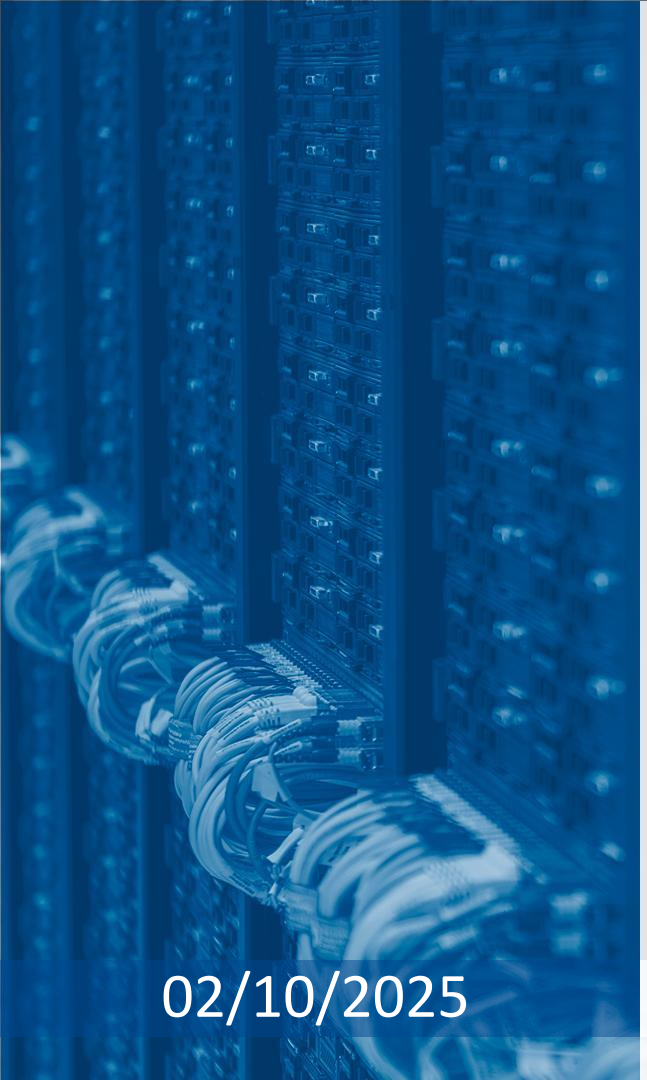

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R user meeting

02/10/2025

Victòria A., Ariadna B., Theertha K.

Agenda

1. Ice-breaker:
2. News
    - General
    - ClimProjDiags
    - startR
    - multiApply
    - s2dv
    - CSTools
    - CSIndicators
    - esviz
    - SUNSET
3. User presentation: Javier Corvillo
4. Q&A

Ice-breaker:

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Interactive mapping of spatial data

R can be used as a Geographic Information System (GIS) tool. Functions like mapview::mapview() create interactive maps with just a few lines:

- Example 1: elevation across Spain
  - Data source: NASA's Shuttle Radar Topography Mission (SRTM)
  - `install.packages(c("geodata", "terra", "mapview", "stars"))`

- Example 2: mean annual temperature in Catalunya
  - Data source: WorldClim (climate normals 1970–2000)
  - `install.packages(c("geodata", "terra", "mapview", "giscoR", "sf", "stars"))`

General

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Status of the R packages on CRAN

★ **What is CRAN?**

The “Comprehensive R Archive Network” is a network of ftp servers that store up-to-date versions of R packages and documentation. Packages on CRAN must pass a series of checks to ensure they are able to be installed and function well on different environments.

★ **Are our R tools on CRAN?**

Our goal is always to have our packages on CRAN to make them easy to share and cite.
In May of 2025, external R package PCICt was removed from CRAN due to problems with package checks. As a consequence, some of our BSC-ES internal R packages were removed as well because they required this package.

Status of the R packages on CRAN

Here is a summary of the status of each package **as of October 2nd, 2025**:

easyNCDF	On CRAN
multiApply	On CRAN
ClimProjDiags	On CRAN
s2dv	Resubmitted to CRAN, undergoing review
startR	Ready for CRAN resubmission
CSTools	Preparing for resubmission
CSIndicators	Preparing for resubmission
CSDownscale	Preparing for first time submission
esviz	Preparing for first time submission

ClimProjDiags

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New release: ClimProjDiags/0.3.4

The main change of the new version of ClimProjDiags is the **removal of the dependency on the PCICt package**.

The function **PCICt::as.PCICt()** is replaced with **ClimProjDiags::as.PCICt()**. This function normalizes dates to a common structure to facilitate comparison of datasets with different types of calendars.

This version is now installed on all machines.

issue: https://earth.bsc.es/gitlab/es/ClimProjDiags/-/issues/19
status: on CRAN

startR

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Running Compute() on MN5/CTE-AMD

Since the hub/workstations and some HPC machines don't have a common filesystem **(esarchive vs gpfs)**, using these machines to run workflows with Compute() is not as simple.

A new development in startR allows the local host to communicate with the ssh cluster even without a common filesystem, and copy the results back to the local machine once the jobs are finished.

The new use case 2.15 shows a step-by-step example of how to do this.

issue: https://earth.bsc.es/gitlab/es/startR/-/issues/212
status: in master

multiApply

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New release of multiApply 2.1.5

The latest release of multiApply contains two main changes in the Apply function:

- ★ The parameter 'data' now takes list names into account and matches them to the parameters in the function ‘fun’.
- ★ We fixed a bug that caused problems when using Apply() with primitive-type functions in R>=4.6.x

This version is now installed on all machines.

issue: https://earth.bsc.es/gitlab/ces/multiApply/-/issues/18
status: on CRAN

New release of multiApply 2.1.5

Example 1: List names

```
fun <- function(x, y, z) {
  return(x + y - z)
}

# The names are matched to the arguments of 'fun'
res <- Apply(data = list(x = x, z = z, y = y),
             fun = fun)
```

Example 2: Primitive functions

```
A <- array(1:20, c(5, 2, 2))
B <- array(1:20, c(5, 2, 2))
# The product operator '*' is a primitive function
D <- Apply(data = list(A, B),
           target_dims = c(2, 3),
           fun = "%*%")$output1
```

s2dv

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New release of s2dv 2.2.0

The latest release of s2dv contains the following updates:

- **Bugfixes**
  - RandomWalkTest(): Fix error when '`A_better`' or '`B_better`' is NA
  - test-Load(): Remove deleted experiment
  - RandomWalkTest(): Relax dimensions check to accept dimensions in different order
- **Development**
  - RMSSS(): calculate the climatological forecast from the average of '`obs`' if '`ref`' is NULL
  - Accept probabilities as inputs for Fair RPS() and Fair RPSS()
- **Other**
  - Add CONTRIBUTING.md

s2dv has been resubmitted to CRAN after its archival and is currently undergoing review.

issue: https://earth.bsc.es/gitlab/es/s2dv/-/blob/release-s2dv_2.2.0/NEWS.md
status: undergoing review in CRAN

CSTools

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New function AreaWeighted()

- This function was added by Carlos Torres.
- The function calculates the spatial area-weighted average of multidimensional arrays . The area per grid point of each region(s) is used.
- It is complementary to ClimProjDiags::WeightedMean(), were area over user-defined box is used.

merge request: https://earth.bsc.es/gitlab/external/cstools/-/merge_requests/227
status: in branch develop-AreaWeighted

CSIndicators

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New Indicator RNoughtIndices

- New indicator from Javier Corvillo.

- This function computes the **environmental contribution** to Aedes-borne disease transmissibility.
- This function utilizes four possible ento-epidemiological models, the model choice is included as a function parameter.

merge request: https://earth.bsc.es/gitlab/es/csindicators/-/merge_requests/79
status: in branch dev-RNought, under review.

esviz

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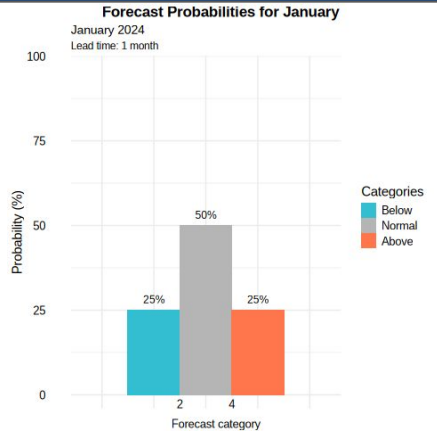
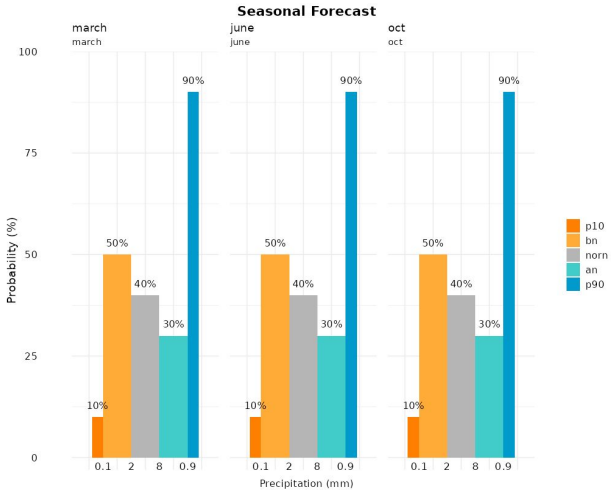
New function: BarPlotCat()

Creates **bar plots** for **probabilistic forecasts split into categories** (e.g., below-normal, normal, above-normal).

- Optionally including extreme categories (e.g., below P10, above P90)
- Supports multi-panel plotting for different time steps
- Optional skill-based transparency
- Shared legend and axis title
- Output to file





Developed by Núria Pérez-Zanón.

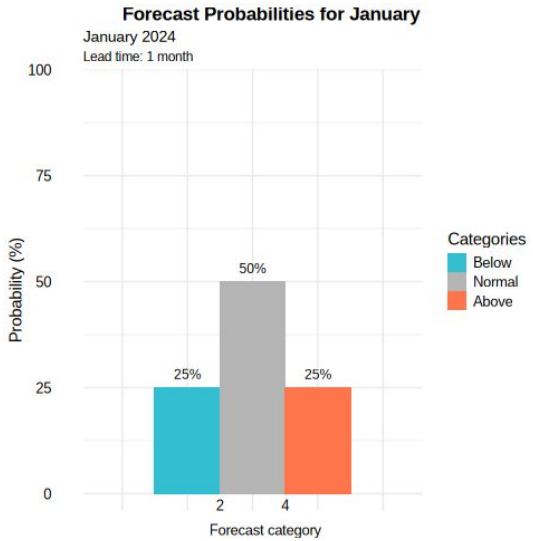
New function: BarPlotCat()

Required parameters:

- `probs`: A named 2D array with the probabilities for each category.
- `lims`: A named 2D array with category threshold values (e.g., tercile cutoffs), or a vector with length one less than the category dimension of 'probs'.

```
probs <- c(0.25, 0.5, 0.25)
lims <- c(2, 4)

BarPlotCat(probs = probs, lims = lims,
  toptitle = "Forecast Probabilities for January",
  category_names = c("Below", "Normal", "Above"),
  panel_title = "January 2024",
  panel_subtitle = "Lead time: 1 month",
  panel_bottom_name = "Month",
  xaxis_title = "Forecast category",
  legend_title = "Categories")
```



issue: https://earth.bsc.es/gitlab/es/esviz/-/blob/main/R/BarPlotCat.R

status: in main

SUNSET

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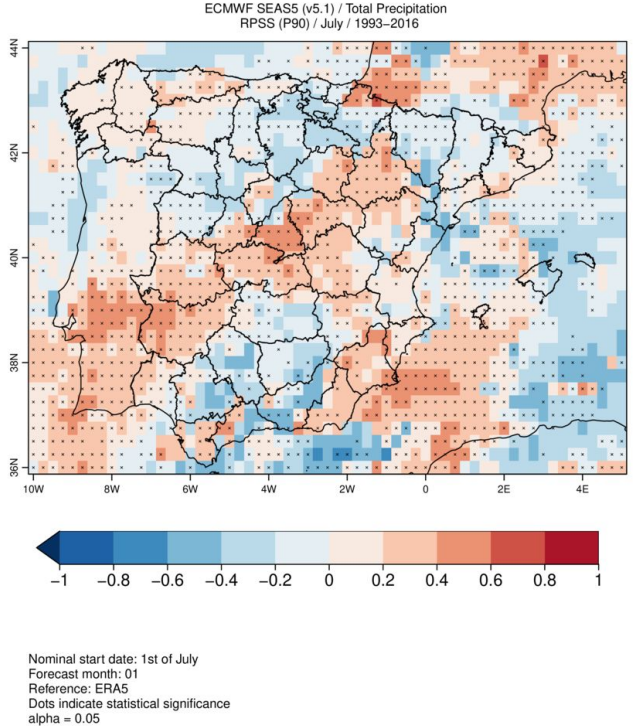
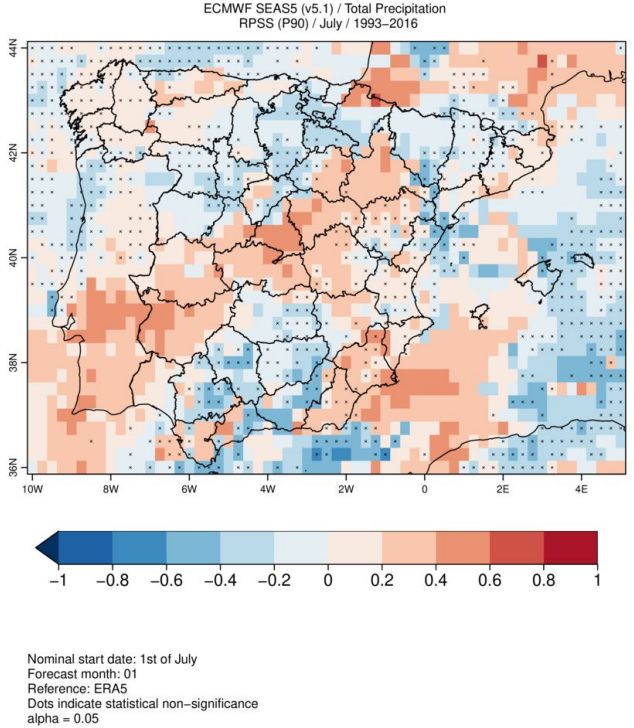
New options for plots

New parameter to choose which points to dot:

- Plot metrics (`skill_metrics`):

  `recipe$...$Visualization$dots_on_points_significance <- "significant"/"non-significant"`

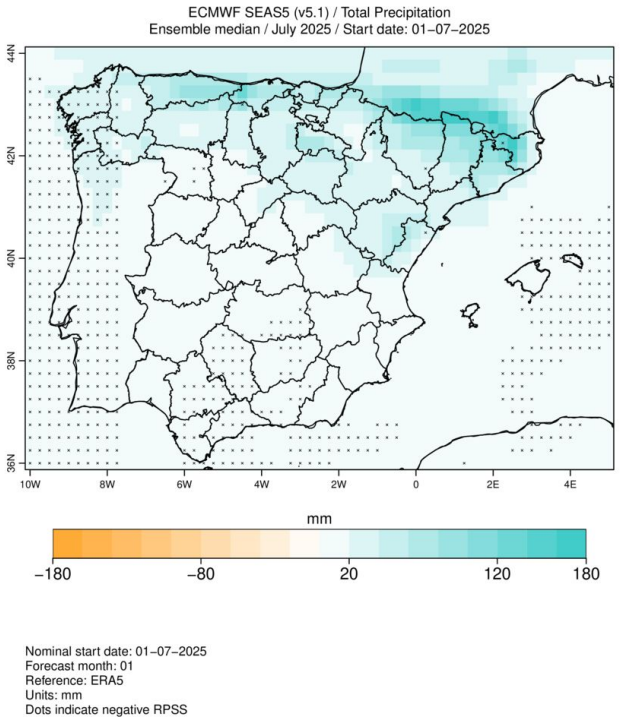


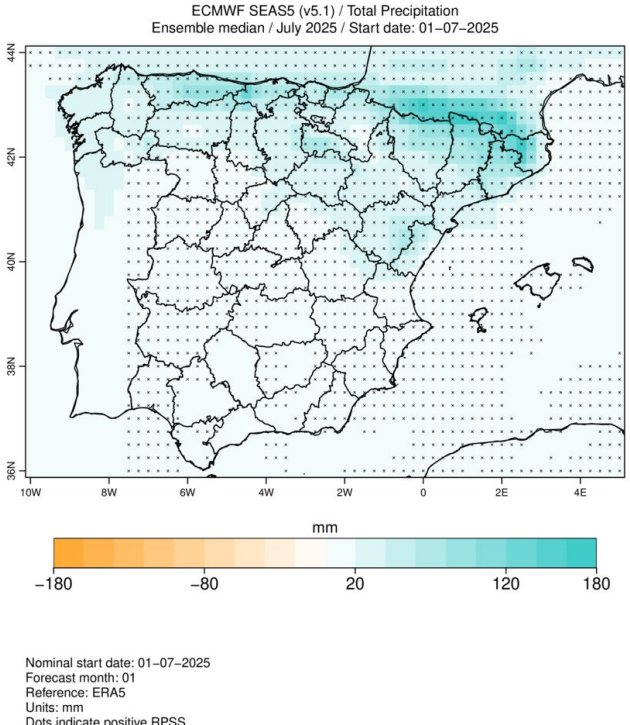


New options for plots

New parameter to choose which points to dot:

- Plot forecast map (`forecast_map`):
  `recipe$...$Visualization$dots_on_points_ens <- "negative"/"positive"`

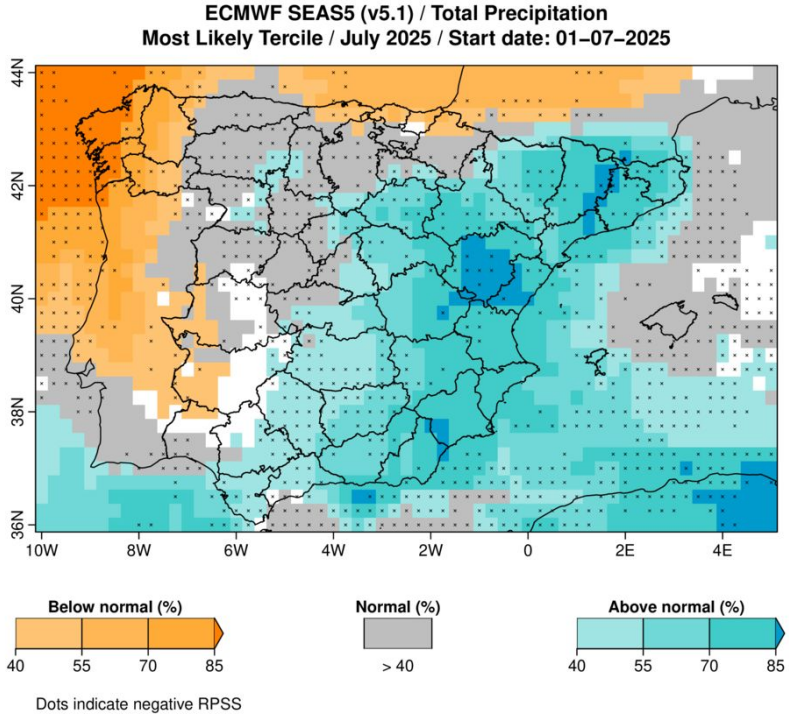


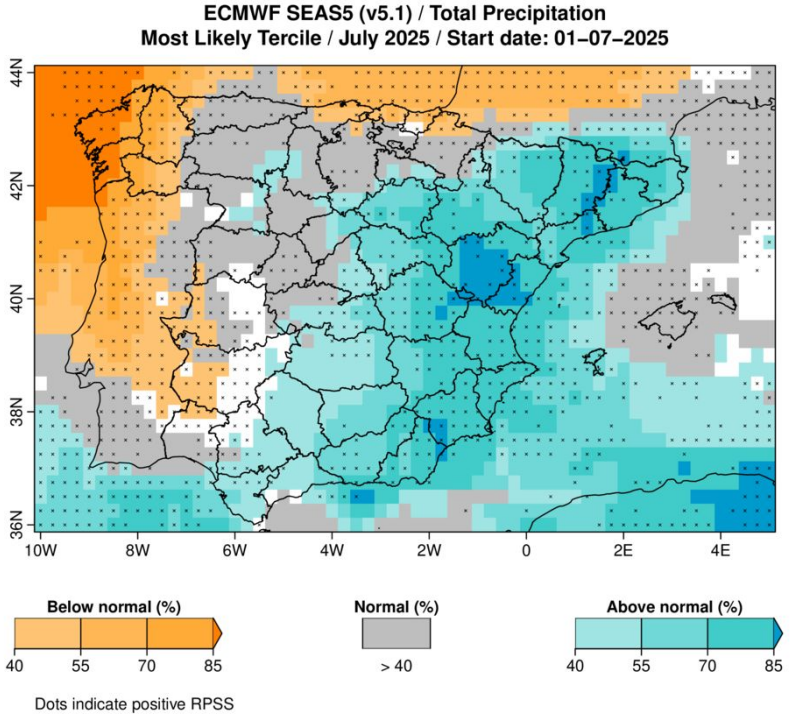


New options for plots

New parameter to choose which points to dot:

- Plot most likely terciles (`most_likely_terciles`):
  `recipe$...$Visualization$dots_on_points_rpss <- "negative"/"positive"`





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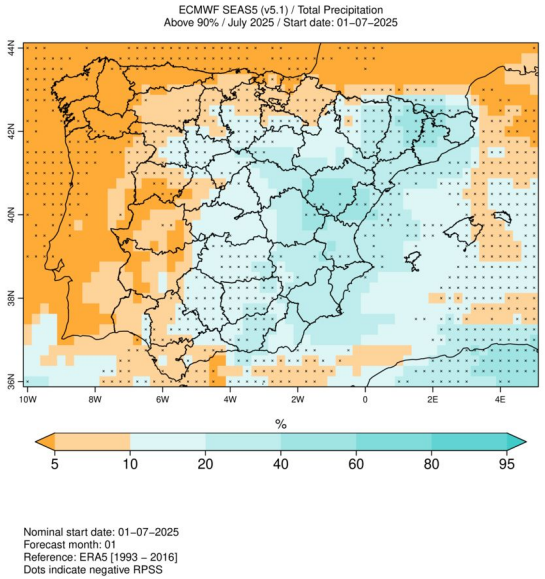
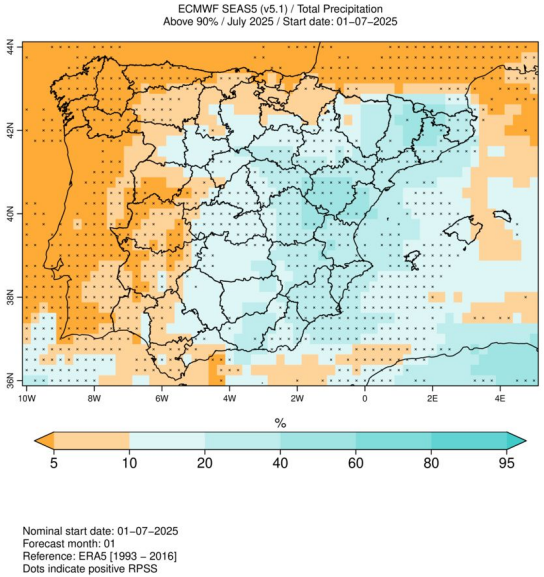




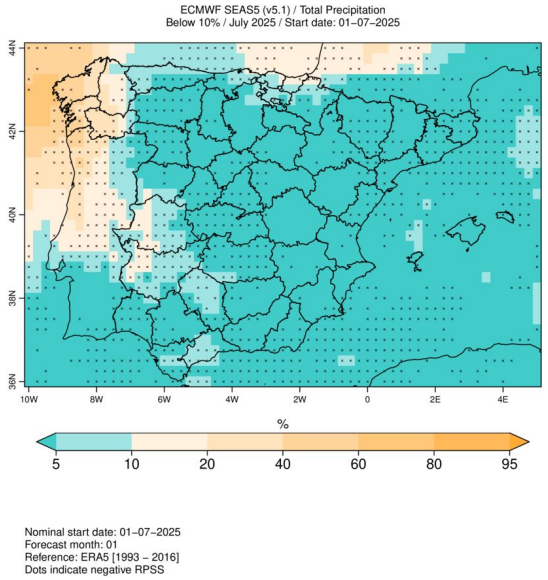
MR: https://earth.bsc.es/gitlab/es/sunset/-/merge_requests/239

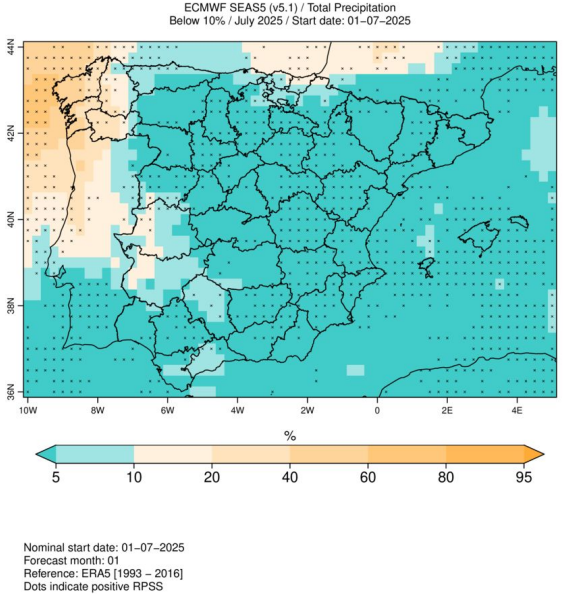
status: in branch ‘dev-vis_dots_nonsignificant’

New options for plots

New parameter to choose which points to dot:

- Plot most likely terciles (`most_likely_terciles`):
  `recipe$...$Visualization$dots_on_points_rpss <- “negative”/”positive”`





MR: https://earth.bsc.es/gitlab/es/sunset/-/merge_requests/239

status: in branch ‘dev-vis_dots_nonsignificant’

User Presentation CST_RNoughtIndices (Javier Corvillo)

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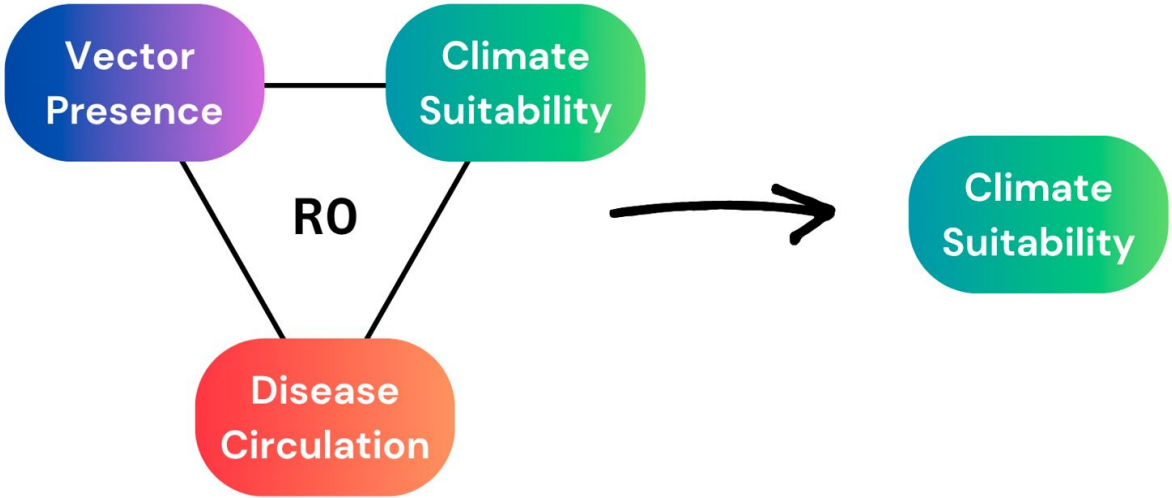
CSIndicators: CST_RNoughtIndices

Computes **environmental suitability** for Aedes-borne diseases (dengue, Zika, chikungunya) using temperature and epidemiological models

Environmental suitability: how many people would be infected with the disease under current climate conditions?



CSIndicators: CST_RNoughtIndices

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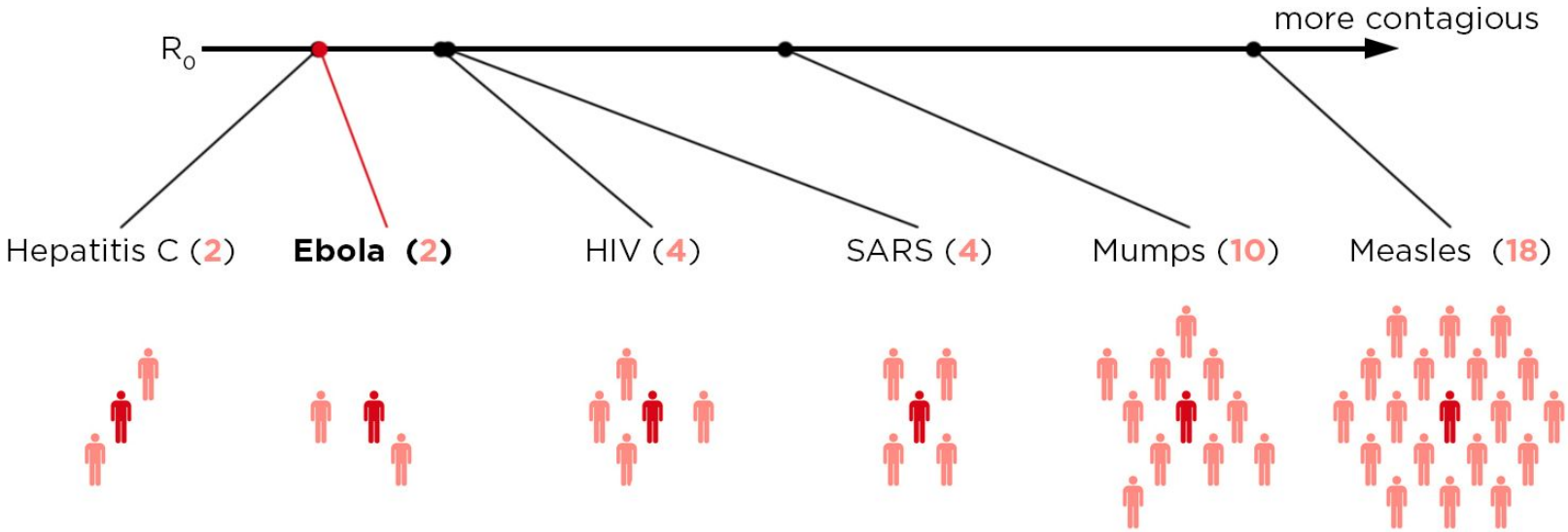


CSIndicators: CST_RNoughtIndices

```
CST_RNoughtIndices <- function(temp, method, mm,
      lon_dim,lat_dim, ncores)
```

- **temp**: Temperature array (in ºC) with at least spatial dimensions
- **method**: One of four different ento-epidemiological models, or an empirical adjustment using previously recorded data
- **mm**: 2D Kramer probability matrix if “caminade” is selected as method. Needs to match the spatial dimensions in “temp”

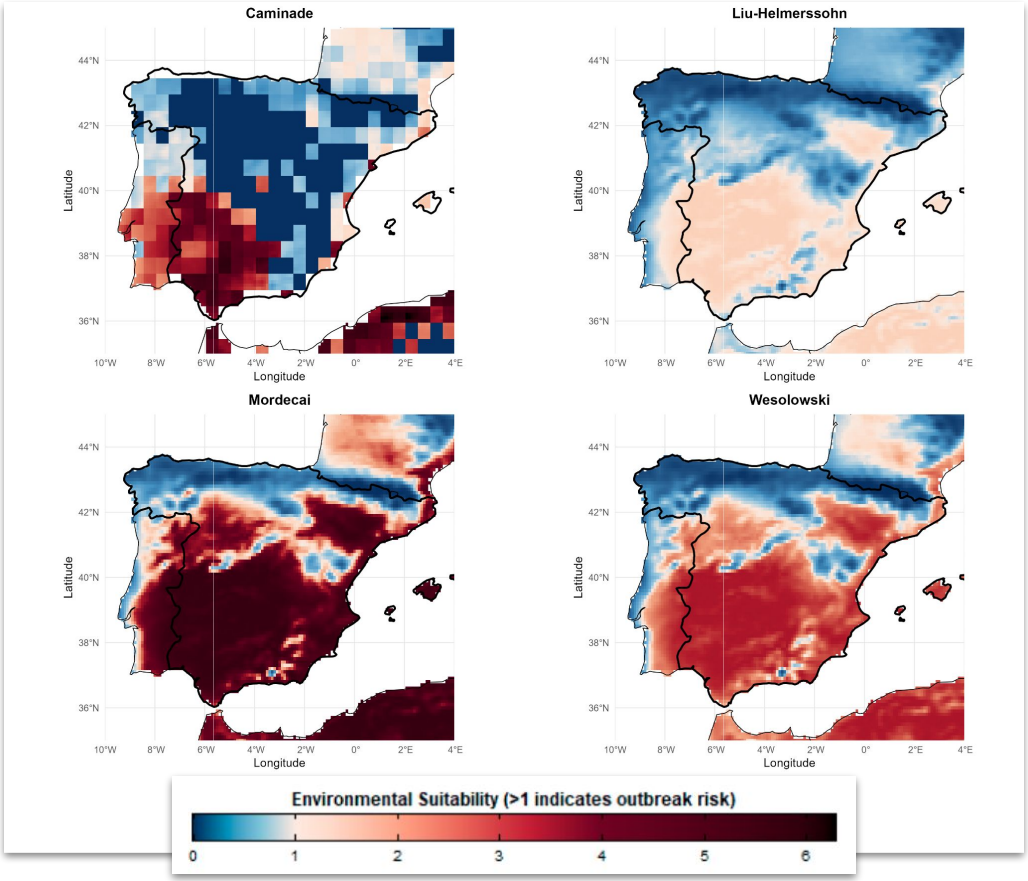
Example script:

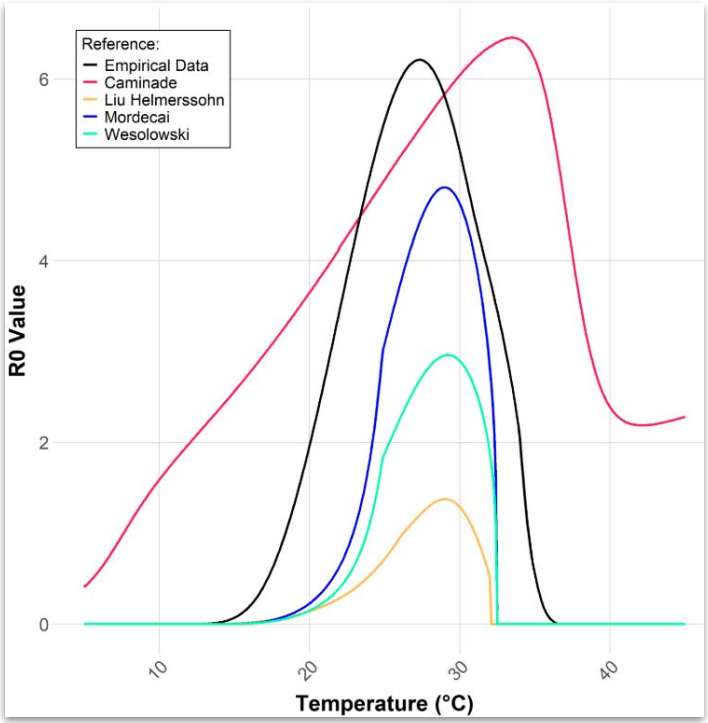
```
# Generate temperature s2dv_cube object
dims <- c(time = 100, lat = 5, lon = 4)
temp_cube <- list(
   data = array(
     runif(prod(dims), min = 15, max = 35),
     dim = dims
   ),
   attrs = list(
     Variable = list(varName = '2m Temperature')
   )
)

class(temp_cube) <- 's2dv_cube'

# Call the function
R0 <- CST_RNoughtIndices(temp_cube, method =
"mordecai", mm = NULL, lon_dim = “lon”, lat_dim =
“lat”, ncores = NULL)
```

Example: August 2025 Era5Land data





Status: MR in CSIndicators

Q&A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Thanks for joining

Next meeting: December 4th?