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# Seafords suite quicklook

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# Seafords pack : folders description

v2109



## SEAFORDS-DATA

<b>DATA_[xxx]</b>	: Local data (stations) - Predictands		<b>Your local data</b>
RR	: <i>Example : variable RR : quarterly rainfall data</i> ([xxx]_RR_[QQQ].txt)		
<b>DATA_gridded</b>	: Regional data (grids) - Predictands		
GPCP_[reg]	: Rainfall estimates (2,5° res)		
PREC_ERA5_[reg]	: ERA5 rainfall (1° res)		
T2M_ERA5_[reg]	: ERA5 2m temperature (1° res)		
<b>ERA5_DATA</b>	: Global data (Large scale – 2.5° res) - Predictors / Learning phase (PP)		
<b>FORECAST_DATA</b>	: Global data (Large scale – 2.5° res) - Predictors / Forecast phase		
MF8	: ARP-S8 forecasts (51 membres)		
CEP	: ECMWF SEAS-S5 forecasts (51 membres)		
NCEP	: NCEP CFSv2 forecasts (51 membres)		
<b>HINDCAST_[mod]_1t[x]_DATA</b>	: Global data (Large scale) - Predictors / Learning phase (MOS)		

## SEAFORDS-global-v2109

<b>OUTLOOK</b>	: Script for CCA and forecast downscaling	
<b>OUTPUT</b>	: Results of CCA and forecast downscaling	
<b>EXPERT</b>	: Expertised forecasts files	
<b>SHP</b>	: Coastlines data (SHP files)	
<b>SRC</b>	: Sub-scripts used by main scripts	
<b>TOOLS</b>	: Scripts for PCA, CA, YA, Indices, ClimateWatch, Verif	
<b>OUTPUT</b>	: Results of tools (Results of Indices in <b>DATA_[xxx]</b> )	
fic_env.R	: Configuration file (Linux) : path of installation folder	

# Seafords : running the scripts

v2109

## Basic principle :

`APP.R` : main R script to **execute** (source) a given APPlication  
`config_APP.R` : configuration file to **edit and tune**

## TOOLS

`ACP.R` : Principal Component Analysis main script  
`config_ACP.R` : PCA configuration file  
`Composites.R` : Composite Analysis main script  
`config_Composites.R` : CA configuration file  
`ClimateWatch.R` : Climate monitoring main script  
`config_ClimateWatch.R` : CW configuration file  
`Indices.R` : Indices processing main script  
`config_Indices.R` : Indices processing configuration file  
`Verif.R` : Verification process main script  
`config_Verif.R` : Verification process configuration file  
`YearlyAnalysis.R` : Yearly Analysis main script  
`config_YearlyAnalysis.R` : YA configuration file

## OUTLOOK

`Seasonal_Outlook.R` : CCA & Forecast Downscaling main script  
`config.model.R` : Seasonal Outlook configuration file (model parameters)  
`config.model-optim.R` : Seasonal Outlook optional file (geographical optimization)  
`config.zones-[XXX].R` : Seasonal Outlook optional file (country zoning)  
`Final_Map.R` : Expertised forecast display main script  
`config.FinalMap.R` : Expertised forecast display configuration file  
`MixGCM.R` : Blended downscaled forecasts main script  
`config.FinalMap.R` : Blended downscaled forecasts configuration file

The following slides show some examples of configuration files and the corresponding output.

*NB : only main parameters are displayed*

## config\_ACP.R

```
# Experiment name
exp_name = "ACP001"

# list of Large scale parameters
param_list = c("SST", "PMER")
domaine_choisi = c(-30, 10, 150, 240)

# list of Local parameters
# param_loc_list=c("PREC_ERA-I_NCPF")
param_loc_list=c("RR")

# Choice of the season
season_list = c("JAS", "ASO")

# explained variance percentage
p = 70

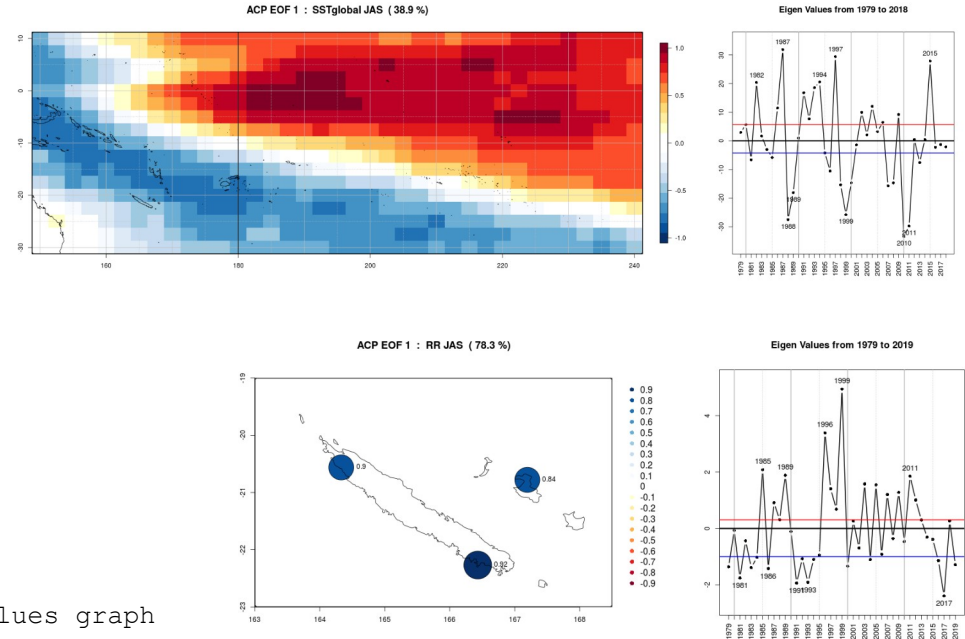
# number of eigenvectors to map
nb = 5

# number of extreme years to plot in the eigen values graph
nb.extremes.years = 5

# Choix du pays (Country / gridded) :
country = "NC"

# GRAPHICAL TUNING:
# Choice of the large scale parameter index (one value / season (ncol) / EOF (nrow))
param_GE_idx <- matrix(1, nrow=3, ncol=12)
param_GE_idx[1,] <- c(1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1)
param_GE_idx[2,] <- c(1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1)

# Choice of the local parameter index (one value / season (ncol) / EOF (nrow))
param_loc_idx <- matrix(1, nrow=2, ncol=10)
param_loc_idx[1,] <- c(-1, 1, 1, 1, 1, 1, 1, 1, 1, 1)
param_loc_idx[2,] <- c(-1, -1, 1, 1, 1, 1, 1, 1, 1, 1)
```



>>> Results in : TOOLS/OUTPUT/ACP/ACP001/global  
TOOLS/OUTPUT/ACP/ACP001/NC

## config\_Composites.R

```
# Enter the name of the experiment (may be left blank)
exp_name = ""

# List of years for the composite analysis
listName = "NINO+"
yearList = c("1982","1986","1987","1991","1997","2002","2009","2015")

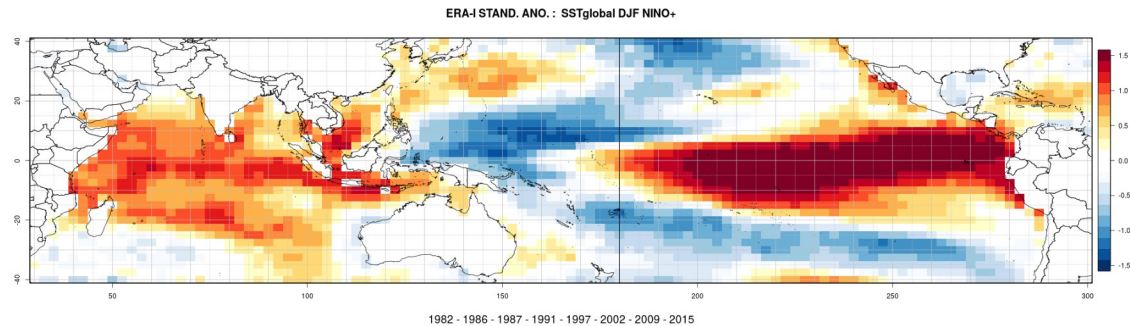
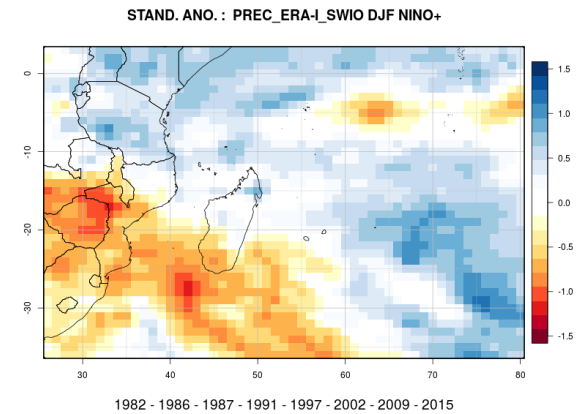
# pour DJF
#listName = "REU SEC"
#yearList = c("1980","1982","1987","1990","1994","1998","2011","2016")

# list of Large scale parameters
param_list=c("SST","PREC")
domaine_choisi = c(-40,40,30,300)

# list of Local scale parameters (gridded OR station)
param_loc_list=c("GPCP_NCPF")
#param_loc_list=c("RR")

# Choice of the season
season_list=c("OND","DJF")

# Local domain (Country or gridded) :
country = "gridded"
```



>>> Results in : [TOOLS/OUTPUT/COMPOSITES/global/PRECglobal/NINO+](#)  
[TOOLS/OUTPUT/COMPOSITES/gridded/GPCP\\_NCPF/NINO+](#)

## config\_YearlyAnalysis.R

```
# Enter the name of the experiment (may be left blank)
exp_name = ""

# list of large scale parameters
param_list=c("SST")
domaine_choisi = c(-30,10,150,240)

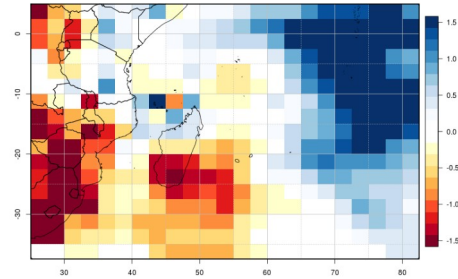
# list of local parameters
param_loc_list=c("GPCP_SWIO")

# years : c(1985,1990) ou "all"
yearList <- c(1982,1986,1987,1991,1997,2002,2009,2015)

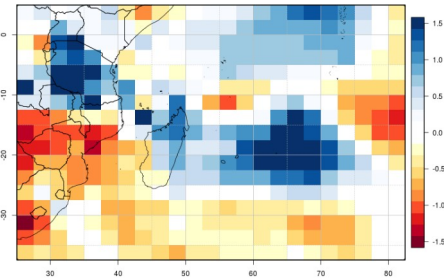
# Choice of the season
saison_list=c("DJF","JAS")

# Choice of local domain: (Country or gridded)
country = "gridded"
```

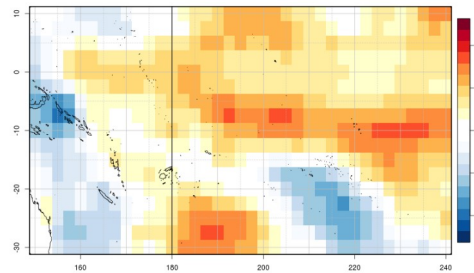
ANOMALIE (STAND.) : GPCP\_SWIO DJF 1982



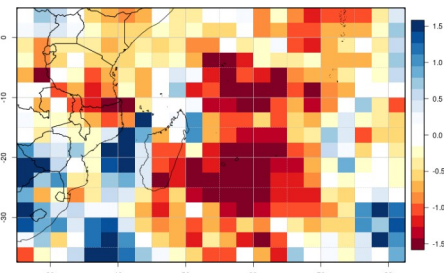
ANOMALIE (STAND.) : GPCP\_SWIO DJF 1986



ERA-I ANOMALIE (STAND.) : SSTglobal DJF 1987



ANOMALIE (STAND.) : GPCP\_SWIO DJF 1987



>>> Results in : [TOOLS/OUTPUT/YEARS/global/DJF/SSTglobal](#)  
[TOOLS/OUTPUT/YEARS/gridded/DJF/GPCP\\_SWIO](#)

config\_ClimateWatch.R

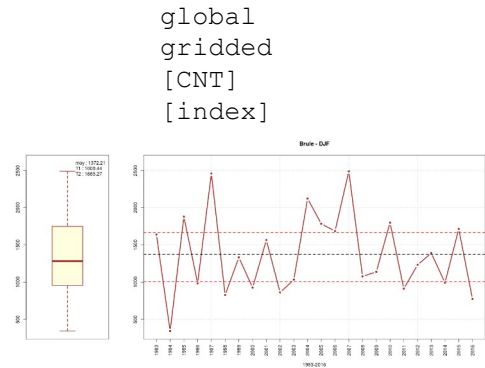
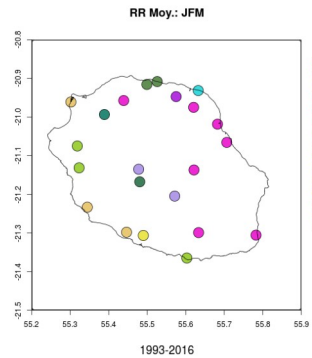
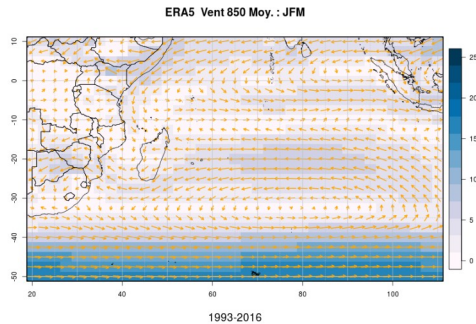


**ClimateWatch.R** : computes reference climatology (+) anomalies for large scale data, regional gridded data, country data and SST indexes



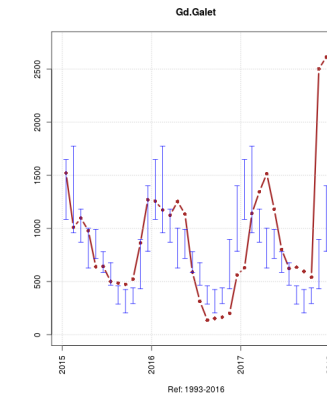
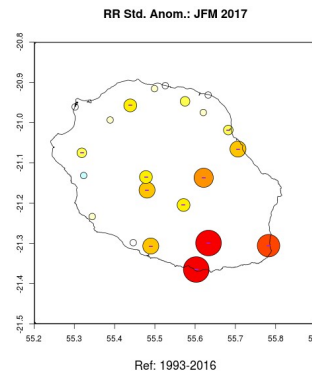
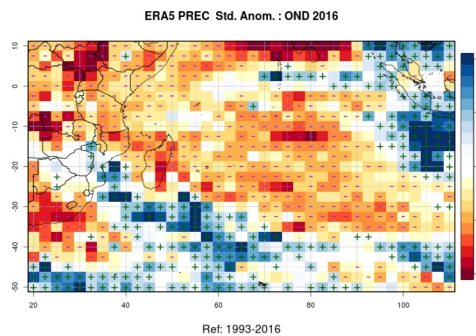
TOOLS/OUTPUT/MONITORING/ [exp] /Ref-AAAmin-AAAmax/ [domain] / ...

**Clim :**



TOOLS/OUTPUT/MONITORING/ [exp] /Exp-AAAbeg-AAAend/ [domain] / ...

**Anom :**



## config\_ClimateWatch.R

```
# Enter the name of the experiment (may be left blank)
exp_name = "TST"

# Climatology
#-----
# - Reference period
yearmin = 1993
yearmax = 2016
# - Chosen quarters
season_list = c("JFM","FMA","MAM","AMJ","MJJ","JJA","JAS","ASO","SON","OND","NDJ","DJF")

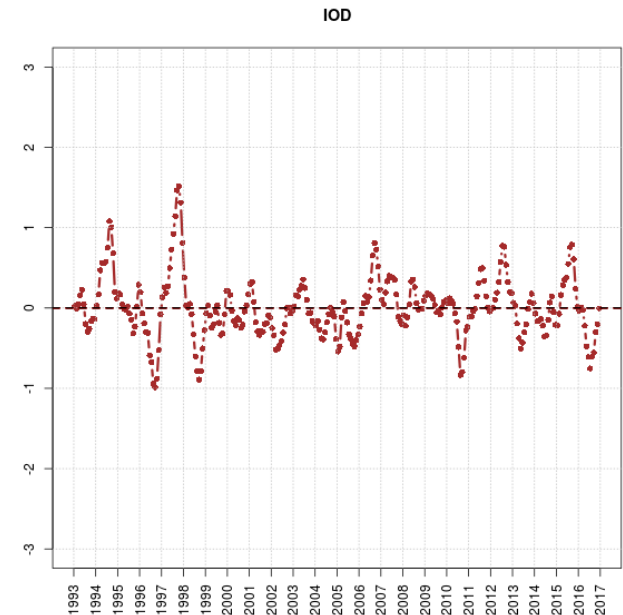
# - Large scale parameters
param_GE_list = c("SST","PMER","U850","V850")
domaine_choisi = c(-50,10,20,110)

# - SST indices
param_IDX_list = c("IOD")

# - Local scale parameters
country = "REU" # "country" or "gridded"
param_loc_list = c("RR")

# - Graphics parameters
ticks = "dyn" # Y-scale: dyn / seas / fixed > yscale=[ymin,ymax]

# Monitoring
#-----
monitoring = "yes"
# - Overwatch period
yearbeg = 2017
yearend = 2020
```



>>> Results in : [TOOLS/OUTPUT/MONITORING/TST/Ref-1993-2016](#)  
[TOOLS/OUTPUT/MONITORING/TST/Exp-2017-2020](#)



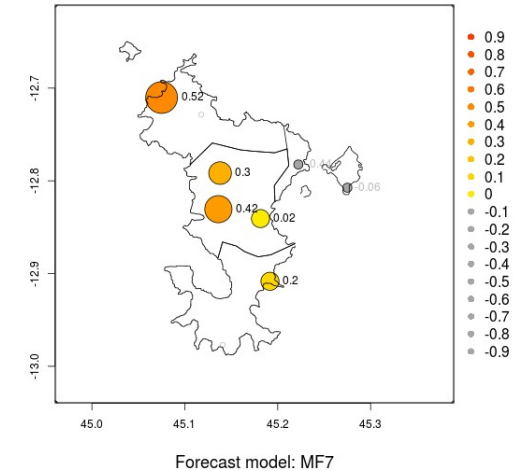
## config\_Verif.R

```
# Enter the name of the experiment (may be left blank)
exp_name = "TST"

# Forecast references
#-----
model = "MF7" # - Numerical forecast: CEP,MF7 / Expertised forecast: LRF
sais = "NDJ"
year = "2016"
leadtime = 1
param_loc = "RR"
country = "MYT" # - country or "gridded"
by.zone = "no"
varGE = "Synthesis" # - Large Scale variable or "Synthesis"

# Forecast data file id. and location
# (Typical file name and location are proposed below, should be user-defined as appropriate)
#-----
if ( model=="LRF" ) {
# Final forecast
filefcst=paste(country,"-201812.csv",sep="")
repfcst=paste("../..//LRF/EXPERT",sep="")
} else {
# Numerical forecast
if ( varGE=="Synthesis" ) {
filefcst=paste("Synthesis_",country,"_",model,"_",sais,year,"_MODEL_ERA5.txt",sep="")
repfcst=paste("../OUTLOOK/OUTPUT/TEST/",country,"/",sais,"/",param_loc,sep="")
}
}
}
```

Score RPSS: RR NDJ-2016 It3



>>> Results in : [TOOLS/OUTPUT/MONITORING/TST/Ref-1993-2016](#)  
[TOOLS/OUTPUT/MONITORING/TST/Exp-2017-2020](#)

## config\_Indices.R

```
# country
country = "NC"

# seasons
saison_list = c("JFM", "FMA", "MAM", "AMJ", "MJJ", "JJA", "JAS", "ASO", "SON", "OND", "NDJ", "DJF")

# WMO indices
indice_list = c("RRTOT", "CDD", "RR10mm")

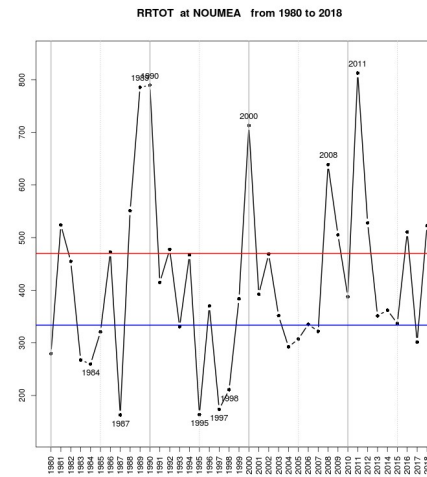
# Daily data file (.csv separe par des virgules)
ficin = "../DATA_NC/Daily_RRQ_NC_1980-2018.csv"
```

### Daily\_RRQ\_NC\_1980-2018.csv

```
StationId,Station_Name,Lat,Lon,Elev,Year,Month,Day,PRECIP
98812001,KOUMAC,-20.559,164.284,19,1980,01,01,0.0
98812001,KOUMAC,-20.559,164.284,19,1980,01,02,0.0
98812001,KOUMAC,-20.559,164.284,19,1980,01,03,0.2
. . .
98818001,NOUMEA,-22.276,166.453,69,2018,12,29,0.0
98818001,NOUMEA,-22.276,166.453,69,2018,12,30,3.6
98818001,NOUMEA,-22.276,166.453,69,2018,12,31,0.0
```

### NC\_RRTOT\_JFM.txt

STN	KOUMAC	NOUMEA	OUANAHAM
LAT	-20.559	-22.276	-20.778
LON	164.284	166.453	167.241
1980	404.1	279.7	645.5
1981	370.3	523.9	592.7
1982	407	454.8	686.8
1983	377.1	267.5	377.7
. . .			



>>> Results in : DATA\_[CNT]/[param]/[CNT]\_[param]\_[sais].txt  
TOOLS/OUTPUT/INDICES/[CNT]/[sais]/[station]

# Seafords / OUTLOOK / Seasonal\_Outlook

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config\_model.R

config\_model-optim.R

**Seasonal\_Outlook.R** : performs CCA (+) Downscaling

OUTLOOK/OUTPUT/[exp]/[cnt]/[sais]/[param\_loc]/...

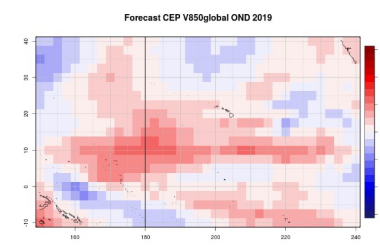
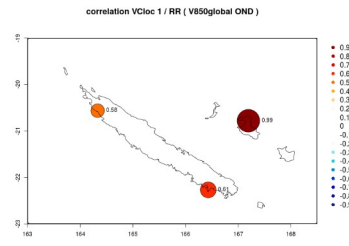
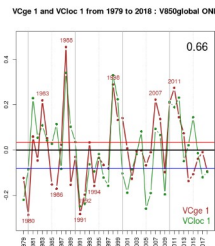
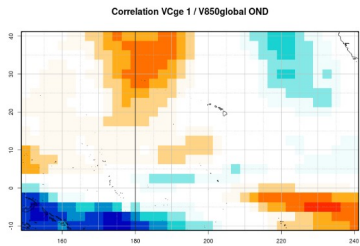
**Predictand** : parameter to predict / explain

**Predictor** : LS parameter

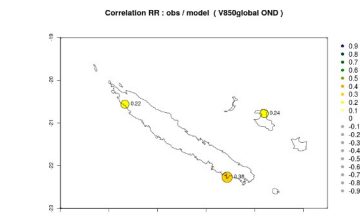
**Reanalysis (PP) / Hindcast (MOS)**

... [param\_GE]<sub>(n)</sub> / [MODEL\_xxxx] / [FORECAST\_AAAA]

## CCAnalysis



LS param  
Forecast



Scores



Loc param  
Forecast  
(terciles proba.)

## config\_model.R (1/2)

```
# Enter the name of the experiment (may be left blank)
exp_name = ""

# -----
# Enter large scale parameter (resolution 2.5)
parametres_a_traiter = c("SST","U850","PMER","V850","U200","PREC")

# Enter forecast model
# CEP (ECMWF), MF7 (Meteo-France Syst7)
modele_prevision = "CEP"

# Enter Forecast Period (Season, Year)
saison_list = c("OND")
#annee : (exemple NDJ 2016 : it is N 2016, D 2016, J 2017) / if annee="" --> no forecast, only Canonical Analysis
annee = "2019"
leadtime = 1      ##### 1, 2 ou 3

# Choix du jeu d'apprentissage (grande echelle)
# ERA5 (Perfect Prediction PP), HINDCAST (Model Output Statistics MOS)
hindcast = "ERA5"
# score = "HINDCAST" / "" : If hindcast = "ERA5"
score = "HINDCAST"

# -----
# Enter local parameter
param_loc = "RR"

# Enter if local data are : "station" or "gridded"
param_loc_type = "station"

# Enter kind of data : zone or stations
by.zone = "no" # "yes" (colored polygons) or "no" (colored points at station locations)

# Enter country choice : CNT of Region "NCPF"
country = "NC"
```

## config\_model.R (2/2)

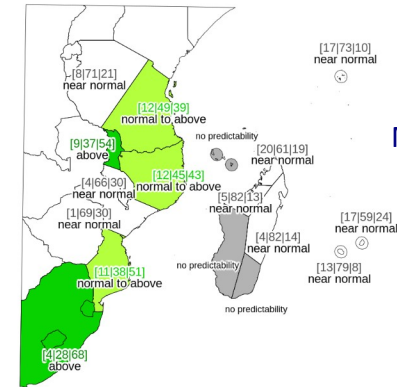
```
# -----  
# Canonical Correlation Analysis configuration (default values that may be tuned in config.model-optim.R)  
domaine_choisi = c(-50,10,20,110)  
#cca.optim = "yes" # "yes" : a file config.model-optim.R exists containing refinements for the domain  
cca.optim = "no"  
  
# Conditions to determine the number of canonical variables (nbvc) kept in the model  
# nb_modes_auto = "yes": nbvc depends on seuil_CorCan (canonical correlation threshold)  
# nb_modes_auto = "no": nbvc fixed value = nbvc_mini  
nb_modes_auto = "yes"  
seuil_CorCan = 0.5  
nbvc_mini=2  
  
# -----  
# Output configuration  
  
# Terciles used for the distribution of param_loc forecast members  
# select :  
# "obs" : historical terciles (learning period)  
# "ref" : historical terciles (user defined period): needs minYear ans maxYear  
# "rec" : downscaling model terciles recalculated  
# "gauss" : if local parameter has a gaussian repartition (like SPI), then terciles : -0.43 and +0.43  
tercile_final_utilise = "obs"  
minYear = 2001  
maxYear = 2015  
  
# Minimum correlation threshold to show the stations in output results  
seuil_correlation_zone = 0.00  
  
# Barplot display and size (map from 0 to 1)  
bp.plot = TRUE  
bp.width = 0.08  
bp.height = 0.12  
  
# Verbosity level  
verb = 1
```



## config\_model-optim.R

```
#####  
# CCA Optimization #  
#####  
  
# Domain on which the Large Scale fields (GCM/Rea) are sampled  
# Tuning with respect to the parameter and the season  
  
if (saison=="OND") {      # latmin, latmax, lonmin, lonmax  
  if (param=="PMERglobal") {domaine_choisi = c(-10,40,150,240.0) ; seuil_CorCan = 0.5}  
  if (param=="PRECglobal") {domaine_choisi = c(-10,40,150,240.0) ; seuil_CorCan = 0.5}  
  if (param=="SSTglobal") {domaine_choisi = c(-10,40,150,240.0) ; seuil_CorCan = 0.9}  
  if (param=="U200global") {domaine_choisi = c(-10,40,150,240.0) ; seuil_CorCan = 0.7}  
  if (param=="U850global") {domaine_choisi = c(-10,40,150,240.0) ; seuil_CorCan = 0.7}  
  if (param=="V850global") {domaine_choisi = c(-10,40,150,240.0) ; seuil_CorCan = 0.7}  
  if (param=="T2Mglobal") {domaine_choisi = c(-10,40,150,240.0) ; seuil_CorCan = 0.7}  
}  
  
...
```

Rainfall Seasonal forecast - MAM 2021 - It 1



Mixed forecast map

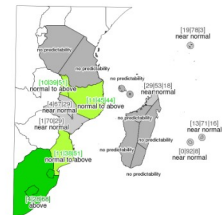
## config\_MixGCM.R

```
# Enter the name of the experiment (may be left blank)
exp_name = "TST"
```

```
# GCM Forecast references
#-----
```

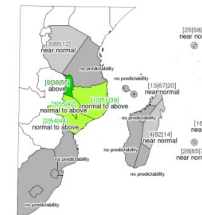
```
model_list = c("CEP", "MF8", "NCEP")
sais = "MAM"
year = "2021"
leadtime = 1
param_loc = "RR"
country = "SWIO" # - country or "gridded"
by.zone = "yes"
bp.plot = TRUE
  bp.width <- 0.08
  bp.height <- 0.12
language = "english"
```

Precipitation Seasonal Outlook CEP - MAM 2021 It1



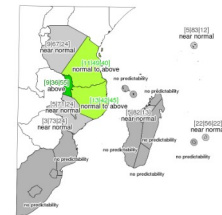
US60.V650.BST.FIMER.L200.PREC

Precipitation Seasonal Outlook MF7 - MAM 2021 It1



US60.V650.BST.FIMER.L200.PREC

Precipitation Seasonal Outlook NCEP - MAM 2021 It1



US60.V650.BST.FIMER.L200.PREC

Individual GCM forecast map

```
# Forecast data file id. and location
# filefcst: standard name given by Seafords while processing the downscaling
# repfcst: !! NB !! experiment name should include the name of the model
#-----
filefcst=paste("Synthesis_",country,"_",model_list,"_",sais,year,"_MODEL_ERA5.txt",sep="")
repfcst=paste("./OUTPUT/SWIO-TEST-",model_list,"/",country,"/",sais,"/",param_loc,sep="")
```

>>> Results in : OUTLOOK/OUTPUT/MIXGCM/TST