Towards an **I**mproved **E**stimation of **O**cean **H**eat **F**lux

Data & Tools

Work Packages: 2, 3, 5

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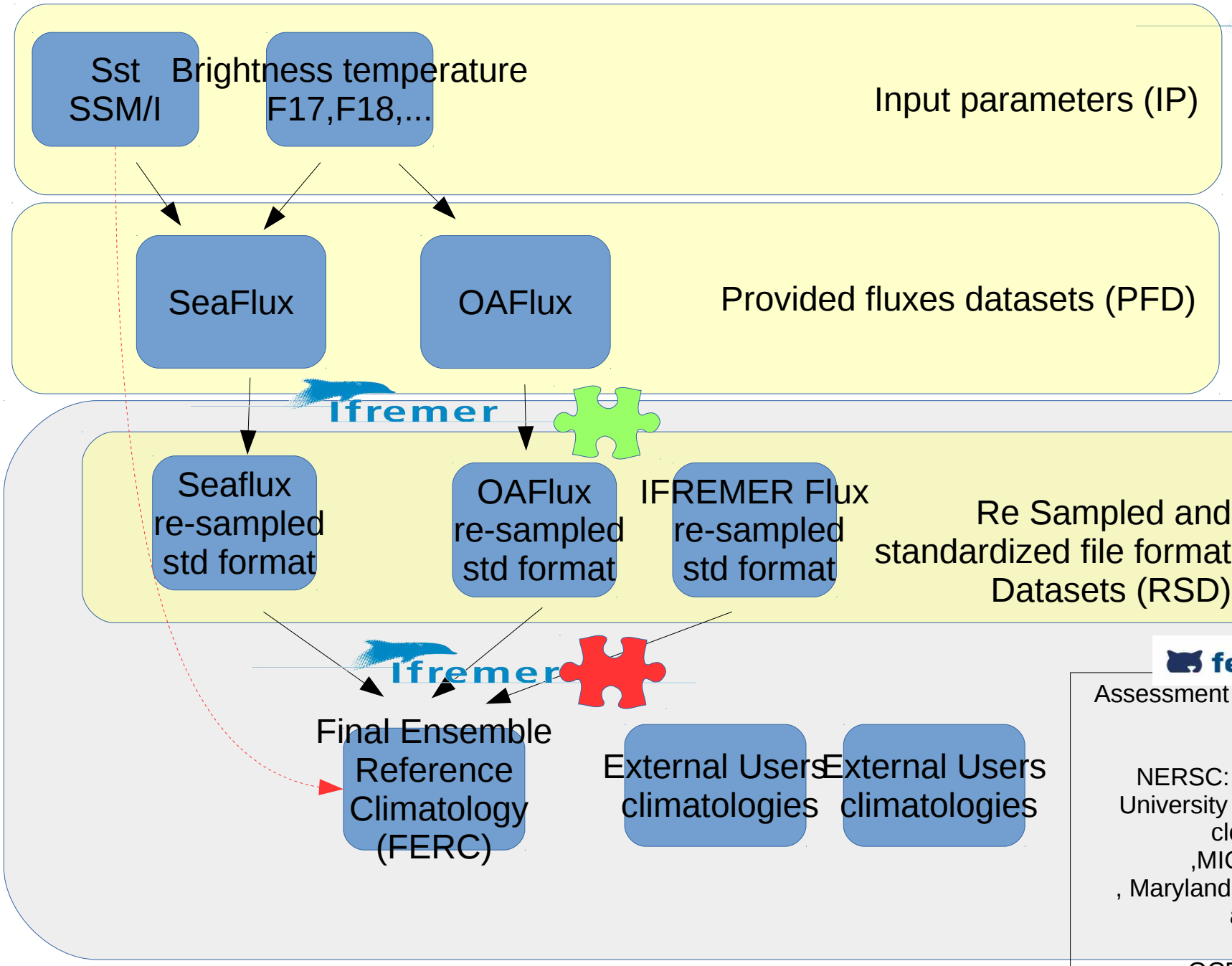
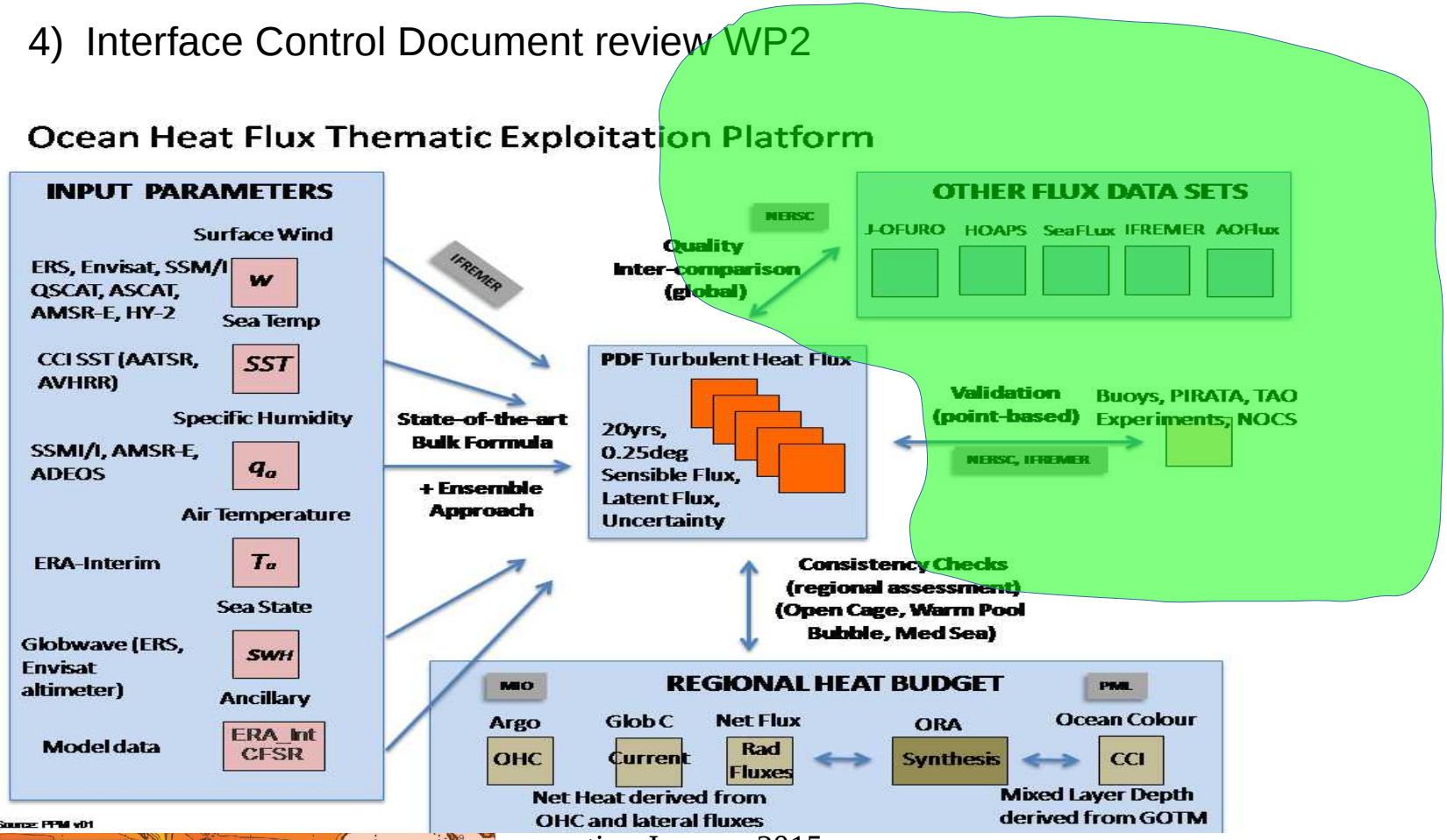


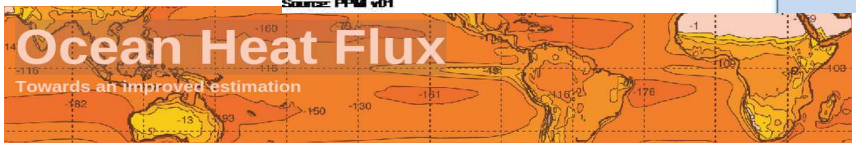
felyx

Assessment performed by metrics from
PML
NERSC: triple collocations
University of Reading: budget closure cage
,MIO: cage OHC
, Maryland University: process approach
WHOI:?
OCEAN.RU: PDF
IFREMER collocations

Outline

1) Homogenisation of flux dataset WP2+WP3
2) Collocation flux / buoys WP3
3) Data portal WP3+WP5
4) Interface Control Document review WP2



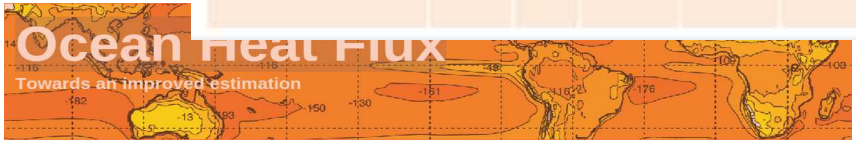


meeting January 2015

Homogenisation of flux data sets WP32

- Why do we need homogeneous flux datasets?

	Wsp	Qa	SST	Ta	τ	LHF	SHF	LW	SW	Period	Spatial Resolution	Temporal Resolution	Format
IFREMER	X	X	X	X	X	X	X			1999 – 2009	0.25°×0.25°	Daily	NetCdf
HOAPS	X	X	X	X		X	X	X	X	1987 - 2008	0.5°×0.5°	6-hourly and Monthly	NetCdf
OAFLux	X	X	X	X		X	X	X	X	1985 - 2014	1°×1°	Daily	NetCdf
SEAFLUX	X	X	X	X		X	X			1998 - 2007	0.25°×0.25°	3-hourly	Binary
J-OFURO	X	X			X	X	X			1988 - 2008	1°×1° 0.25°×0.25°	Daily Monthly	NetCdf
ERA Interim	X	X	X	X	X	X	X	X	X	1992 - 2012	0.75°×0.75°	6-hourly	Grib
CFSR	X	X	X	X	X	X	X	X	X	1992 - 2010	0.38°×0.38°	6-hourly	Grib
NOCS2	X	X	X	X		X	X			1992 – 2010	1°×1°	Daily Monthly	NetCdf



Homogenisation of flux data sets WP32

- Standards
  - Spatial resolution: 1°x1°
  - Temporal coverage: as much as source dataset provides (most of the case 1999-2009)
  - Temporal resolution: daily centred on mid-day
  - Spatial coverage: Global ocean (-80° 80° 180° -180°) centred on Greenwich
  - Ice Mask : IFREMER YYYYMMDD-EUR-L4HRmask-GLOB-v02-fv01-ODYSSEA.nc
  - Attributes names

Method of re sampling:
Weighted mean or interpolation

- long_name
- Units
- valid_min
- valid_max
- scale_factor
- add_offset
- _FillValue
- missing_value

Homogenisation of flux data sets WP32

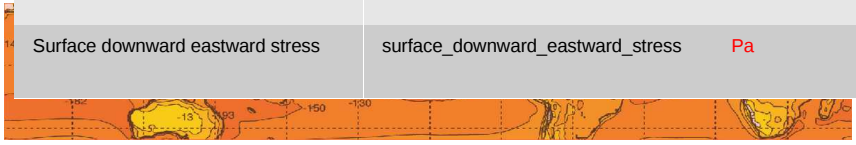
- Standards
  - Dimensions names
  - Files sorting

```
FEATURE : Grid
DIMENSIONS :
  .  time
  .  y
  .  x
GEOLOCATION :
  .  lat
       + dimensions :    OrderedDict([('y', 180)])
  .  lon
       + dimensions :    OrderedDict([('x', 360)])
  .  time
       + dimensions :    OrderedDict([('time', 1)])
DATA :
  .  upward_net_heat_flux
       + dimensions :    OrderedDict([('time', 1), ('y', 180), ('x', 360)])
```

```
standardized_flux_data/
└── OAFLUX
    └── upward_net_heat_flux
        └── 2009
            ├── 001
            │   └── 20090101120000-OHF-L4-upward_net_heat_flux-OAFLUX-global_daily_1x1-v0.1-f01.0.nc
            ├── 002
            │   └── 20090102120000-OHF-L4-upward_net_heat_flux-OAFLUX-global_daily_1x1-v0.1-f01.0.nc
            ├── 003
            │   └── 20090103120000-OHF-L4-upward_net_heat_flux-OAFLUX-global_daily_1x1-v0.1-f01.0.nc
            ├── 004
            │   └── 20090104120000-OHF-L4-upward_net_heat_flux-OAFLUX-global_daily_1x1-v0.1-f01.0.nc
            ....
```

Parameter name	Variable name in netCDF file produced in OHF (cfconvention.org + COARDS convention)	units	description	attributes	datasets
Atmosphere Cloud condensed water content	atmosphere_cloud_condensed_water_content	kg.m-2			HOAPS,
Atmosphere Water vapour content	atmosphere_water_vapor_content	kg.m-2			HOAPS
Water evaporation flux	water_evaporation_flux	mm.d-1 or kg.m-2.s-1			HOAPS, oaflux
Precipitation (rain)	precipiration_volume	mm.d-1			HOAPS
Surface upward Fresh water flux	surface_upward_fresh_water_flux	mm.d-1			HOAPS
Latent heat flux (upward)*	surface_upward_latent_heat_flux	W.m-2			HOAPS, oaflux, j-ofuro, seaflux,ifremer
Net heat flux	net_heat_flux	W.m-2			oaflux, j-ofuro
Sensible heat flux (upward)*	surface_upward_sensible_heat_flux	W.m-2			HOAPS, oaflux, j-ofuro, seaflux,ifremer
Long wave net flux (upward)	long_wave_upward_net_radiative_flux	W.m-2	daily mean net surface fullsky longwave radiation flux, positive upward		HOAPS, oaflux
Short wave net flux (downward)	short_wave_downward_net_radiative_flux	W.m-2	daily mean net surface fullsky shortwave radiation flux, positive downward		oaflux
Latent heat transfer coefficient	latent_heat_transfert_coefficient	dimensionless		parameterization: C.W.Fairall et al., J.Geophys.Res.; 1996; Vol 101; No C2; 3747-3764	HOAPS
Sea surface specific humidity	sea_surface_specific_humidity	Kg/kg		Bentamy et al.; Journal of Climate; 2003; Vol 16; 637-656; formula 3	HOAPS, j-ofuro, seaflux, ifremer
Air surface specific humidity	air_surface_specific_humidity	g/Kg			HOAPS, oaflux, j-ofuro, seaflux
Sea air specific humidity difference*	sea_air_specific_humidity_difference	g/kg	Sea Surface Saturation Specific Humidity - Specific Air Humidity		Seaflux,HOAPS
Sea surface temperature	sea_surface_temperature	Degree Kelvin (GHRSST convention)		Depth (skin, subskin, ?) TDB	HOAPS, oaflux, seaflux, ifremer
Air temperature	air_temperature	Degree Celsius		Level TBD	oaflux,seaflux, ifremer
Sea air temperature difference		Degree Celsius			seaflux
Wind speed	wind_speed	m.s-1	Wind speed module		HOAPS, oaflux, j-ofuro, seaflux, ifremer
Northward Wind	northward_wind	m.s-1			HOAPS, oaflux, j-ofuro, seaflux, ifremer
Eastward Wind	eastward_wind	m.s-1			HOAPS, oaflux, j-ofuro, seaflux, ifremer
Wind stress	wind_stress	Pa			J-ofuro, ifremer
Surface downward northward stress	surface_downward_northward_stress	Pa			ifremer
Surface downward eastward stress	surface_downward_eastward_stress	Pa			ifremer

Red = need to be discuss



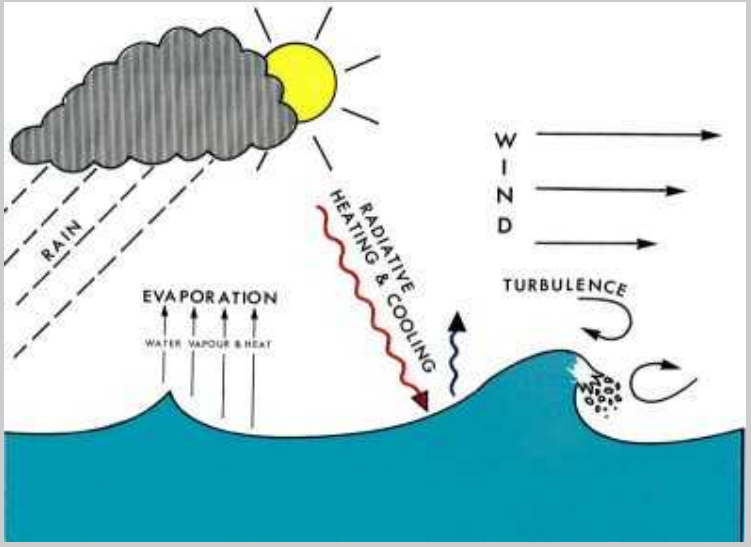
Homogenisation of flux data sets WP32

- Status:
  - Some standardized sample files for OAFLUX (net_heat_flux) available ✓
  - No ice mask applied ✓
  - Averaging/interpolating data not tested ✓
  - High-pass filter for interpolation not tested ✓
  - Need agreement on variable names ✓

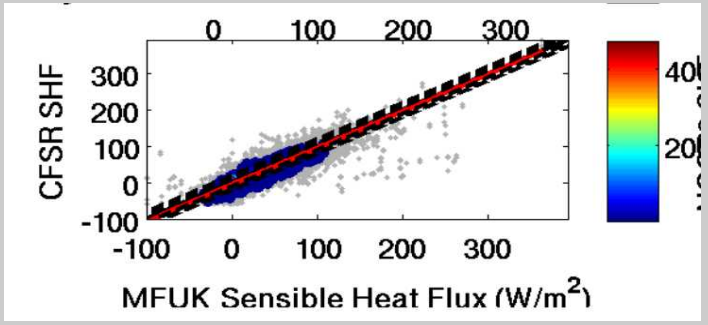

Ocean Heat Flux
Towards an improved estimation

Collocation flux / in situ data

- Why do we need collocations between buoys and flux datasets?

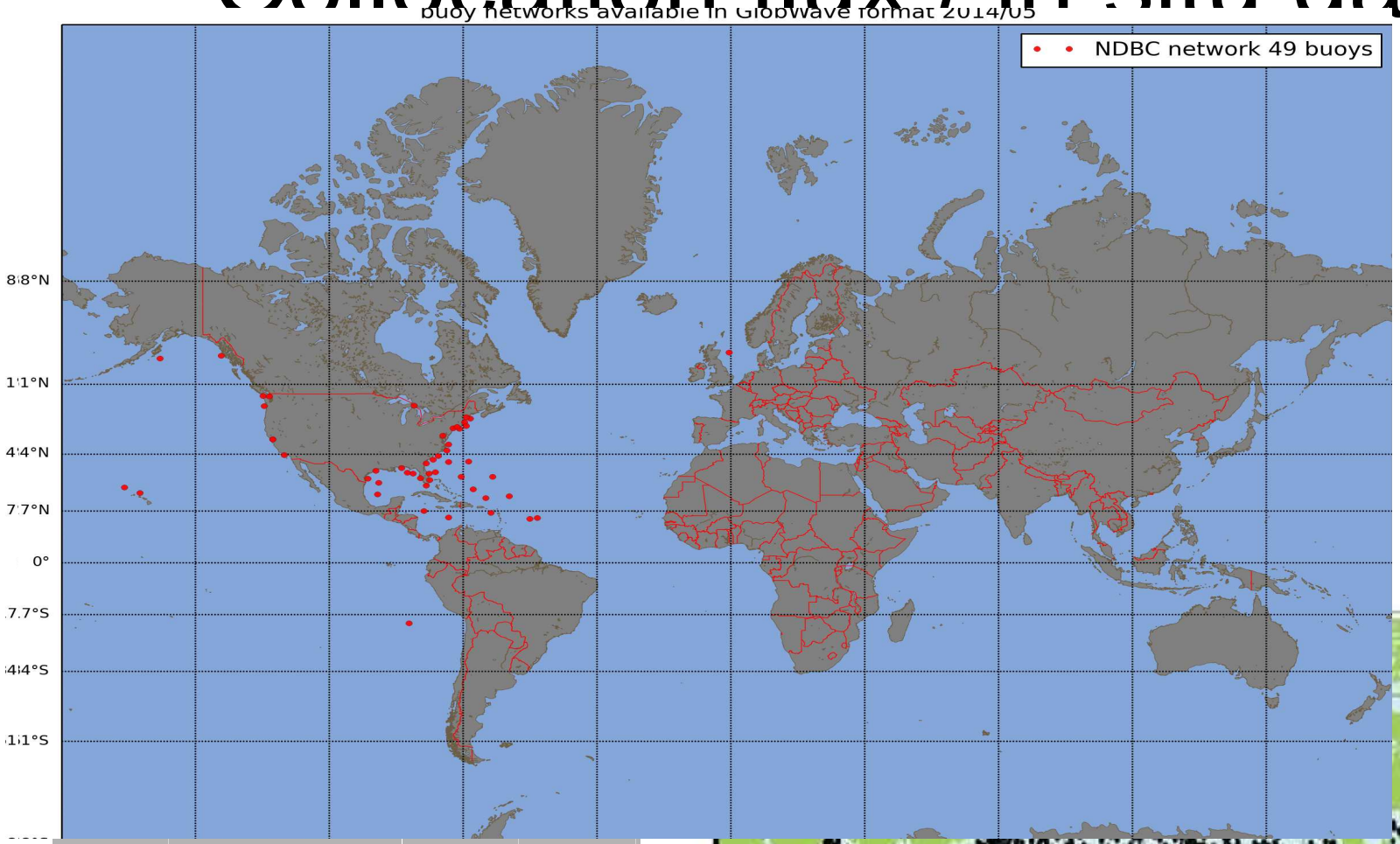


Case studies



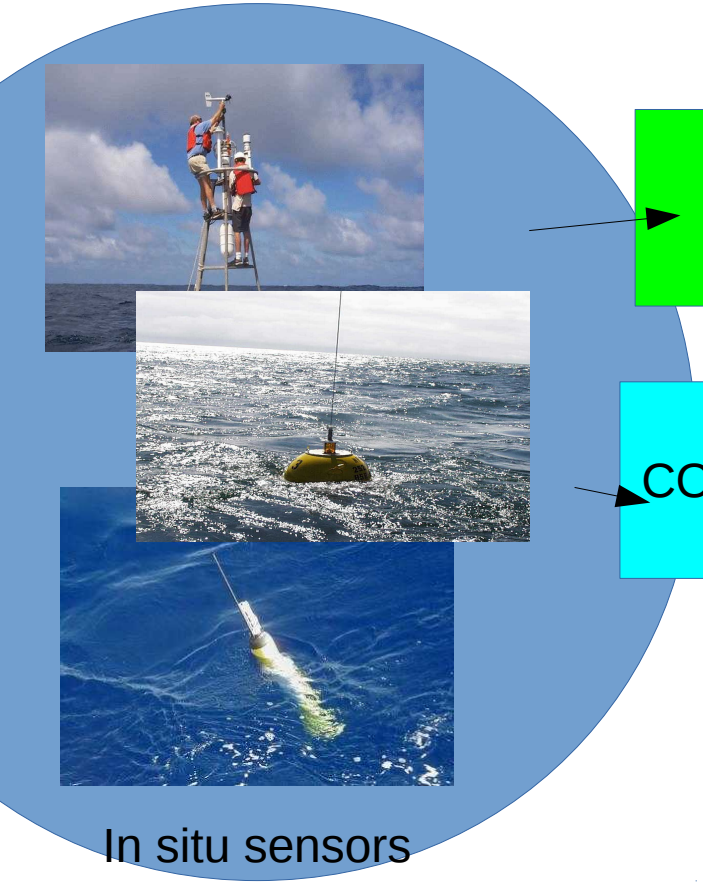
Inter-comparison WP51

Collocation flux / in situ data



	HOAPS	IFREMERFLUX	OAFLUX	SEAFLUX
NDBC				
CORIOLIS				

Where in situ data come from?



In situ sensors

NDBC

Ndbc netCDF format

GlobWave netCDF format

CORIOLIS

CORIOLIS netCDF format

GlobWave netCDF format

Quality control

Collocation flux/in situ buoys

- Buoys parameters mandatory for collocation:
  - Relative humidity (or dew point temperature)
  - Wind_speed
  - Sea_surface_temperature
  - Air_temperature
- Additional buoys parameters copied in collocation files (if present)
  - Current
  - Precipitation
  - Radiative fluxes
  - Sea state

Collocation flux/ *in-situ* buoys
files sorting

```
└── colocation
    ├── 2003
    │   ├── 102
    │   ├── 103
    │   ├── 104
    │   │   ├── air_temperature
    │   │   └── sea_surface_temperature
    │   │       ├── era-interim
    │   │       ├── hoaps
    │   │       ├── ifremerflux
    │   │       ├── j-ofuro
    │   │       ├── oaflux
    │   │       └── seaflux
    │   │           ├── coriolis
    │   │           └── ndbc
    │   │               └── tie-ohf-matchups_20030414_seaflux_ndbc_sea_surface_temperature.nc
    │   └── 105
    ├── 2004
    └── 2005
```

- What if there are collocations with a buoys with 3-hourly data?

All data from buoys within a day are copied

- Spatial window: 100km radius grid point
- Temporal window: ±12hours

+ plot argo

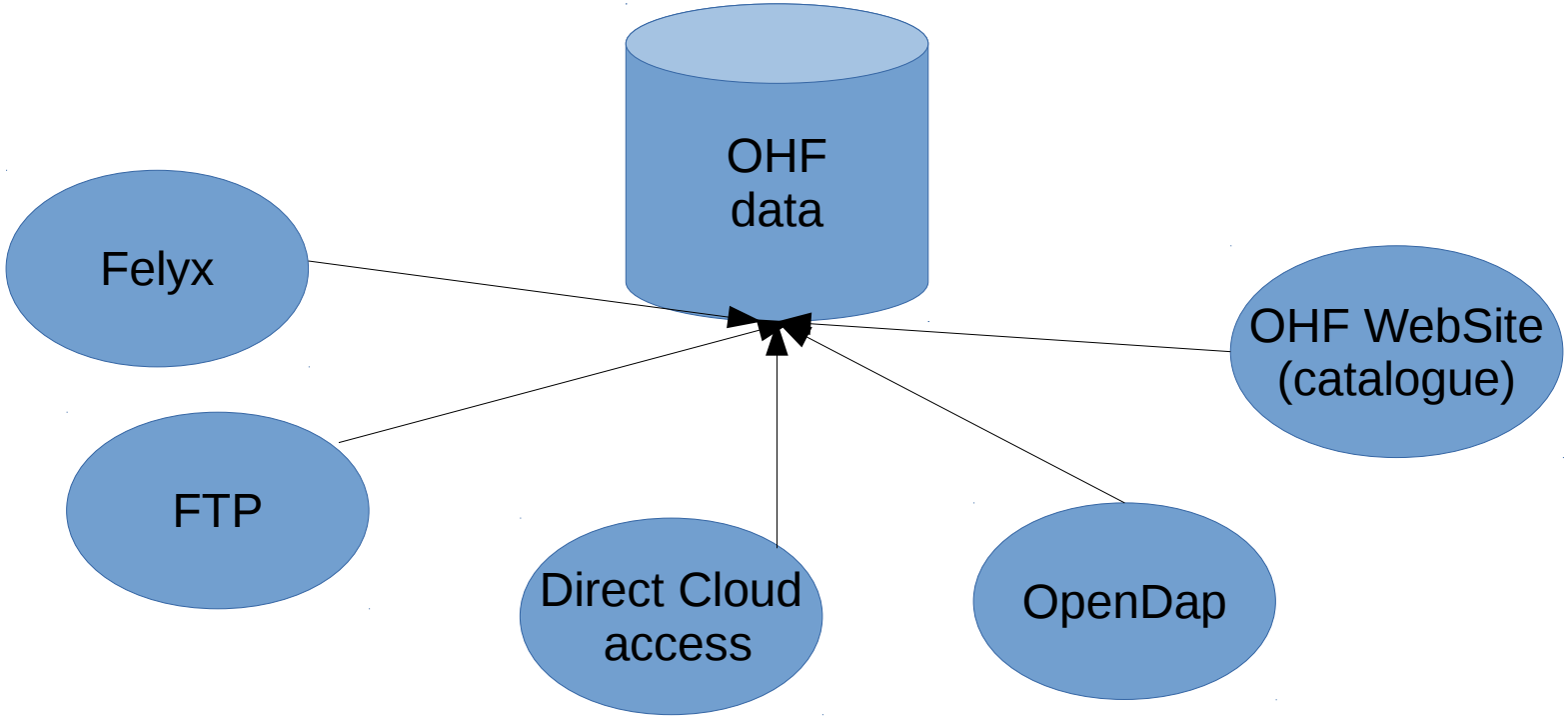
Collocation flux/in situ data

- Status:
  - Python tool already available (Pathfinders Ocean Acidification) ✓
  - Tuning to get all historic from a buoy within the day ✓


Ocean Heat Flux
Towards an improved estimation

Data portal (WP5 + WP34)

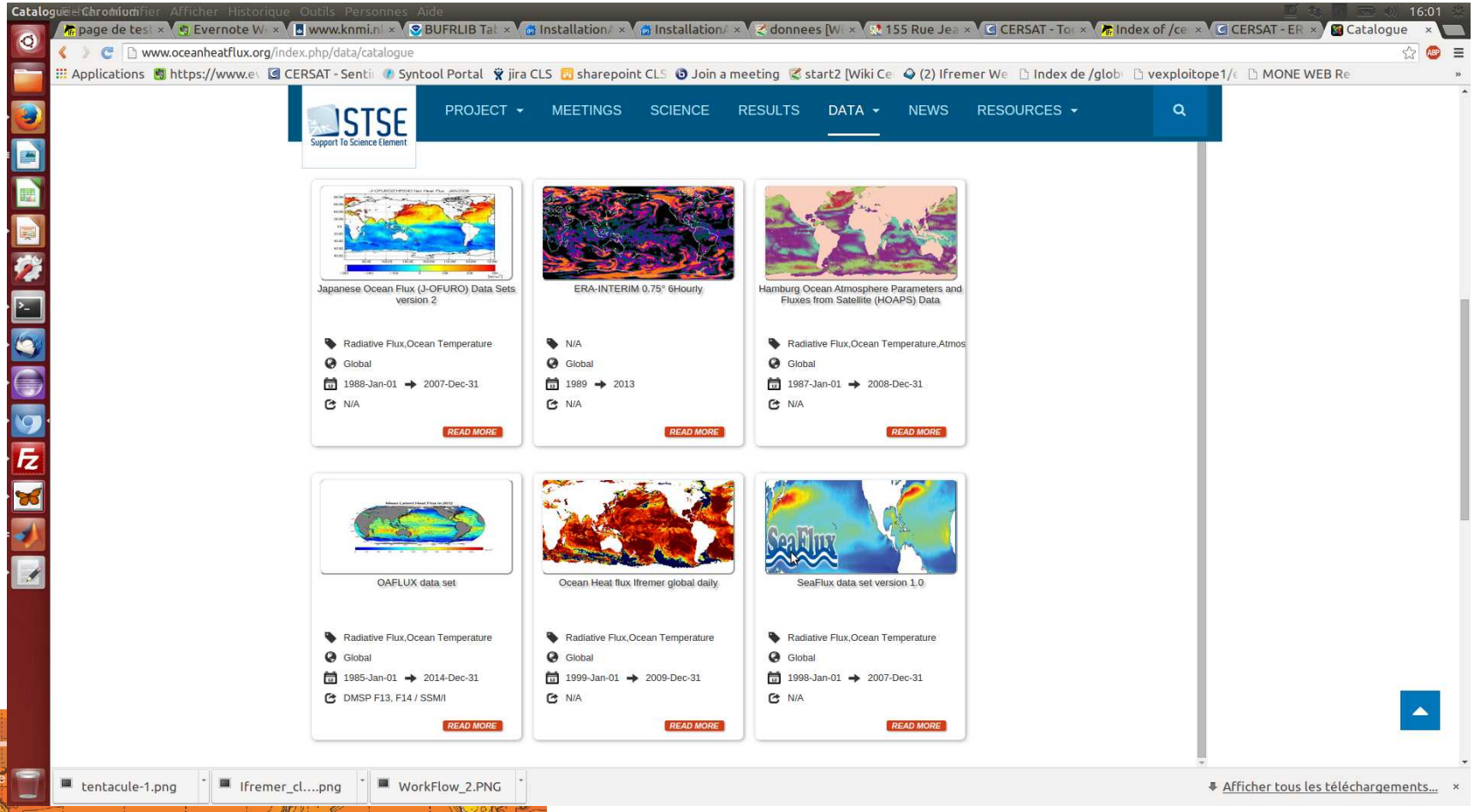
- What is the data portal?
  - All the way available to access OHF data



Data portal (WP5 + WP34)

Catalogue of data available on website (WP31):
http://oceanflux.cersat.fr/index.php/data/catalogue

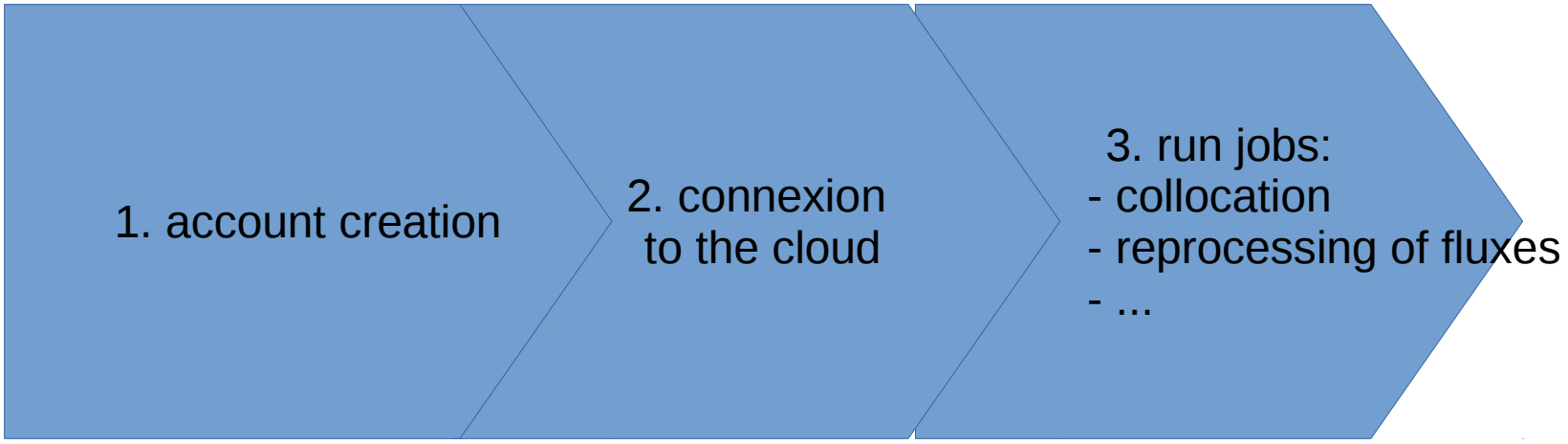
- Ftp access: ftp://o1ef56:DeJd6uNv@eftp.ifremer.fr/



Data portal (WP5 + WP34)

- ftp is ok but
  - you don't want to download the datasets?
  - You need fast solution to process thousands of files?
- → You can use IFREMER cloud to process the data.

How to access data on IFREMER cloud

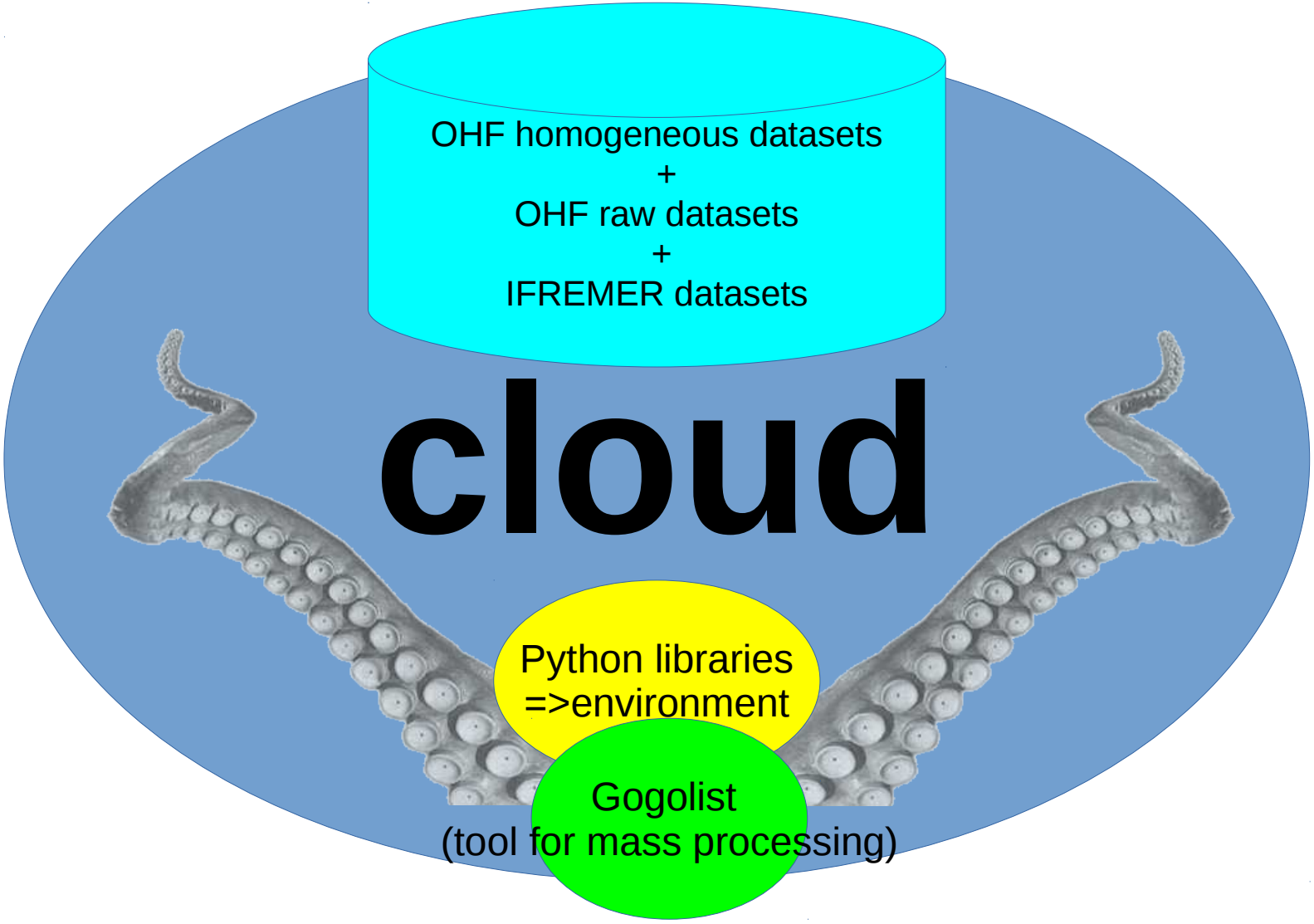


How to connect to IFREMER cloud

Creation of account:
http://forms.ifremer.fr/los/cersat-cloud-account-creation-form/

```
>ssh vepoceanflux.ifremer.fr
Welcome to Ubuntu 12.04.1 LTS (GNU/Linux 3.2.0-27-generic x86_64)

 * Documentation:  https://help.ubuntu.com/

842 packages can be updated.
469 updates are security updates.

New release '14.04.1 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

Last login: Thu Jan 22 14:33:51 2015 from br152-187.ifremer.fr
br156-149:
```

How to run jobs on IFREMER cloud




Ocean Heat Flux
Towards an improved estimation

Synergy with other ESA projects WP27

Distributed mass Processing tool

Homogeneous insitu database

Specific tool to get matchups with Argo

Felyx

OceanFlux GHG

Flux datasets + climatologies

OceanHeatFlux (tie-ohf)

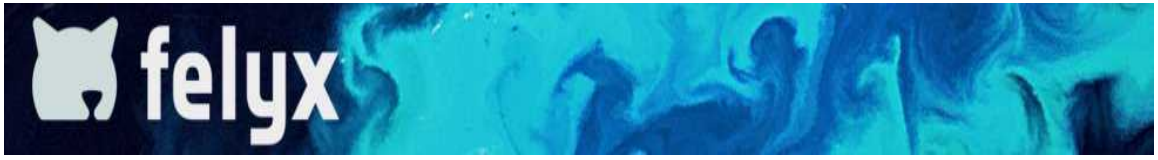
Inter comparison Sub-setting visualizing tool

Collocations tools
Re sampling tool
Earth Observations files read/write tool

Data visualisation Demo WP52

- Felyx tool: http://felyx.cersat.fr

  free, open source, software system to support cal/val activities




Ocean Heat Flux
Towards an improved estimation

Interface Control Document WP22

Review of ICD

http://www.oceanheatflux.org/index.php/magazine/documents

Questions?