)

ERA-interim reanalysis data

Period 1979-Now.

\[
\text{dim(Datatas$mod)}: [5, 9, 27, 3, 73, 144] \\
\text{dim(Datatasmax$mod)}: [5, 9, 27, 3, 73, 144]
\]

\[
\text{dim(Datatas$obs)}: [1, 1, 27, 3, 73, 144] \\
\text{dim(Datatasmax$obs)}: [5, 9, 27, 3, 73, 144]
\]
Before opening R (directly in the terminal):

```r
R_LIBS="/afs/ictp.it/public/c/cprodhom/R/x86_64-pc-linux-gnu-library/3.0"
export R_LIBS
```

Or in Rstudio:

```r
.libPaths("/afs/ictp.it/public/c/cprodhom/R/x86_64-pc-linux-gnu-library/3.0")
```

Open R:

```r
> Library(s2verification)
```

Open the R archive:

```r
> load("/afs/ictp.it/public/c/cprodhom/tas-tasmax.RData")

!not the same than Load of s2dverification
Correlation

Load

dim(Datatas$mod): [5, 9, 27, 3, 144, 73]
dim(Datatas$obs): [1, 1, 27, 3, 144, 73]

Ensemble Mean

Mean1Dim
MeanListDim

Ensmeanmod=Mean1Dim(Datatas$mod,2)
Ensmeanobs=Mean1Dim(Datatas$obs,2)

dim(Ensmeanmod) → [5, 27, 3, 73, 144]
dim(Ensmeanobs) → [1, 27, 3, 73, 144]

corrskill

Corr

cor=Corr(Ensmeanmod, Ensmeanobs,
posloop=1, poscor=2)

dim(Ensmeancor) → [5, 1, 3, 4, 73, 144]
Seasonal forecasting of extreme events

Plot: corrskill for cmcc, August

corrskill = Corr(Ensmeanmod, Ensmeanobs, posloop=1, poscor=2)

\[ \text{dim(Ensmeancor)} \rightarrow [5, 1, 3, 4, 73, 144] \]

min=-1
max=1
int=(max-min)/20
interval=seq(min,max,int)

colorbar = c("blue4","blue3","blue","dodgerblue3","dodgerblue2",
            "dodgerblue1","steelblue1","cadetblue2","cadetblue1",
            "white","white","gold","goldenrod","chocolate","orangered",
            "firebrick1","firebrick3","firebrick","firebrick4","red4")

Plot = PlotEquiMap

PlotEquiMap(cor[1,1,3,2,,], Datatas$lon, Datatas$lat,
totitle = "cmcc July start May", sizetit = 0.6, units = "",
brks = interval, cols = color, axelab = F, labW = F, intylat = 20, intxlon = 20,
square=TRUE, filled.continents=FALSE)