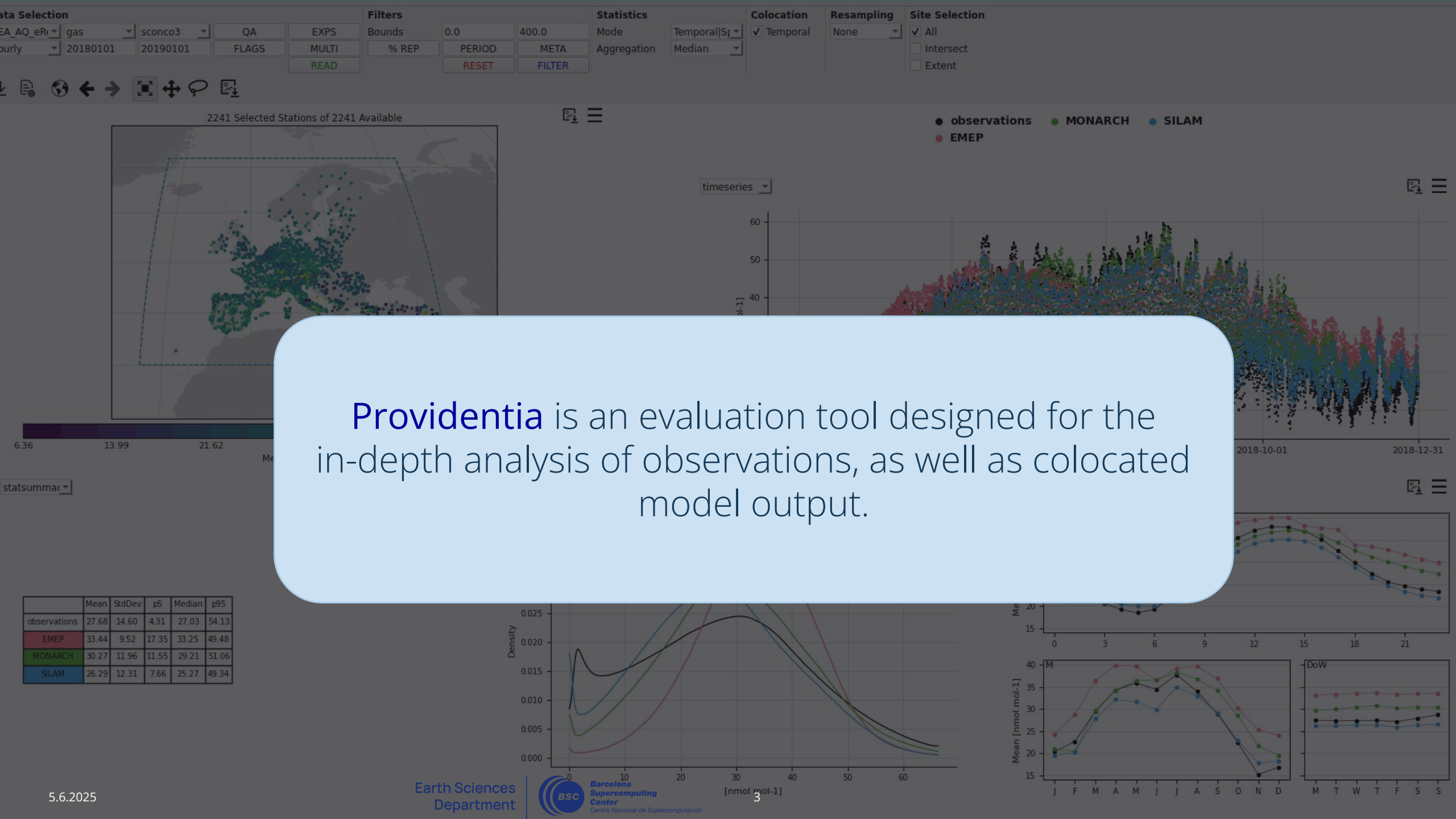
Earth Sciences Department | Barcelona Supercomputing Center
Centro Nacional de Supercomputación

Providentia

An Evaluation and Visualisation Tool for ACTRIS Data

Paula Serrano | Alba Vilanova | Dene Bowdalo

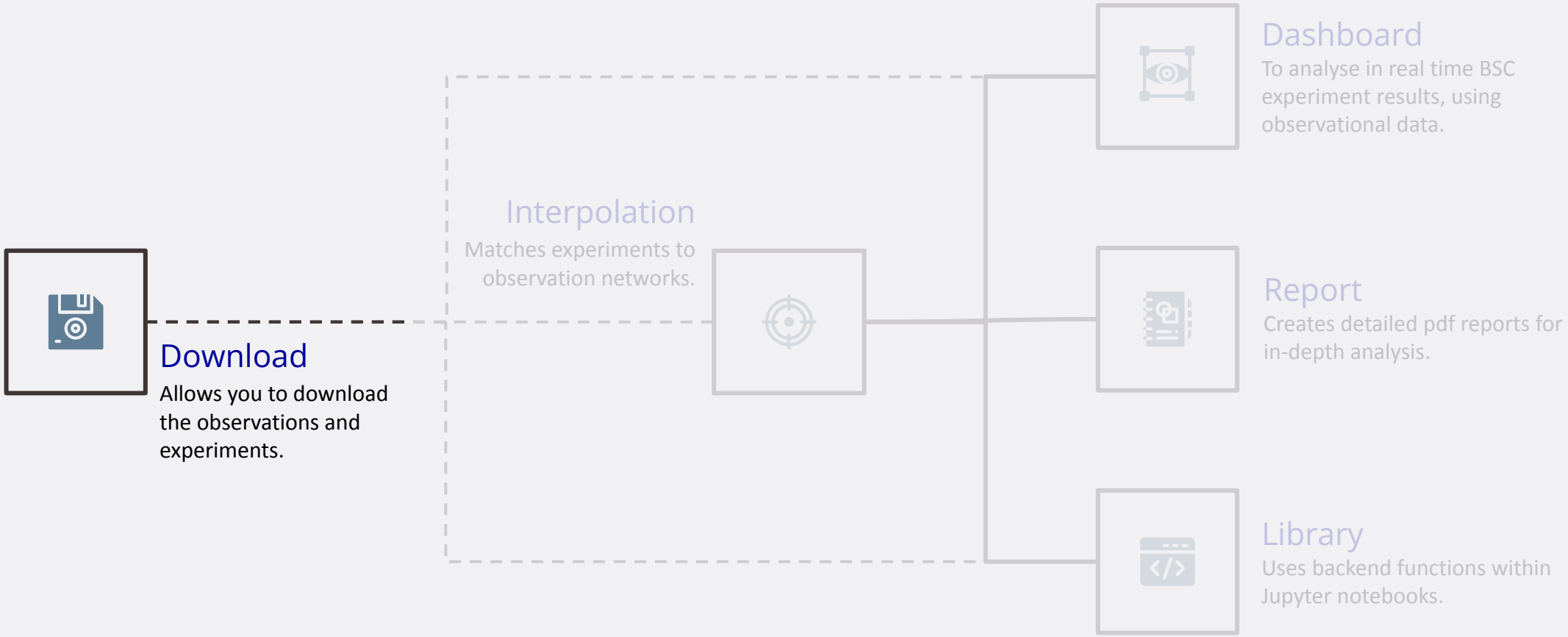
Introduction



	Mean	StdDev	p5	Median	p95
observations	27.68	14.60	4.31	27.03	54.13
EMEP	33.44	9.52	17.35	33.25	49.48
MONARCH	30.27	11.96	11.55	29.21	51.06
SILAM	26.29	12.31	7.66	25.27	49.34

Key Functionalities

Structure


Download
Allows you to download the observations and experiments.
Interpolation
Matches experiments to observation networks.
Dashboard
To analyse in real time BSC experiment results, using observational data.
Report
Creates detailed pdf reports for in-depth analysis.
Library
Uses backend functions within Jupyter notebooks.

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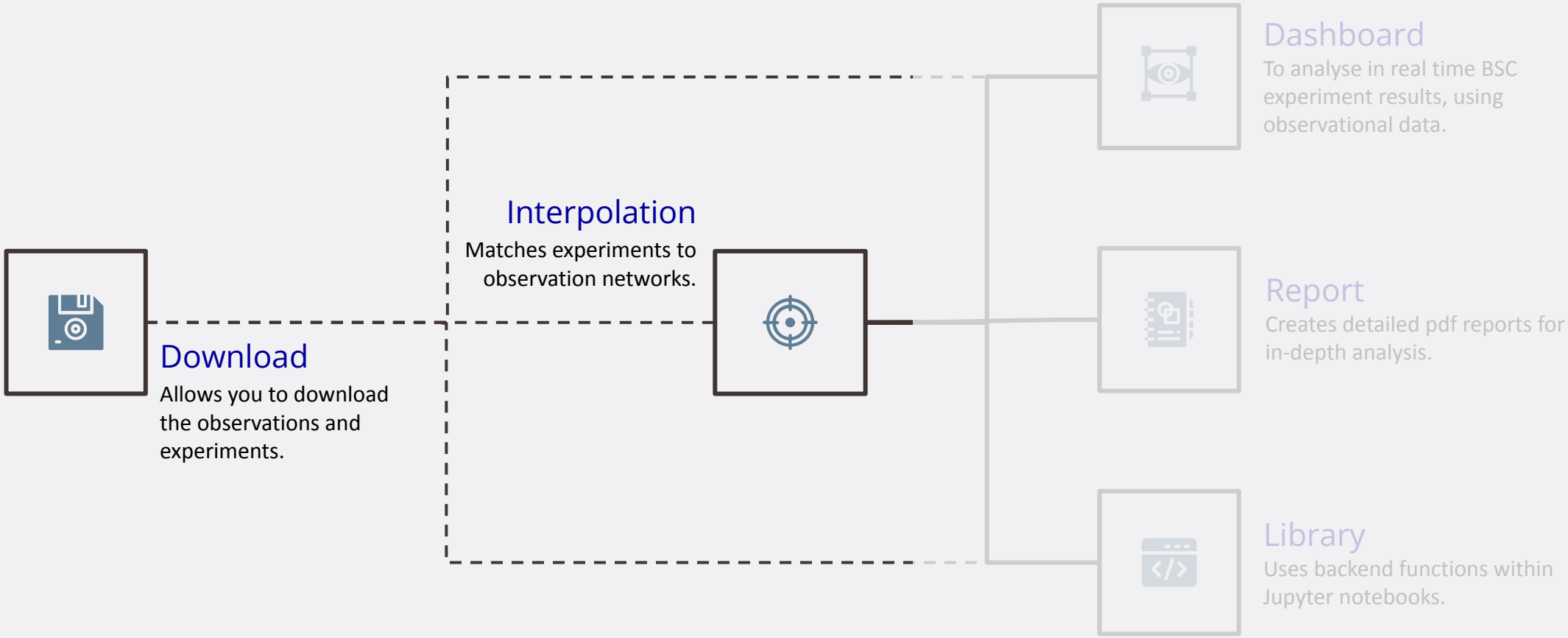
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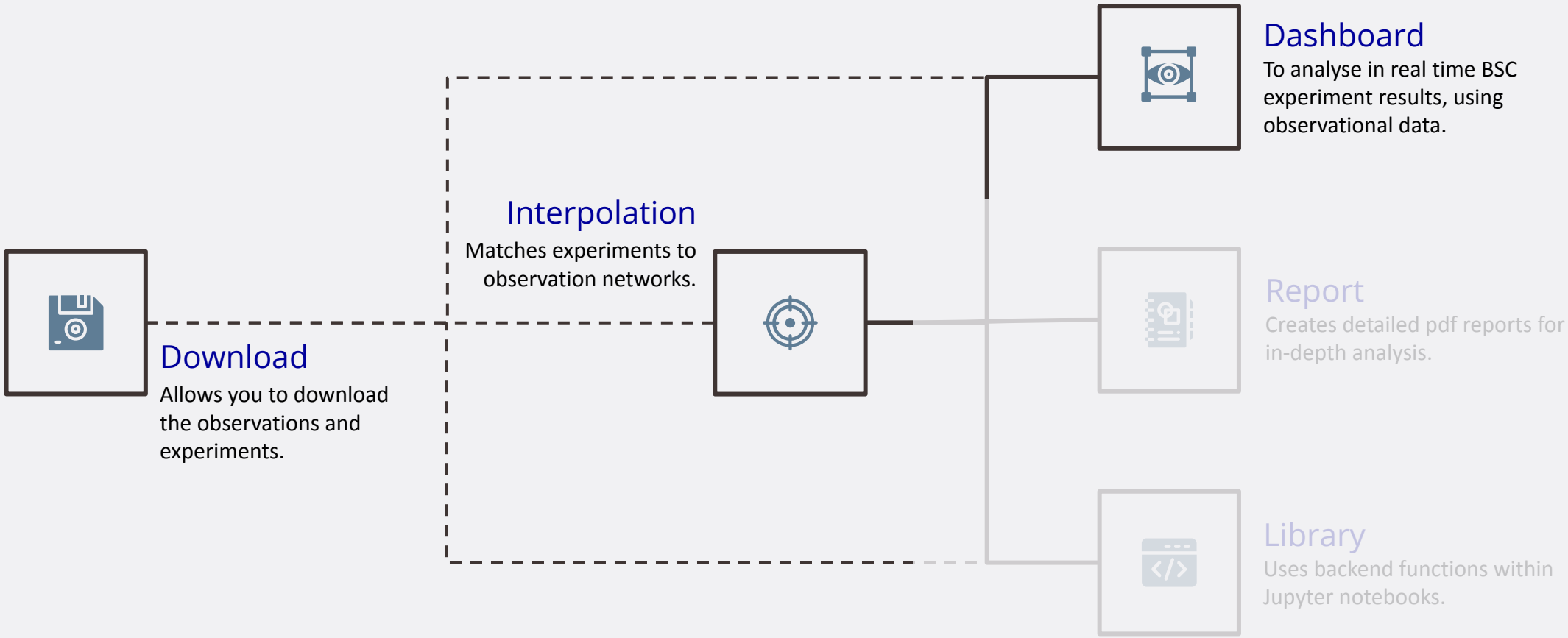
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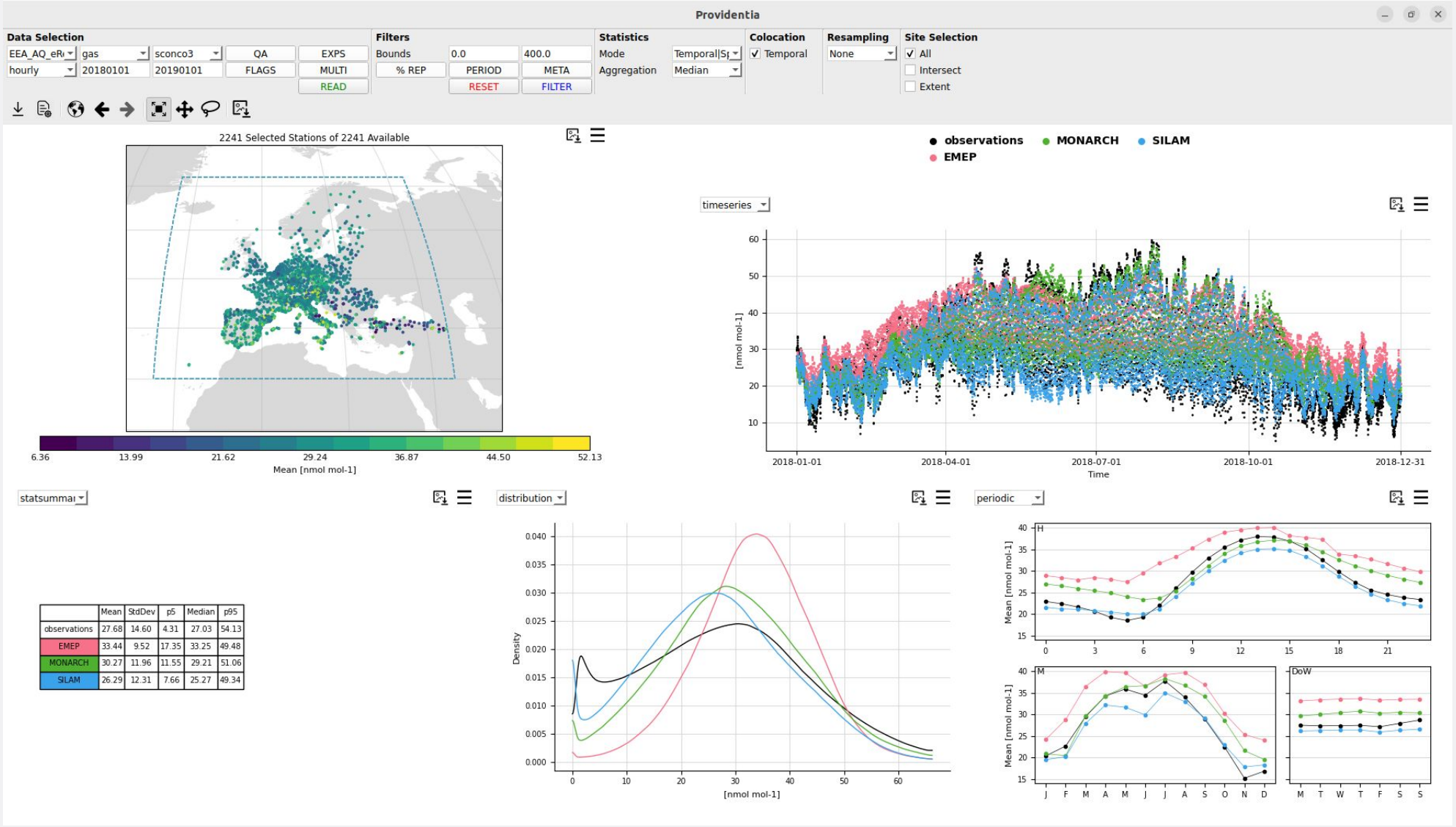

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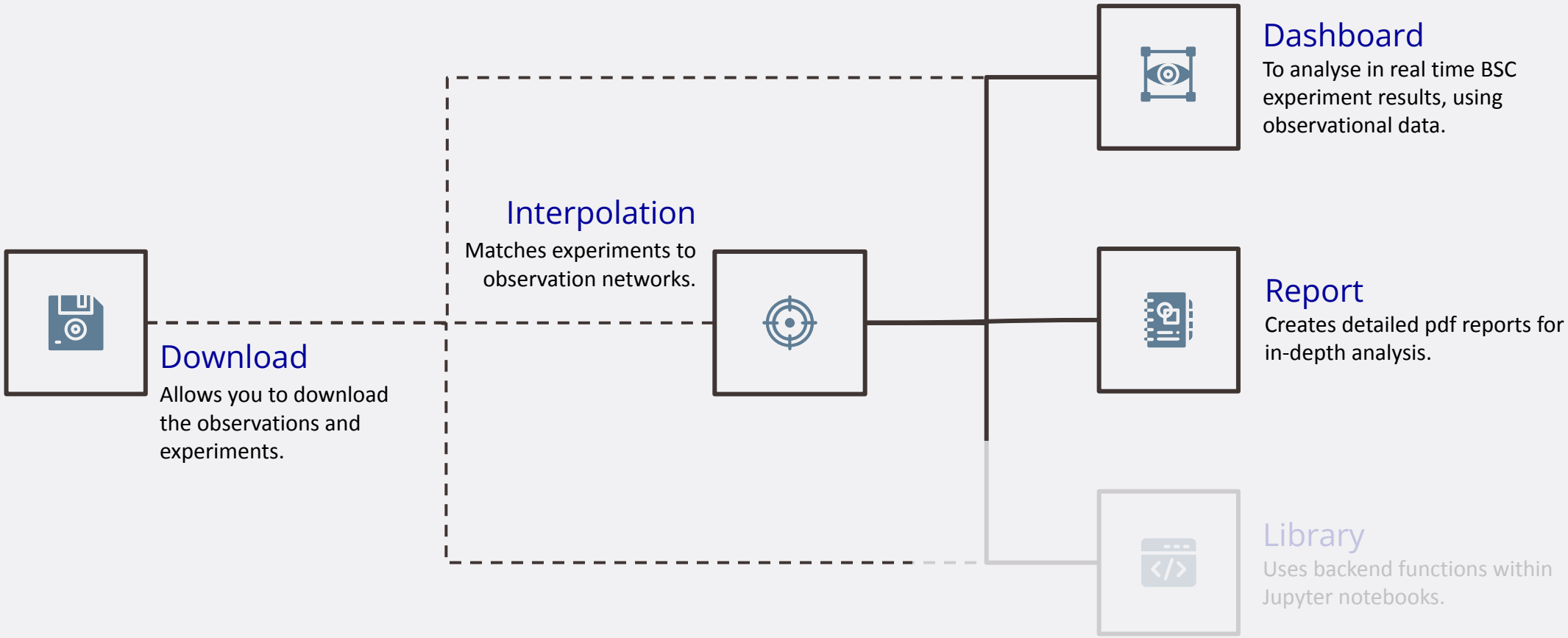

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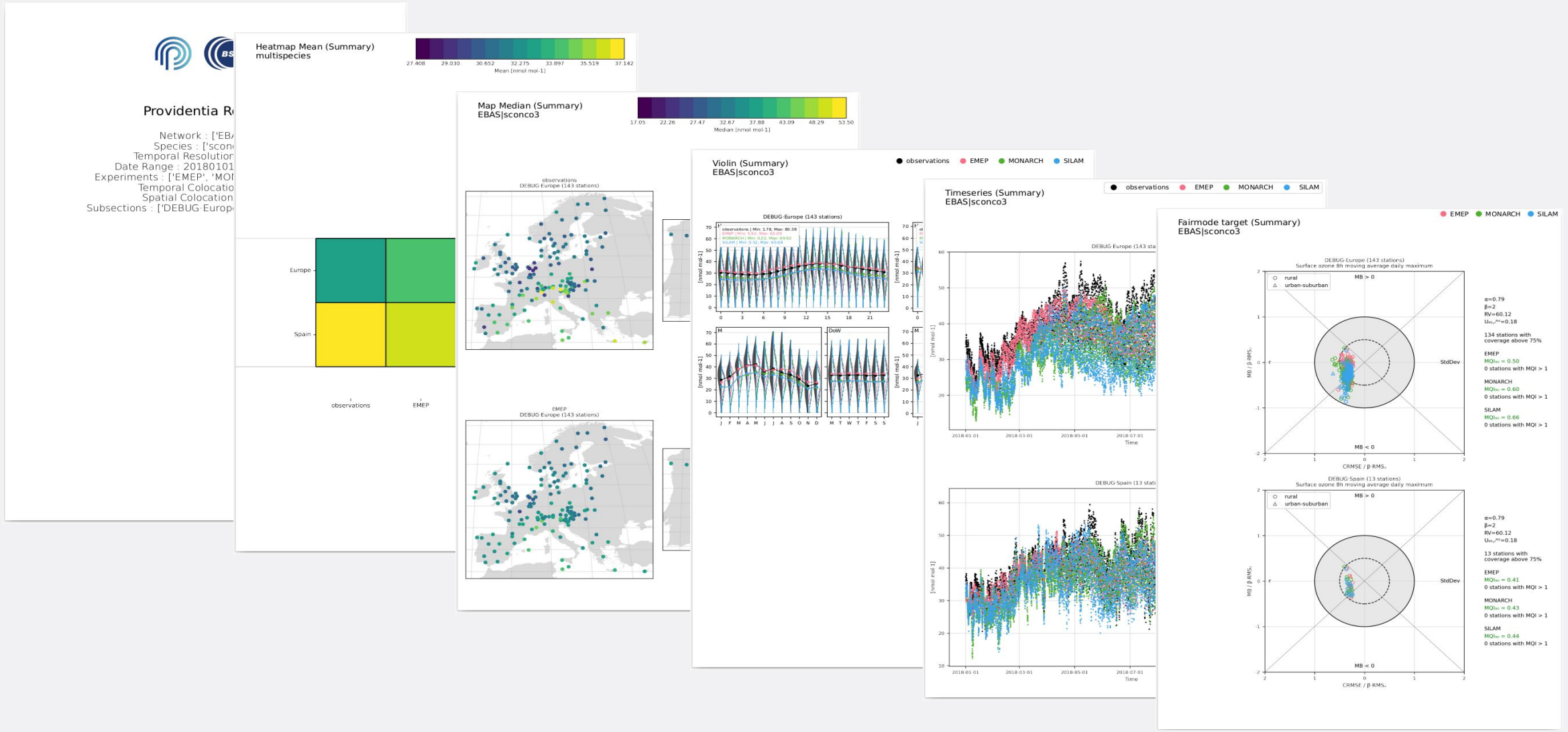
Providentia R
Network : ['EB
Species : ['scon
Temporal Resolutio
Date Range : 20180101
Experiments : ['EMEP', 'MO
Temporal Colocatio
Spatial Colocation
Subsections : ['DEBUG·Europ
Heatmap Mean (Summary)
multispecies
27.408 29.030 30.652 32.275 33.897 35.519 37.142
Mean [nmol mol-1]
Europe
Spain
observations
EMEP
Map Median (Summary)
EBAS|sconco3
17.05 22.26 27.47 32.67 37.88 43.09 48.29 53.50
Median [nmol mol-1]
observations
DEBUG·Europe (143 stations)
EMEP
DEBUG·Europe (143 stations)
Violin (Summary)
EBAS|sconco3
observations EMEP MONARCH SILAM
DEBUG·Europe (143 stations)
[nmol mol-1]
M
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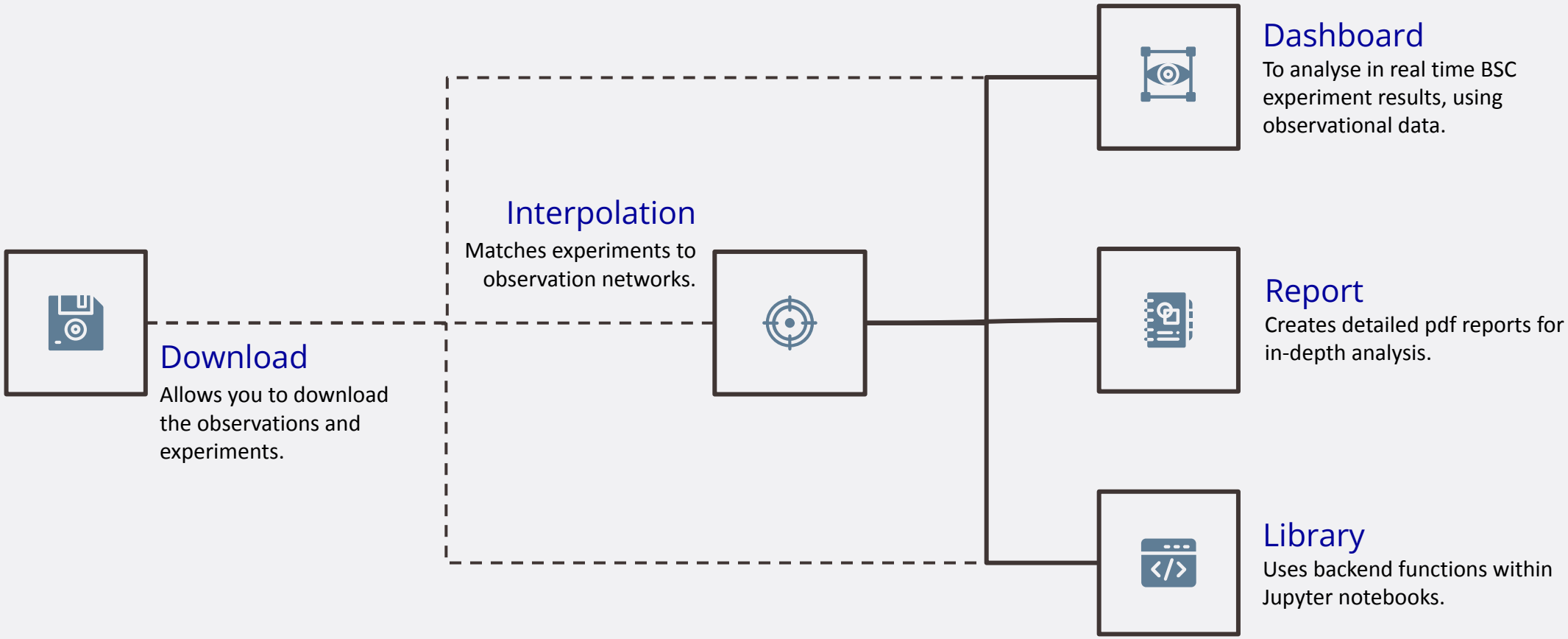
Timeseries (Summary)
EBAS|sconco3
observations EMEP MONARCH SILAM
DEBUG·Europe (143 sta
DEBUG·Spain (13 stati
2018-01-01
2018-03-01
2018-05-01
2018-07-01
Time
Fairmode target (Summary)
EBAS|sconco3
EMEP MONARCH SILAM
DEBUG·Europe (143 stations)
Surface ozone 8h moving average daily maximum
rural
urban-suburban
MB > 0
MB < 0
StdDev
MB / β·RMSₑ
CRMSE / β·RMSₑ
α=0.79
β=2
RV=60.12
Uₘₛ,ᴿᵛ=0.18
134 stations with coverage above 75%
EMEP
MQI₉₀ = 0.50
0 stations with MQI > 1
MONARCH
MQI₉₀ = 0.60
0 stations with MQI > 1
SILAM
MQI₉₀ = 0.66
0 stations with MQI > 1
DEBUG·Spain (13 stations)
Surface ozone 8h moving average daily maximum
13 stations with coverage above 75%
EMEP
MQI₉₀ = 0.41
0 stations with MQI > 1
MONARCH
MQI₉₀ = 0.43
0 stations with MQI > 1
SILAM
MQI₉₀ = 0.44
0 stations with MQI > 1

Structure



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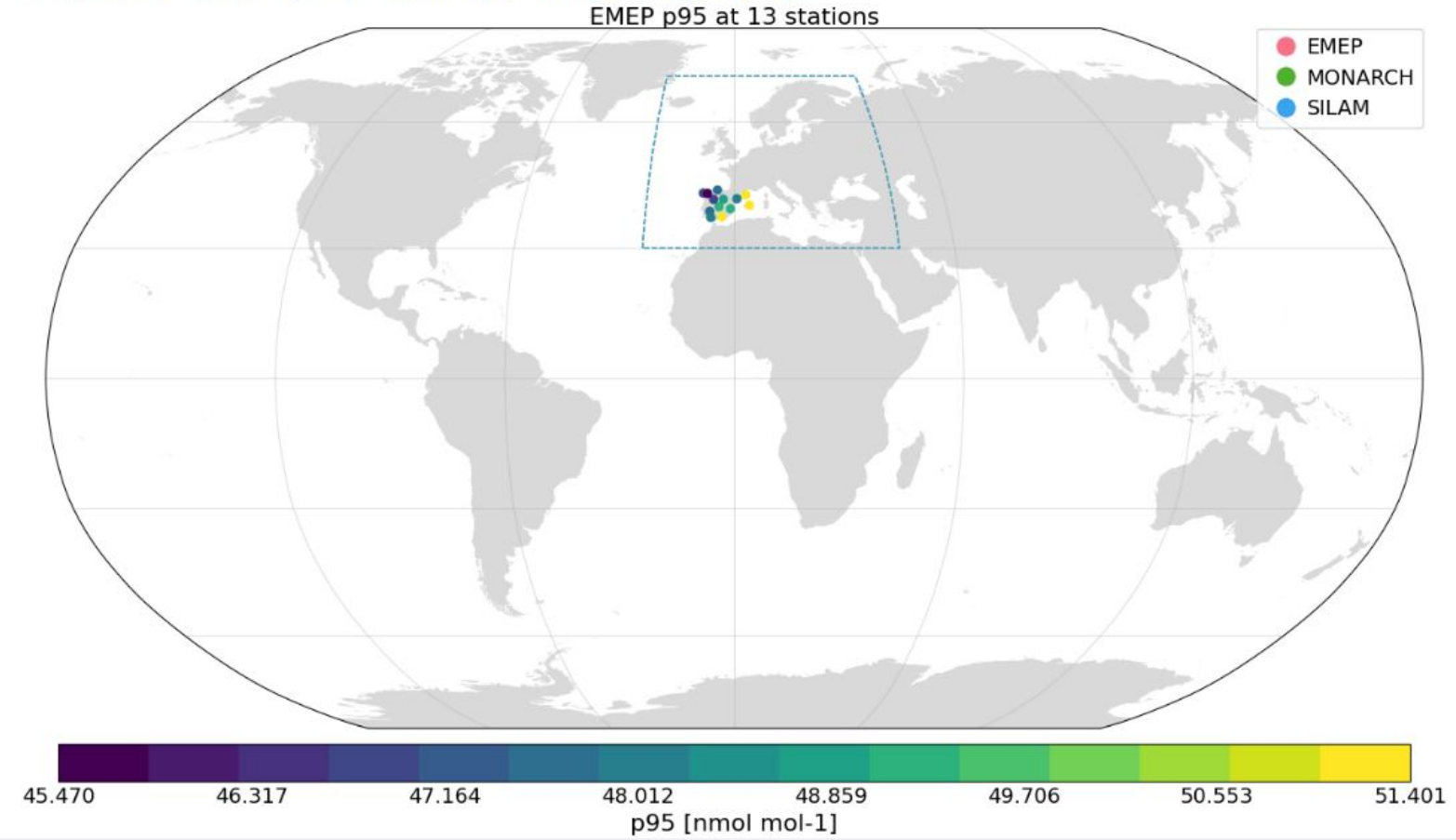
```
import providentia as prv
provi = prv.load("interactive_template.conf")
```

```
# make a map plot (p95 statistic)
provi.make_plot('map-p95', labela='EMEP', map_extent=[-180, 180, -90, 90], plot_options=['domain'])
```

```
Warning: Width and/or height have not been passed. The default values will be set.
Warning: More than 1 network or species defined, can only plot for 1 pair. Taking EBAS|sconco3.
```



ACTRIS

ACTRIS Configuration Setup

To use ACTRIS data in Providentia, you just need to set up a configuration file.

Section ([name])

Subsections ([[name]])

configurations/actris.conf

```
[ACTRIS]
framework = actris
species = sconco3
resolution = hourly
start_date = 20180101
end_date = 20190101
experiments = cams61_chimere_ph2-eu-000 (CHIMERE)
temporal_colocation = True
spatial_colocation = True
report_type = standard
report_summary = True
report_stations = False
report_filename = PROVIDENTIA_Report
report_title = Report

    [[Barcelona]]
    latitude = 39.8, 41.8
    longitude = 1.5, 2.5

    [[Spain]]
    longitude = -9.39, 3.04
    latitude = 35.945, 43.75
```

Download ACTRIS Data

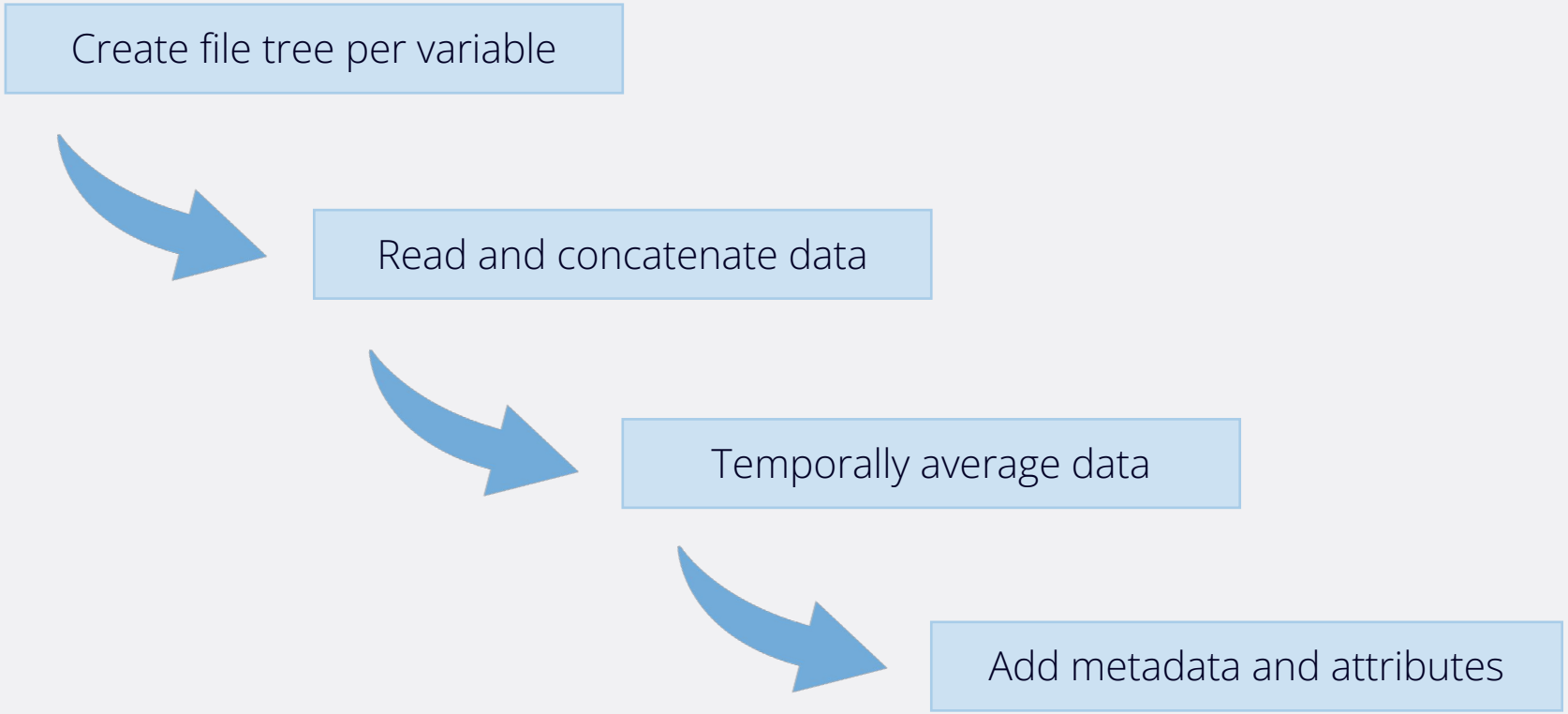
Using the download mode from Providentia, we can access Thredds (EBAS DOI in prod-actris-md.nilu.no) and retrieve the files to our machine in BSC format for the selected variable, resolution and period.

Once the config file is ready, downloading is simple. You run a single command:

```
./bin/providentia --config=your_configuration_name.conf --download
```

Providentia will automatically fetch the relevant ACTRIS data and begin formatting it.

Data Formatting



Demo

Launch the Tool

- Opening the dashboard:

```
./bin/providentia --config=your_configuration_name.conf
```

- Opening the jupyter notebook:

```
./bin/providentia --config=your_configuration_name.conf --notebook
```

- Creating reports:

```
./bin/providentia --config=your_configuration_name.conf --offline
```

- Interpolate the experiment to the observation:

```
./bin/providentia --config=your_configuration_name.conf --interpolation
```

Earth Sciences Department

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ACTRIS Data Centre

Thank you for your attention!

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

ACTRIS