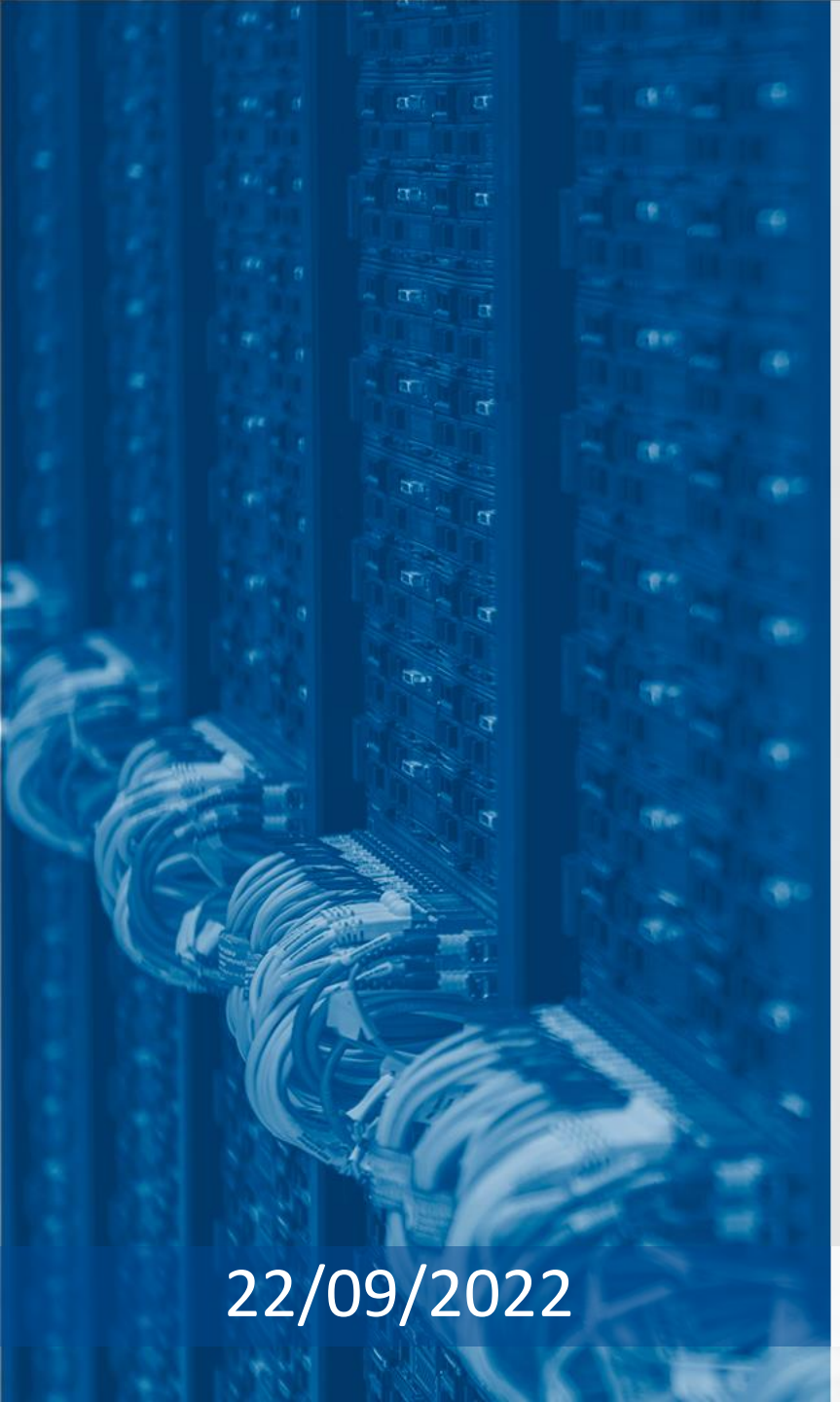

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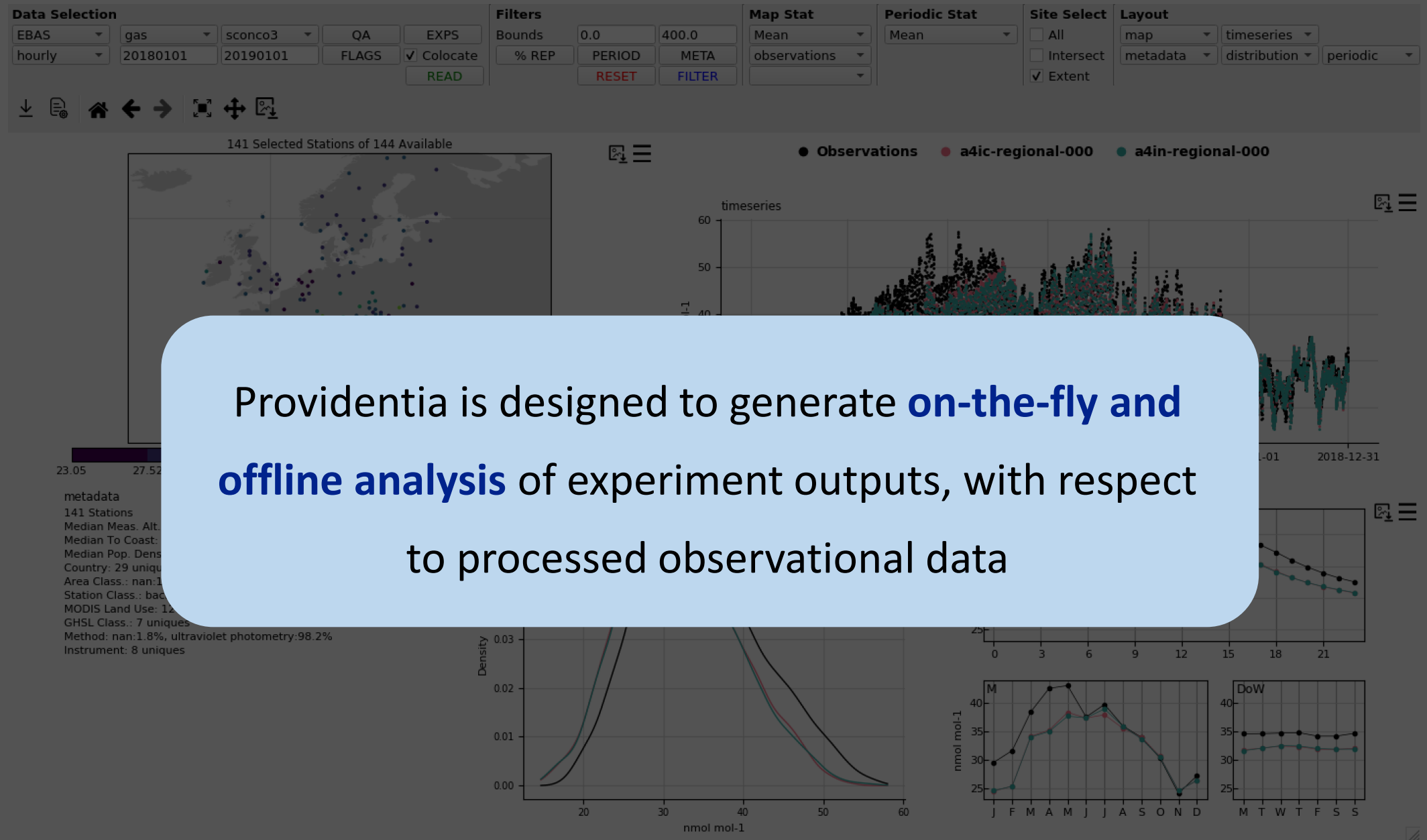
Providentia v2.0
Training Session 1

22/09/2022

Alba Vilanova | Dene Bowdalo

Introduction



Providentia is designed to generate **on-the-fly and offline analysis** of experiment outputs, with respect to processed observational data

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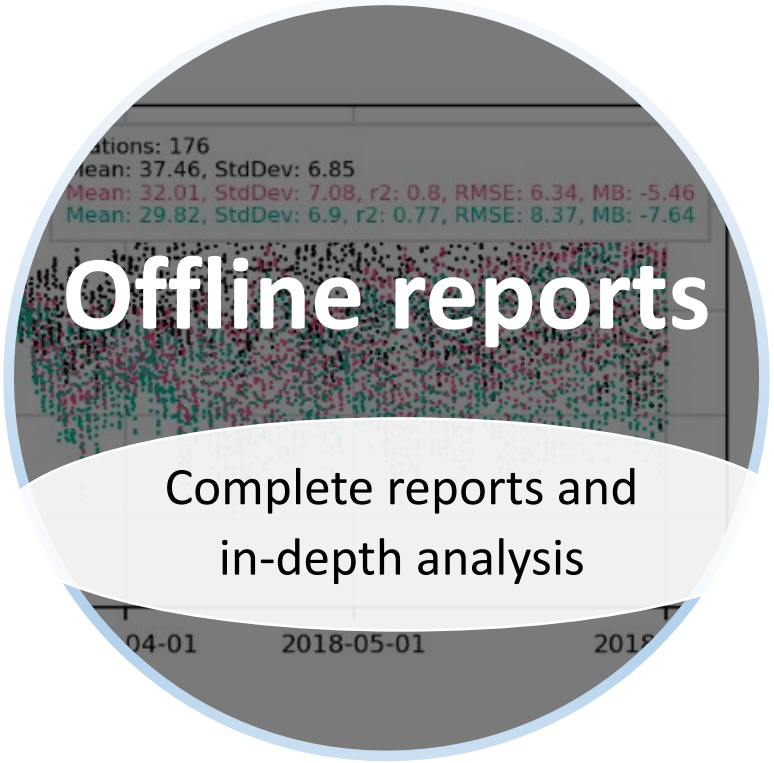
VISUALIZATION TOOLS



Data Selection

EBAS | gas | sconco3 | QA | EXPS

hourly | 20180101 | 20190101 | FLAGS | ☑ Colocate | READ

Filters

Bounds | 0.0 | 400.0

% REP | PERIOD | META

RESET | FILTER

Map Stat

Mean

observations

Periodic Stat

Mean

Site Select

☐ All

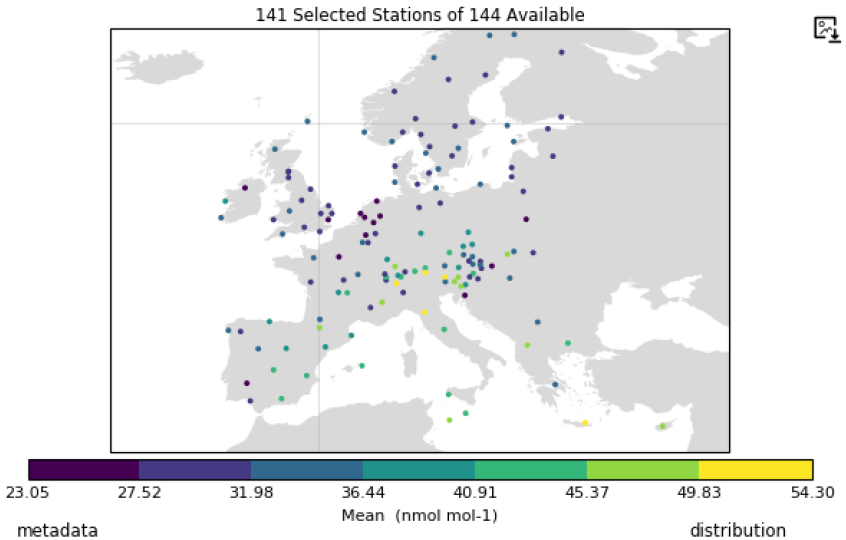
☐ Intersect

☑ Extent

Layout

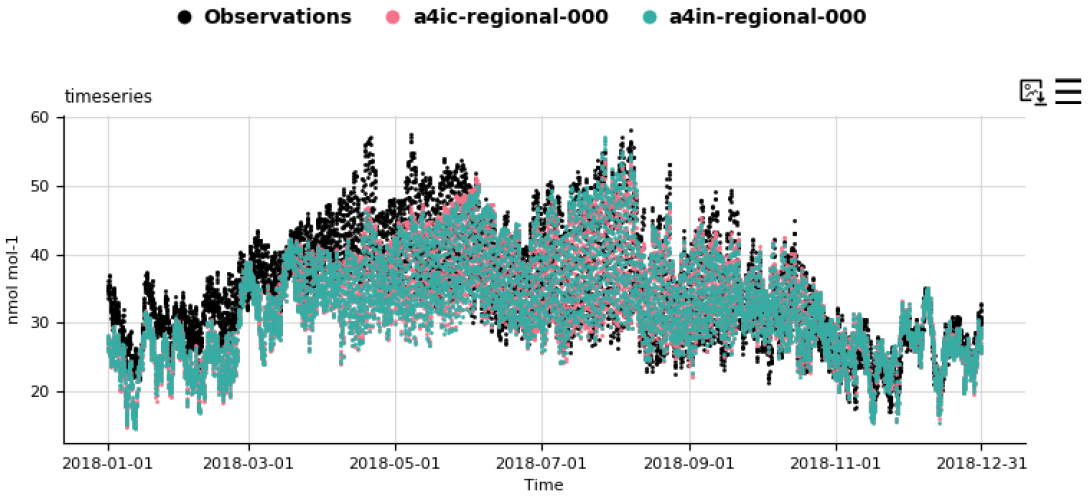
map | timeseries

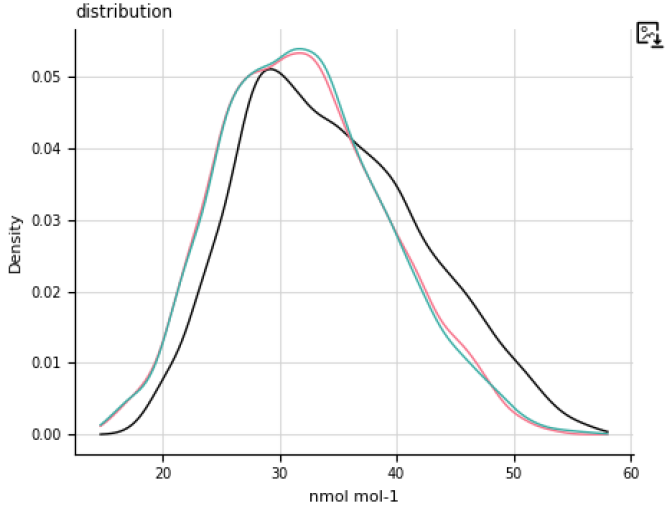
metadata | distribution | periodic

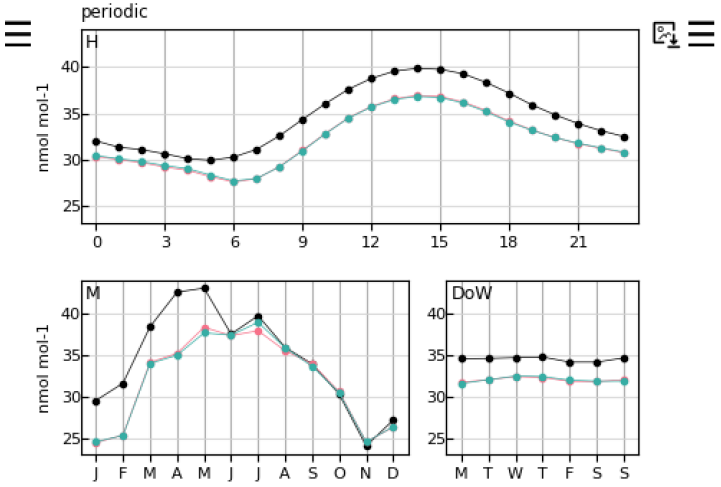


metadata

141 Stations
Median Meas. Alt.: 267.00 m
Median To Coast: -91.00 km
Median Pop. Dens.: 0.0 xx/km-2
Country: 29 uniques
Area Class.: nan:1.8%, rural:69.4%, urban-suburban:28.8%
Station Class.: background:69.4%, nan:30.6%
MODIS Land Use: 12 uniques
GHSL Class.: 7 uniques
Method: nan:1.8%, ultraviolet photometry:98.2%
Instrument: 8 uniques







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STEPS

BASIC

1. Set up your connection to BSC machines
2. Clone Providentia Interpolation and Providentia
3. Interpolate your experiments
4. Launch the dashboard

PRO

5. Edit the plots style
6. Export data and configuration files
7. Load configuration files

1 Set up your connection

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SET UP YOUR CONNECTION

In your local machine**, open and edit the configuration file of SSH** with:

```
$ vi .ssh/config
```

```
Host mn1
        HostName mn1.bsc.es
        User bsc32XXX
        IdentityFile ~/.ssh/id_rsa
        ForwardX11Trusted yes
        ForwardX11 yes
        Compression yes
        Ciphers aes128-gcm@openssh.com
        ForwardX11Timeout 7d
```

```
Host nord3v2
        HostName nord4.bsc.es
        User bsc32781
        IdentityFile ~/.ssh/id_rsa
        ForwardX11Trusted yes
        ForwardX11 yes
        Compression yes
```

Note that the options for Nord3v2 do not include the line with Ciphers. Note also that compression is turned on.

2

Clone the repositories

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CLONE PROVIDENTIA INTERPOLATION

1. Enter the project's GitLab page:

   https://earth.bsc.es/gitlab/ac/providentia-interpolation

2. In Clone copy link from Clone with HTTPS
3. In your terminal, clone using:

```
$ git clone --recurse-submodules https://earth.bsc.es/gitlab/ac/providentia-interpolation.git
```

4. Transfer the folder to the path you usually work. (e.g. your gpfs scratch)

```
$ scp -r providentia-interpolation bsc32XXX@dt01.bsc.es:/gpfs/scratch/bsc32/bsc32XXX/
```

CLONE PROVIDENTIA

1. Enter the project's GitLab page:

   https://earth.bsc.es/gitlab/ac/Providentia

2. In Clone copy link from Clone with HTTPS
3. In your terminal, clone the repo:

```
$ git clone https://earth.bsc.es/gitlab/ac/Providentia.git
```

4. Change to the production branch:

```
$ git checkout production
```

5. Transfer the folder to the path you usually work. (e.g. your gpfs scratch)

```
$ scp -r Providentia bsc32XXX@dt01.bsc.es:/gpfs/scratch/bsc32/bsc32XXX/
```

3

Interpolate your experiments

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INTERPOLATE YOUR EXPERIMENTS

1. Add the experiment path to **defined_experiments.py**

```
defined_experiments_dictionary = {# ------------------------------------------------------------ #

                                  # MONARCH experiments
                                  'b007': {'esarchive': '/esarchive/exp/nmmb-bsc-ctm/b007/'},
                                  'a1wd': {'esarchive': '/esarchive/exp/monarch/a1wd/'},
                                  'a1vv': {'esarchive': '/esarchive/exp/monarch/a1vv/'},
                                  'a1vw': {'esarchive': '/esarchive/exp/monarch/a1vw/'},
                                  'a1x8': {'esarchive': '/esarchive/exp/monarch/a1x8/'},
                                  'a1xa': {'esarchive': '/esarchive/exp/monarch/a1xa/'}, ...
                                  }
```

INTERPOLATE YOUR EXPERIMENTS

2. Edit the configuration inside **configuration.py**

```
qos = 'default’
GHOST_version = 'default’
n_neighbours_to_find = 'default’
start_date = '201801' # YYYYMM START FROM THIS POINT
end_date = '201802' # YYYYMM GO UP TO THIS POINT
experiments_to_process = ['cams61_emep_ph2’]
species_to_process = ['sconco3’]
grid_types_to_process = ['default’]
ensemble_options = ['default’]
networks_to_interpolate_against = ['EBAS’]
temporal_resolutions_to_output = ['hourly']
```

INTERPOLATE YOUR EXPERIMENTS

3. Submit the interpolation job to the queue

```
$ sbatch experiment_interpolation_submit.sh
```

4. Check if the job has successfully finished in **management_logs**
5. Check the outputs in:

/gpfs/projects/bsc32/AC_cache/recon/exp_interp

Due to inconsistencies in a dependency module, the interpolation will run in parallel in Power9 and MN4, but in serial in Nord3v2.

GHOST

Providentia Interpolation and Providentia can both be run with AC convention NetCDF files, as well as with GHOST formatted observations.

GHOST (**G**lobally **H**armonised **O**bservational **S**urface **T**reatment) is a project designed to harmonise global surface measurements related to field of Atmospheric chemistry. It currently consists of >200 species across 18 providing data networks between 1970 and 2022.

The use of GHOST data allows access to a vast number of metadata fields, and filtering options when using Providentia.

See more information here:

https://earth.bsc.es/gitlab/ac/GHOST

4 Launch the dashboard

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LAUNCH THE DASHBOARD

Launch the dashboard using:

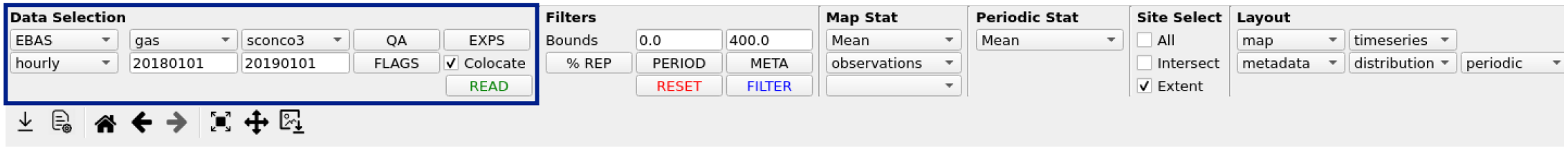
```
$ ./bin/providentia
```

It is also possible to launch the dashboard with a configuration file:

```
$ ./bin/providentia --config=" /esarchive/scratch/avilanova/software/Providentia/configurations/test.conf"
```

The modules will automatically load and the allocation in the machine (either MN4 or Nord3) will be requested. When we are granted the allocation, the dashboard of Providentia will initialize.

DATA SELECTION



Network: EBAS

Matrix: gas

Species: sconco3

Quality assurance (GHOST): QA

Experiments: EXPS

Temporal resolution: hourly

Start date: 20180101

End date: 20190101

Data flags (Provider): FLAGS

Temporal colocation: ✓ Colocate

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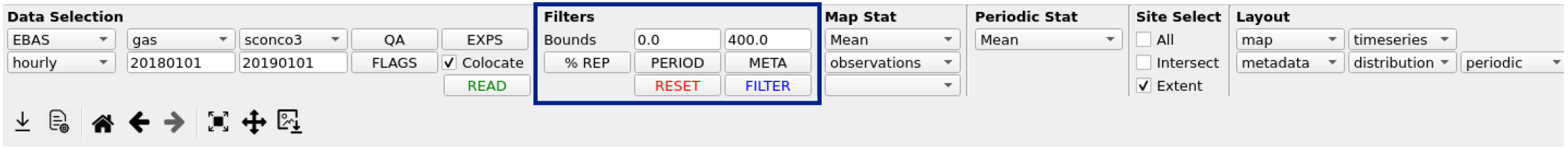
FILTERS SELECTION



Data lower bound

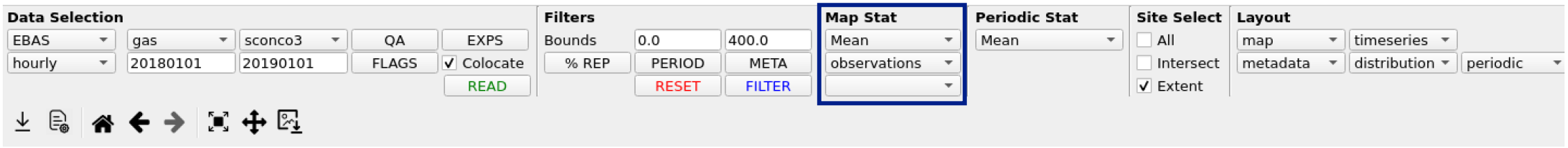
Data upper bound

Representativity filters

Time period filters

Metadata filters

MAP STATISTIC SELECTION



Statistical metric

Dataset to plot

Dataset to plot as a difference of the first one

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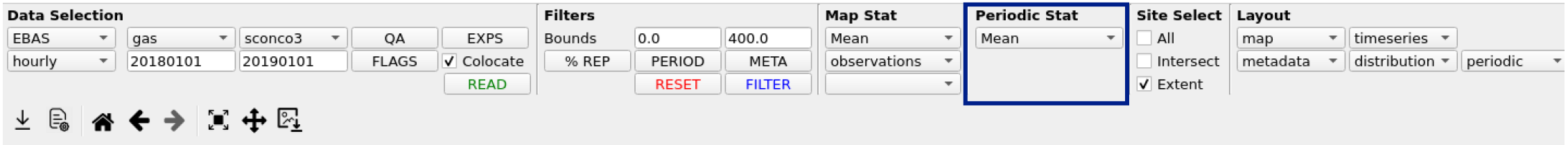
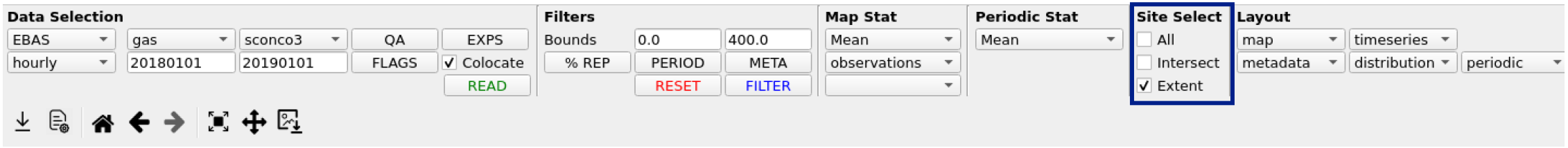
PERIODIC STATISTIC SELECTION



Statistical metric

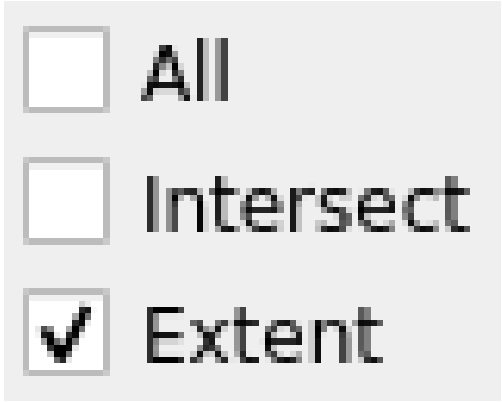
MAP STATIONS SELECTION



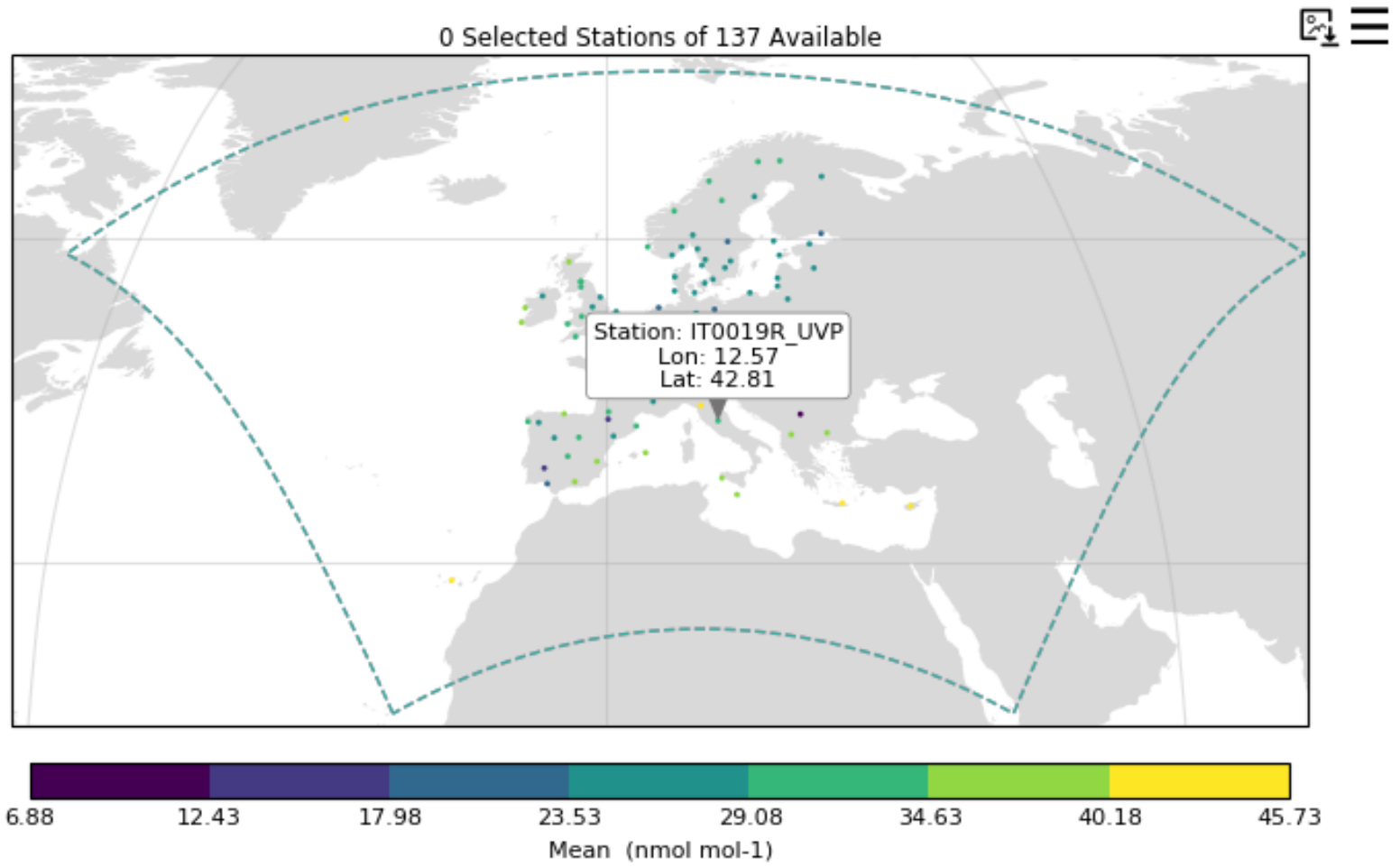
Select all stations

Select intersecting stations within all model domains

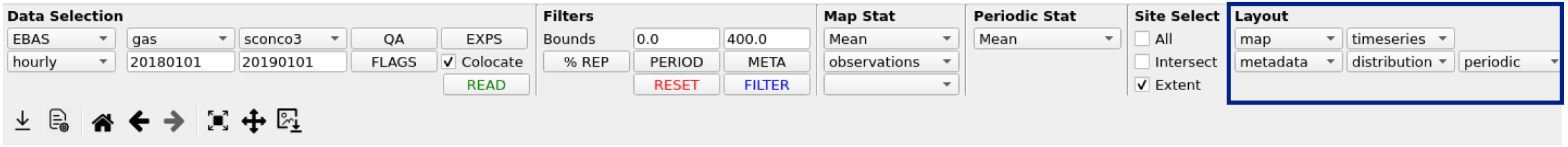
Select stations on current map view



MAP STATIONS SELECTION



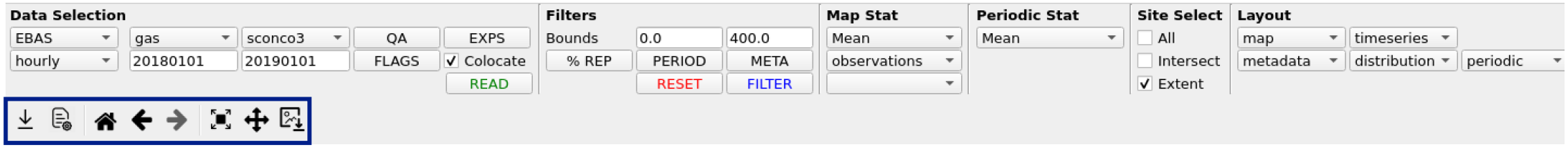
PLOT LAYOUT SELECTION

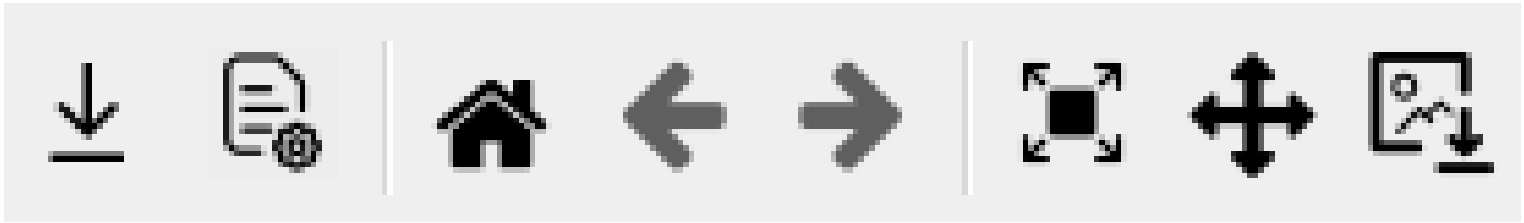


Top left position **Top right position**

Bottom left position **Bottom center position** **Bottom right position**

GENERAL ITEMS





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5

Edit the plots style

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EDIT THE PLOTS STYLE

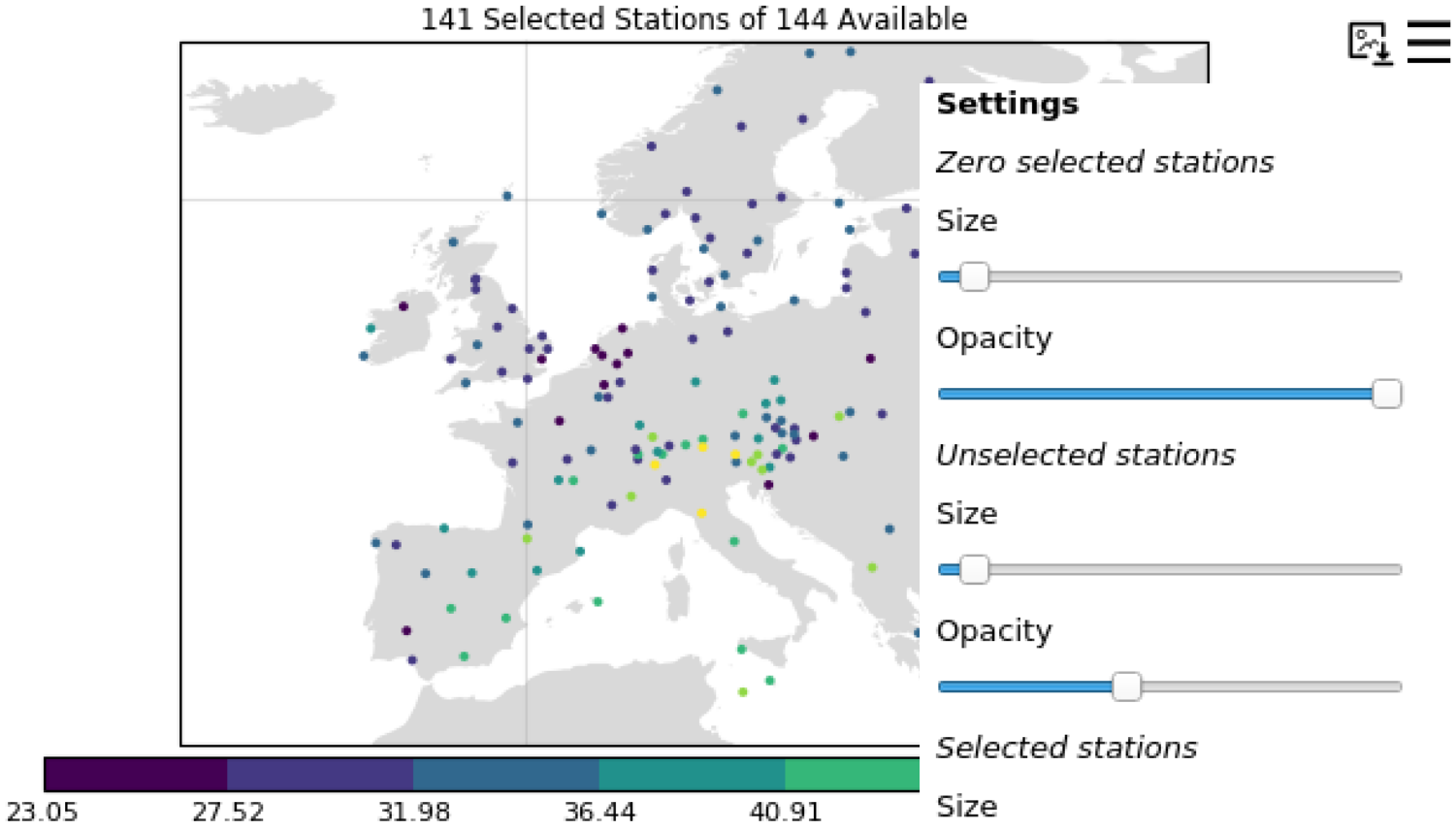
If you want to edit the plot characteristics, you will need to edit the file **plot_characteristics_dashboard.json**. Most parameters are based in Matplotlib 3.1.1 and all have been summarized in:

https://earth.bsc.es/gitlab/ac/Providentia/-/wikis/Plot-customization

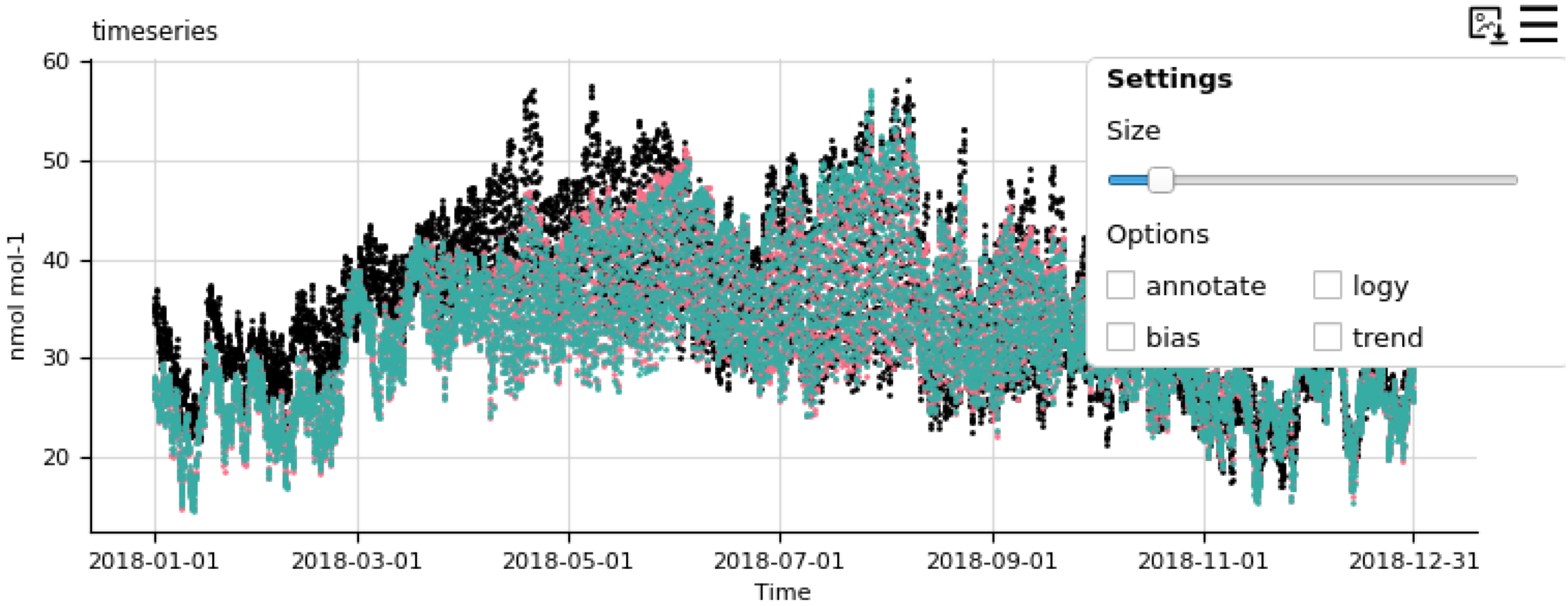
The plots style can also be changed using the settings menus on the top right corner of each plot. Each plot has different options, as you can see in the next slides.

If you want to show scatter plots or use the bias option that is inside the menu settings, make sure that the temporal colocation is active.

EDIT THE MAP STYLE



EDIT THE TIMESERIES STYLE

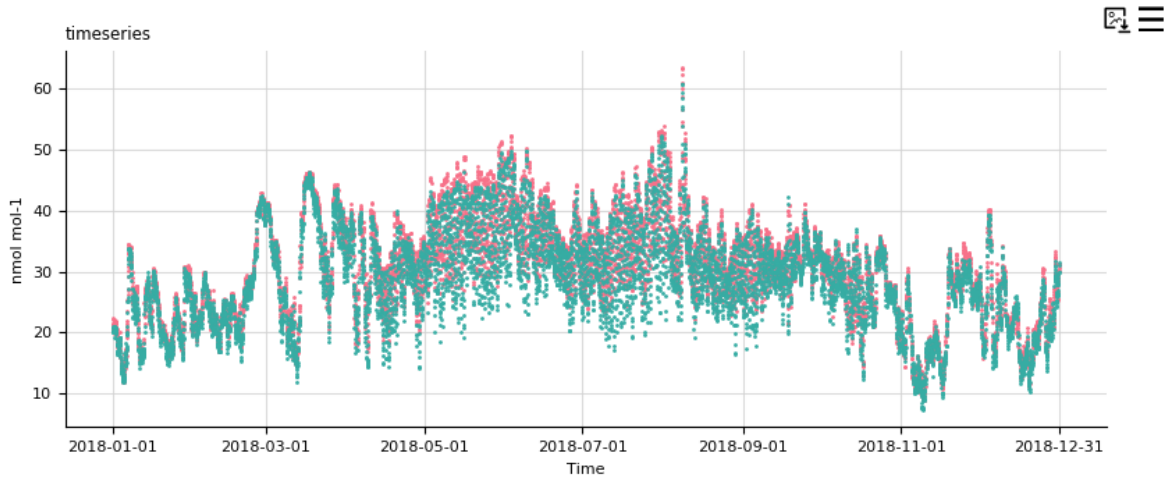


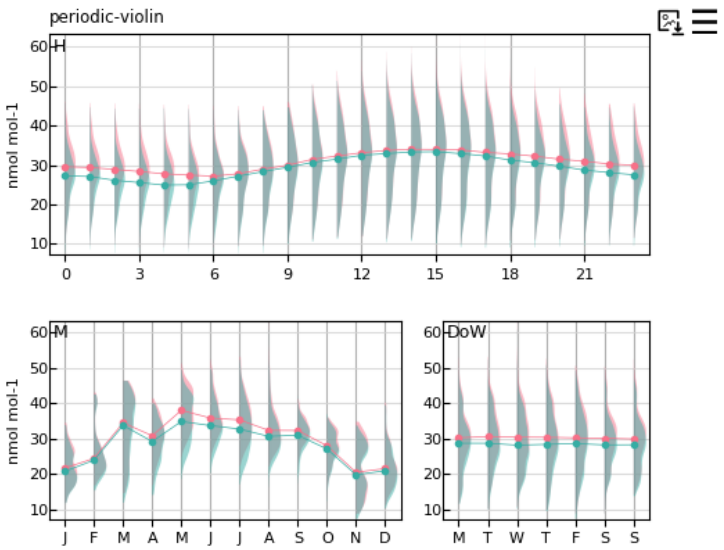
LEGEND PICKING

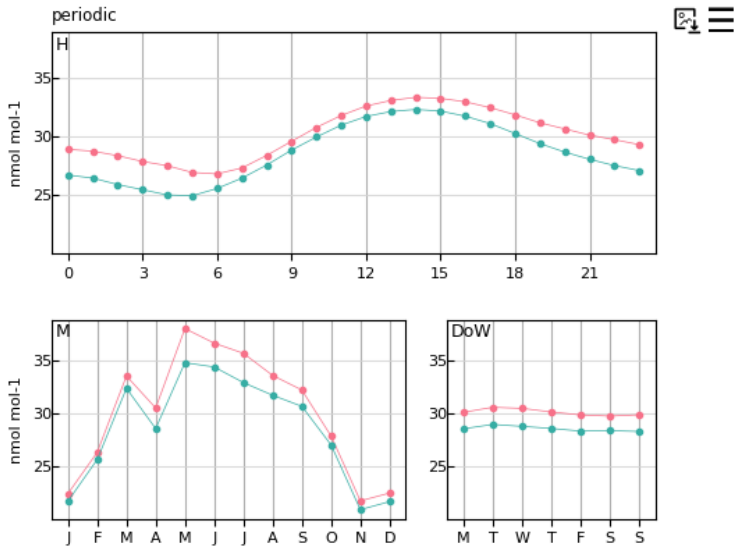
Clicking on the legend labels will remove or add data to the each of the plots

Bold = Visible

Roman = Invisible







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6

Export data and configuration files

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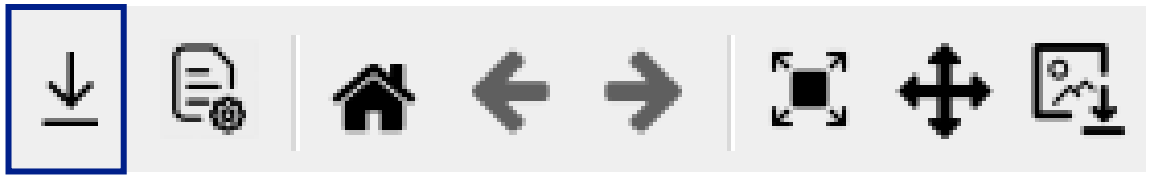
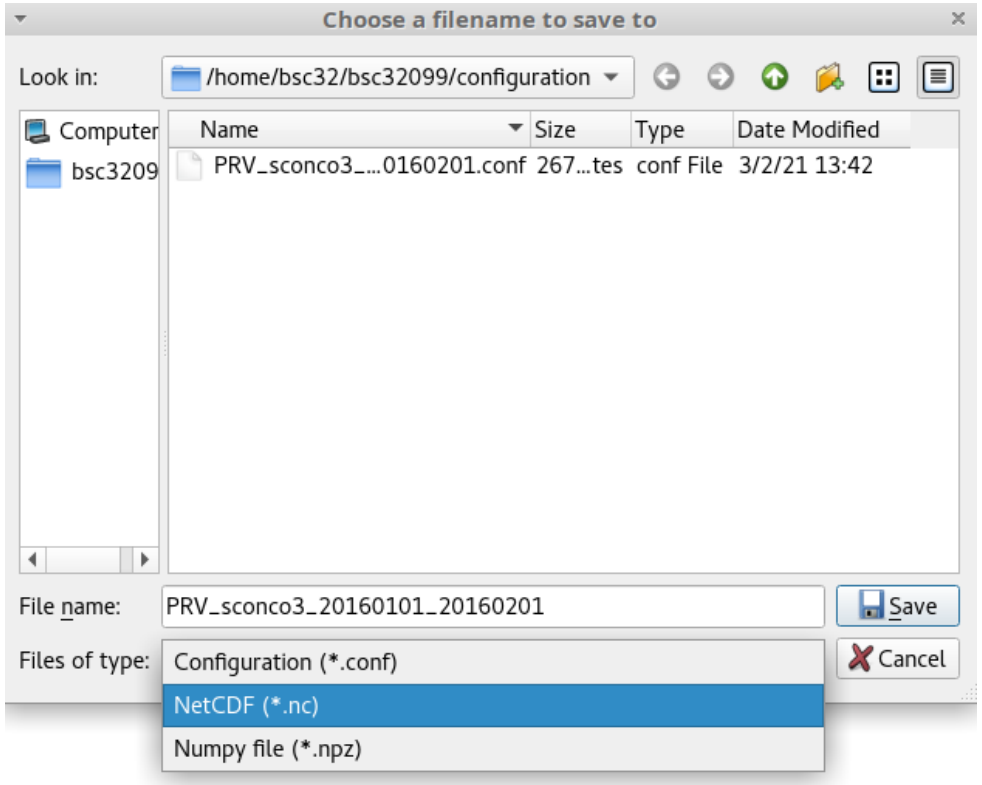
EXPORT DATA AND CONFIGURATION FILES



If we wish to export the data that we used during our evaluation session, we can do it using the save button on the general menu. The formats are **Numpy and NetCDF**.

We can also export **configuration files**, useful to launch the dashboard and create offline reports. It is possible to change the name as well as select its destination path.



7

Load configuration files

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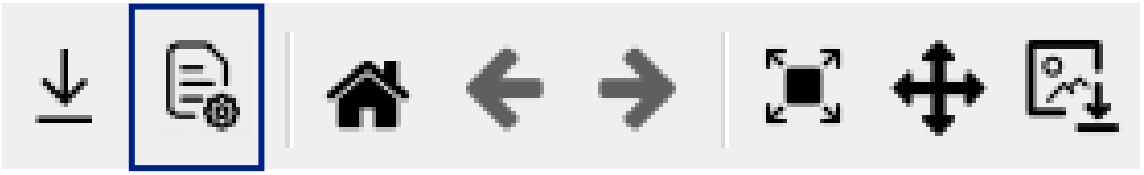
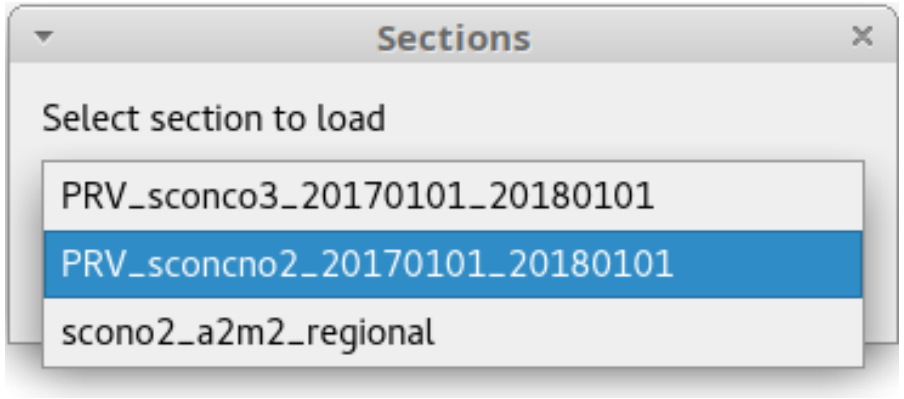
LOAD CONFIGURATION FILES

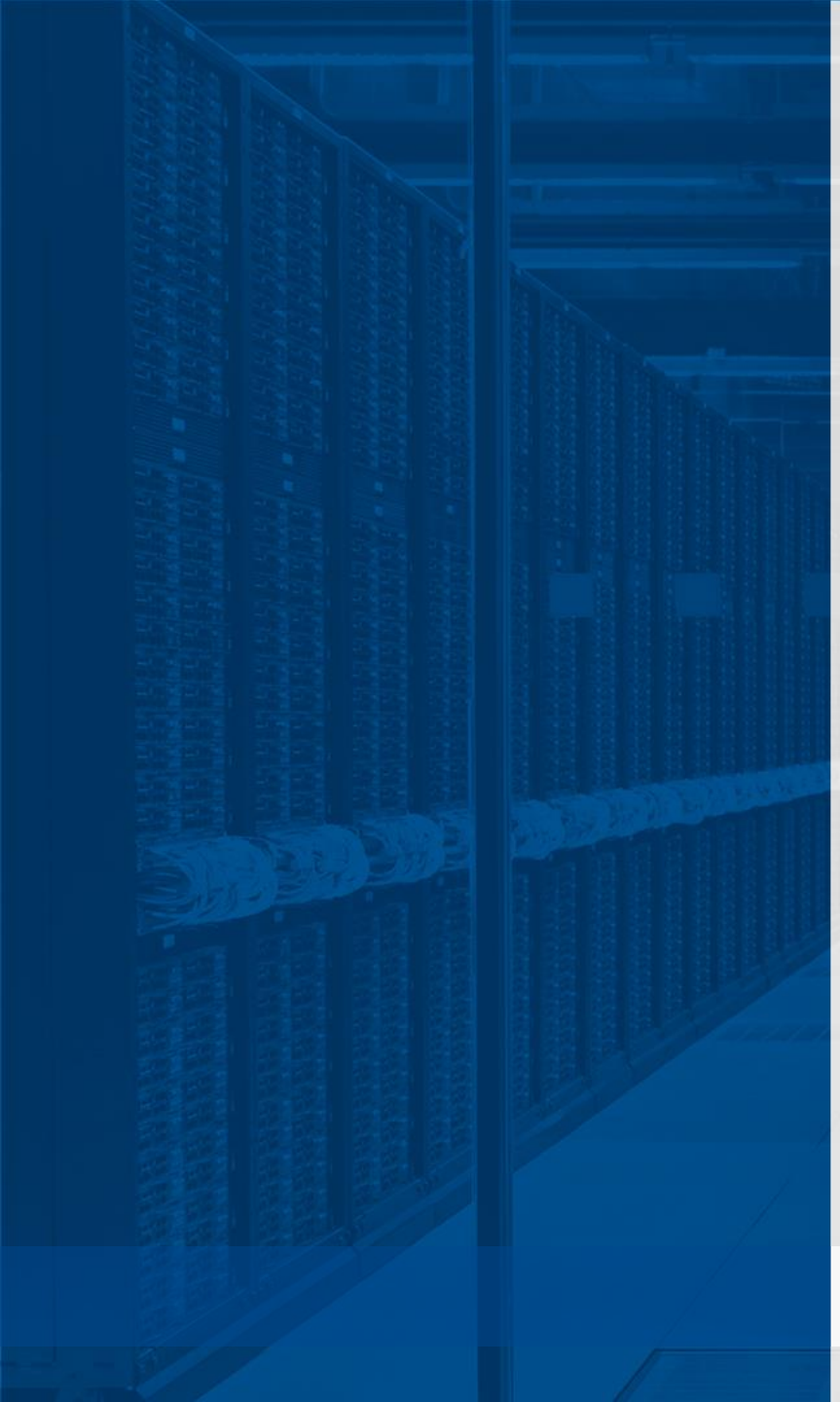


You can select the configuration file which you want to load using the load button on the general menu. After selecting a file and clicking Open, an extra dialog will appear in which you can select which section of your configuration you want to load.



Remember that you can also load the dashboard using a configuration file as an argument as in:

```
$ ./bin/providentia --config=" /esarchive/scratch/avilanova/software/Providentia/configurations/test.conf"
```



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Thank you for your attention!

More information at:
https://earth.bsc.es/gitlab/ac/Providentia

Join the #providentia Slack channel!

alba.vilanova@bsc.es | dene.bowdalo@bsc.es