Euroargodev *Cheat Sheet*

argopy 0.1.15

Join the community at github.com/euroargodev/argopy

Fetching Argo data — API

Import the data fetcher, select an access point (region, float or profile) and trigger data or index download:

A basic example

```
from argopy import DataFetcher

fetcher = DataFetcher().region([-75, -45, 20, 30,
                                0, 100,
                                '2011-01',
                                '2011-06'])
fetcher = DataFetcher().float([6902746, 6902755])
fetcher = DataFetcher().profile(6902746, [1,12])

fetcher.to_xarray()
fetcher.to_dataframe()
fetcher.data
fetcher.index
```

User modes — API

argopy provides 3 user modes with different level of data post-processing:

- **expert** mode: return all the Argo data, without any post-processing,
- **standard** mode: simplifies the dataset, remove most of its jargon and return a priori good data, namely: QC=[1,2] & DM=[R,D,A]. This is the default mode.
- **research** mode: simplifies the dataset to its heart, preserving only data of the highest quality for research studies, including studies sensitive to small pressure and salinity bias (e.g. calculations of global ocean heat content or mixed layer depth), namely: QC=1 & DM=D.

Full session

```
import argopy
argopy.set_options(mode='expert')
```

Temporary context

```
with argopy.set_options(mode='expert'):
  DataFetcher().profile(6902746, 34)
```

Fetcher option

```
DataFetcher(mode='research').region([-75, -45,
                                     20, 30,
                                     0, 100])
```

Data manipulation — API

Use methods from the **argo** xarray accessor

Transformation

```
# Points vs profiles
ds.argo.point2profile()
ds.argo.profile2point()

# Interpolation (pressure levels)
std = [0,100,200,500]  # in db
ds.argo.interp_std_levels(std)

# Group-by pressure bins
b = np.arange(0., 2000., 250.0)  # in db
ds.argo.groupby_pressure_bins(bins=b,
                              select='deep')
ds.argo.groupby_pressure_bins(bins=b,
                              select='random')
```

Filters

```
# QC flags
ds.argo.filter_qc(QC_list=[1,2],
                  QC_fields='all')
ds.argo.filter_qc(QC_list=1,
                  QC_fields='PSAL')

# Data modes
ds.argo.filter_data_mode()

# OWC variables
ds.argo.filter_scalib_pres(force='default')
```

Additional variables

Complete your dataset with additional variables using the TEOS-10

```
ds.argo.teos10(['SA', 'CT', 'CNDC'])
```

Dataset — API

argopy provides 2 data sources for physical ("phy") and biogeochemical ("bgc") parameters

Data sources — API

argopy allows users to fetch Argo data from several sources:

- the **Ifremer erddap**. Updated daily, this database holds the complete dataset and is efficient for large requests
- a **GDAC server**. This could be one of the 2 ftps or the Ifremer http server.
- your **local data** copy of the GDAC. Useful to work offline.
- the **Argovis** server. Updated daily, provides access to QC=1 data only

Full session

```
import argopy
argopy.set_options(src='gdac',
                   ftp='https://...')
```

Temporary context

```
with argopy.set_options(src='argovis'):
  DataFetcher().profile(6902746, 34)
```

Fetcher option

```
DataFetcher(src='erddap')
```

Argo meta data — API

Index of profiles

Based on GDAC servers or local file, support: core, synthetic and bio profiles index

```
from argopy import ArgoIndex
ArgoIndex().N_RECORDS
ArgoIndex().to_dataframe()
ArgoIndex().search_lat_lon([-60, -55, 40, 45])
ArgoIndex().search_wmo([1901393, 6902755])
```

For a more user-friendly API, you can use the index fetcher:

```
from argopy import IndexFetcher
fetcher=IndexFetcher().region([-75, -45, 20, 30])
fetcher.to_xarray()
fetcher.to_dataframe()
fetcher.index
```

Reference tables

Based on NERC Vocabulary Server (NVS) managed by the Argo Vocabulary Task Team (AVTT)

```
from argopy import ArgoNVSReferenceTables
ArgoNVSReferenceTables().tbl_name('R01')
ArgoNVSReferenceTables().tbl('R01')
ArgoNVSReferenceTables().all_tbl_name
ArgoNVSReferenceTables().all_tbl
ArgoNVSReferenceTables().search('sensor')
```

Deployment plan

Based on Ocean-OPS API, retrieve past and future plans

```
from argopy import OceanOPSDeployments
OceanOPSDeployments().to_dataframe()
OceanOPSDeployments([-90, 0,
                     0, 90]).to_dataframe()
OceanOPSDeployments().plot_status()
```

ADMT Documentation

```
from argopy import ArgoDocs
ArgoDocs().list
ArgoDocs(35385)
ArgoDocs(35385).open_pdf(page=12)
ArgoDocs().search('CDOM')
```

Data visualisation

API

From a Data or Index fetcher

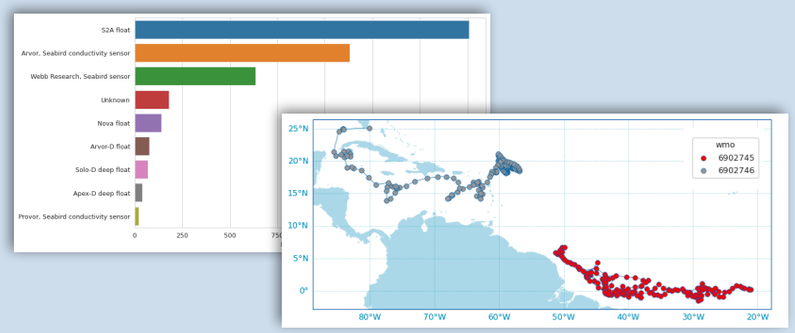
```
from argopy import DataFetcher, IndexFetcher
fetcher = DataFetcher()  # or IndexFetcher()
fetcher.region([-75, -45, 20, 30, 0, 100,
                '2015-01', '2020-01']).load()
```

Trajectories

```
fetcher.plot()
fetcher.plot('trajectory')
```

Histograms on properties

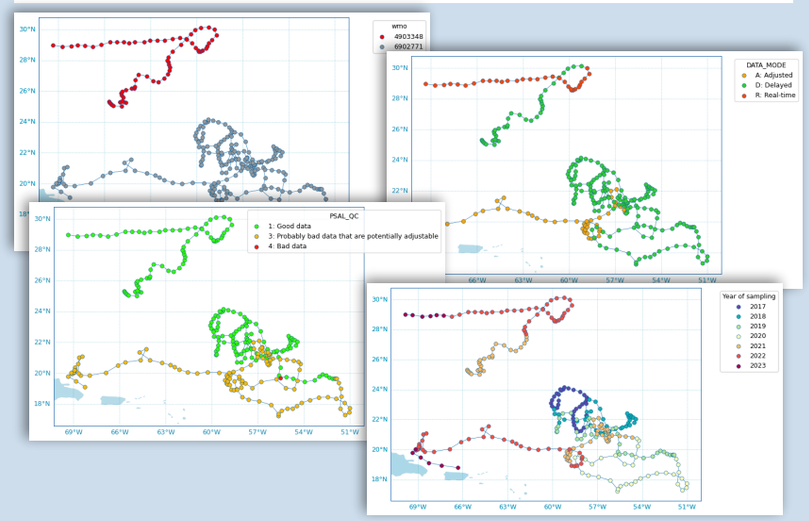
```
fetcher.plot('dac')
fetcher.plot('profiler')
```



Scatter maps from Datasets

```
from argopy.plot import scatter_map
scatter_map(ds)
scatter_map(ds, hue='DATA_MODE')
scatter_map(ds.isel(N_LEVELS=0), hue='PSAL_QC')

ds['year'] = ds['TIME.year']  # Add a variable
scatter_map(ds.isel(N_LEVELS=0),
            hue='year',
            cmap='Spectral_r',
            legend_title='Year of sampling')
```



Dashboards

For a collection of floats or profiles, get an easy and direct access to Euro-Argo, BGC, Ocean-Ops, Coriolis and Argovis dashboards

From a fetcher

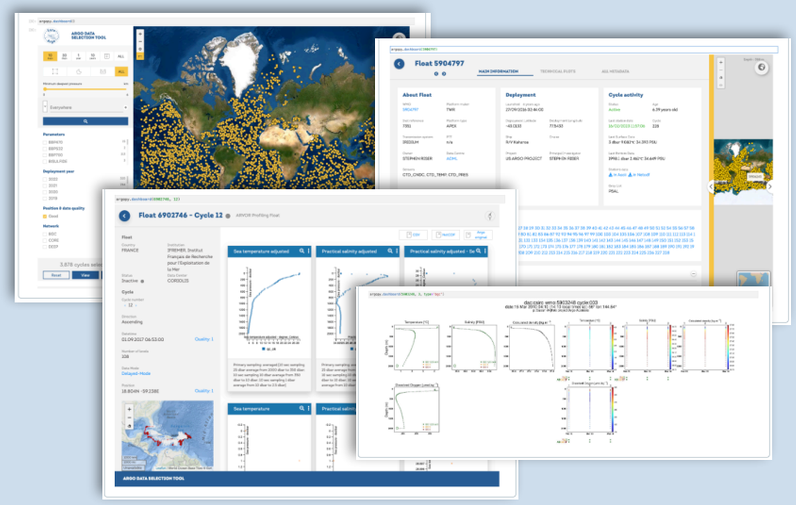
```
DataFetcher().float(6902746).dashboard()
```

or direct access

```
from argopy import dashboard
dashboard()
dashboard(6902746)

dashboard(6902746, 12)
dashboard(5903248, 3, type='bgc')
```

By default, this will insert the dashboard in a notebook cell, but it can also return the url to open in your browser.



Argo color palettes

```
from argopy.plot import ArgoColors
ArgoColors('data_mode')
ArgoColors('qc_flag')
ArgoColors('deployment_status')
```

Quality control flag scale

Names: qc, qc_flag, quality_control, quality_control_flag, quality_control_flag_

0	No QC performed
1	Good data
2	Probably good data
3	Probably bad data that are potentially adjustable
4	Bad data
5	Value changed
6	Not used
7	Not used
8	Estimated value
9	Missing value

Argo Data-Mode

Names: data_mode, datamode, dm

R	Real-time
A	Adjusted
D	Delayed

Deployment status

Names: deployment_status, deployment_code, deployment_id, ptfstatus.id, ptfstatus, status_code

0	PROBABLE
1	CONFIRMED
2	REGISTERED
6	OPERATIONAL
4	INACTIVE
5	CLOSED

Data quality control

API

Topography

Download a regional subset of the GEBCO 15'' topography

```
from argopy import TopoFetcher
ds = TopoFetcher([-65, -55, 10, 20],
                 cache=True).to xarray()
```

CLS Altimetry tests

Easily checkout CLS altimetry test figures for one or more floats

```
from argopy import DataFetcher
fetcher.float([6902745,
               6902746])
fetcher.plot('qc_altimetry')
```

Data sources for OWC

Prepare Matlab data source files for the OWC analysis.

```
from argopy import DataFetcher
ds = DataFetcher(mode='expert')
     .float(6902766)
     .load().data
ds.argo.create_float_source('output_folder')
```

Reference data for core

Using the Ifremer erddap, argopy provides access to the core reference dataset from past Argo profiles as well as from ship-based CTD

Argo reference profiles

```
fetcher = Datafetcher(src='erddap', ds='ref')
fetcher.region([-65, -55, 10, 20,
                0, 5000]).load()
ds = fetcher.data
```

Ship-based reference CTD profiles

```
from argopy import CTDRefDataFetcher
with argopy.set_options(user='jane_doe',
                        password='****'):
    fetcher = CTDRefDataFetcher([-65, -55,
                                 10,  20,
                                  0, 5000])
    ref_ctd = fetcher.to_xarray()
```

argopy

Argopy Cheatsheet

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