Remote processing of OceanFlux climatology on Nephelae

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Outline

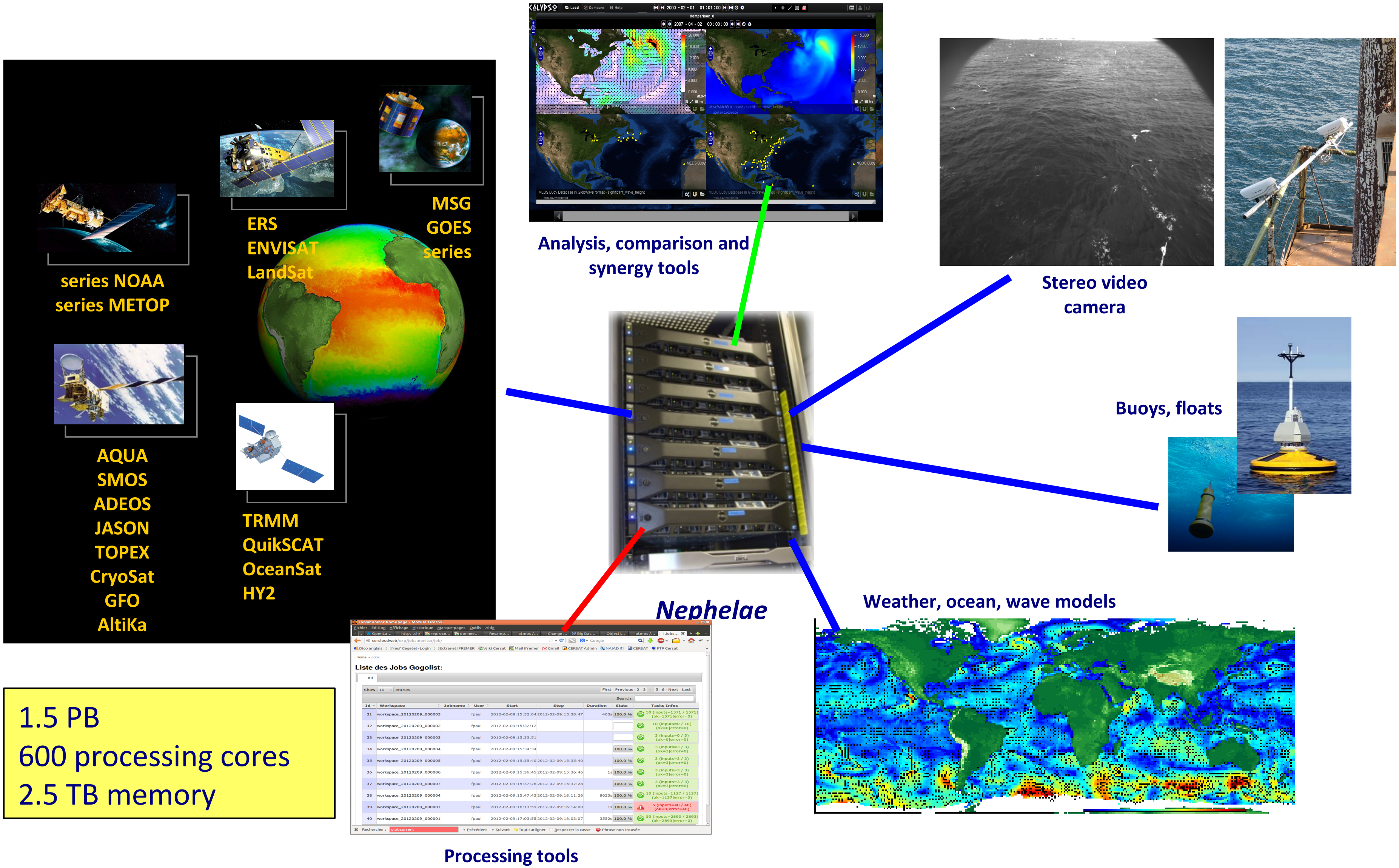
Nehphelae platform

Getting access to data and processing resources

Running an OceanFlux climatology

Further usage

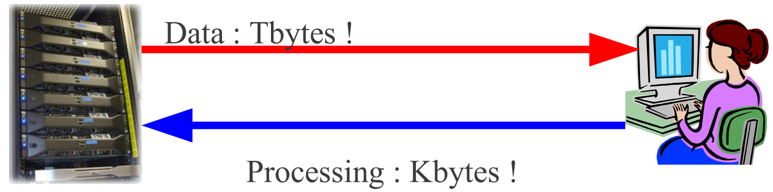
Nephelae big data platform



1.5 PB
600 processing cores
2.5 TB memory

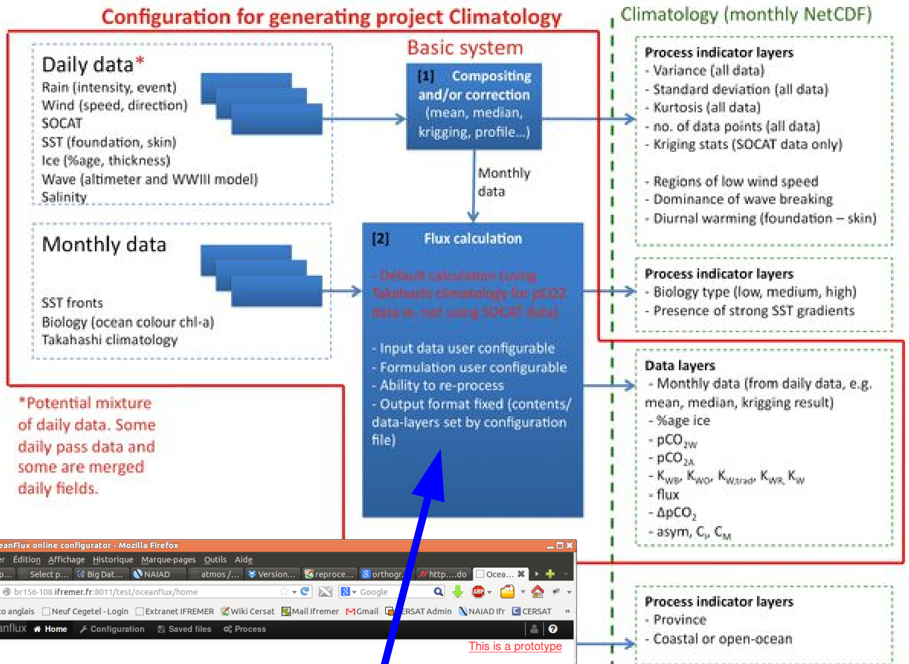
Technological drivers

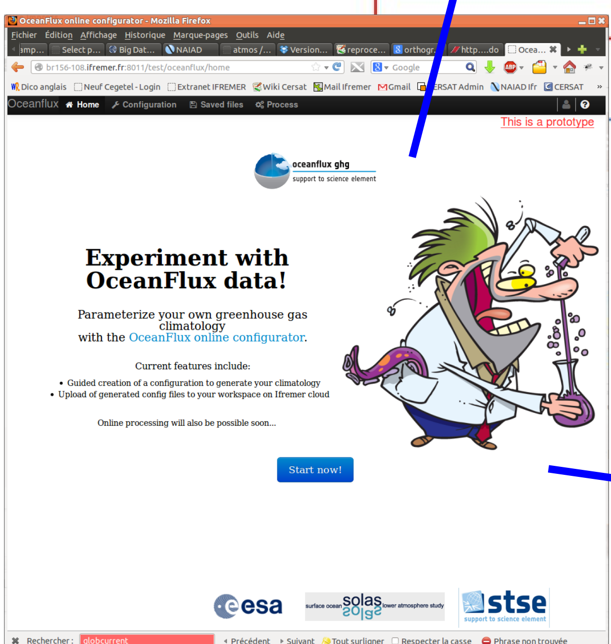
Are traditional massive central static and one-way archive centers still relevant ?



- Highly demanding input/output accesses
- relying on standard (cheap) hardware => weaker reliability balanced by duplication and redundancy
- unique large and scalable filesystem
- processing close to storage, avoiding network bottleneck
- Tailoring system & environment to user or process, no dependency on hardware (virtualization)
- Allowing backup and restoration of complete processing environments (replay)
- No specific coding / deployment skills required from user
- Allocation of resources on demand

OceanFlux framework





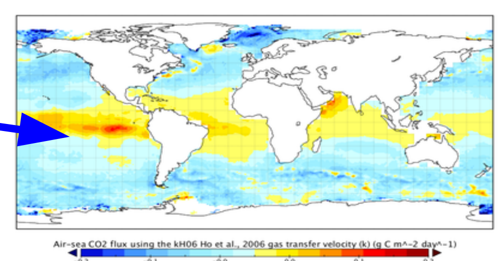
OceanFlux ESA funded project :

- to develop and validate new and innovative products combining field data, satellite observation, and models.
- estimate of the GHG transfer velocity parameter (derivation, uncertainties, sensitivity)
- quantification of the impact of biological slicks, rainfall, sea surface temperature and salinity variability on the air-sea CO2 flux.

Access by multiple remote partner to the same share data pool and processing ressources

Multiple choices for each parameter and algorithm settings => concept of scientific experiment

Stimulate collaborative sciences



oceanflux ghg
support to science element

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All the information is there!
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Published on the 03/09/2013
Climatology available
The datasets have been processed to produce climatology available for the community.
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Published on the 09/05/2013
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The registration for the science workshop is open.
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Heriot Watt University
Access
Contact
Contact : Fanny Girard-Ardhuin
Address :
Ifremer
F-29280 Plouzané
Mail : Fanny.Ardhuin@ifremer.fr
Login
User
Password
OK

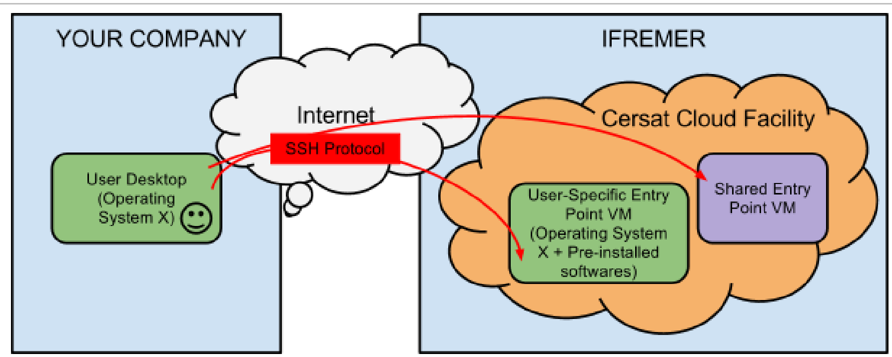
Keywords : nephelae

Nephelae

The project offers the ability to remotely process the data on the Cersat Cloud Facility. This means that the user does not have to download the data archive (which can be a huge amount of data) but instead work and process them remotely. You can find here how to get an access to a virtual machine matching your needs and start playing with the OceanFlux Greenhouse Gases data.

Concept of the Cersat Cloud Facility

To use the Cersat Cloud Facility, each user has to connect to an entry-point virtual machine (shared or user-specific), which is directly connected to the Cersat Cloud infrastructure.



Ifremer_cloud

Basic requirements

SSH Client is required since SSH Protocol is the standard way to access the entry-point.

An authorized IFREMER user account is also required to use the Cersat Cloud Facility.

OceanFlux data +

Tools −

:: Nephelae
:: Climatology configurator

You are at : Home > Products > Tools > Climatology configurator

Keywords : climatology, configurator

Climatology configurator

OceanFlux project offers to interested partners the ability to run their own climatology processing, selecting the parameterization and input data of their choices. This processing configuration can be defined online through a web interface. Users can then connect to the Nephelae processing platform of Ifremer/CERSAT and execute their climatology computation remotely.

Access to the *Nephelae* processing platform must first be requested to the *Nephelae* team, using the following online registration form :

Online registration form for OceanFlux processing

A tutorial is available through the process of configuring and computing your own CO2 flux climatology..

The configuration of your climatology processing can also be done through a step by step wizard.

Last modified : Monday 23 September 2013

Laboratoire d'Océanographie Spatiale

Ifremer

Cersat Cloud – Account Creation Form

Please note that we reserve ourselves the right to grant or refuse the access to our processing resources, depending on the processing platform load and priorities. The description of your project will help us to set these access priorities in case we face with too many demands.

To create your Cersat Cloud account, please fill the following form :

Name *

First name *

Email *

Phone number *

Organization *

Organization type *

- Private / Other
- Education / Research
- Government

guidelines

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www.ifremer.fr/cerweb/oceanflux/

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Cook your own climatology!

OceanFlux project offers to interested partners the ability to run their own climatology processing, selecting the parameterization and input data of their choices. This processing configuration can be defined online through a web interface. Users can then connect to the Nephelae processing platform of Ifremer/CERSAT and execute their climatology computation remotely.

This guidelines describes how you can cook your own climatology.

Registration

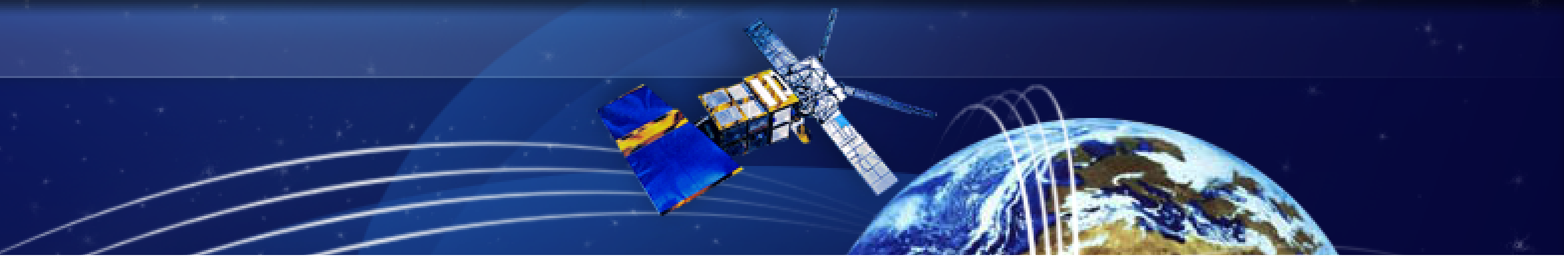
To register for access to the Nephalae Cloud, enabling you to access all of the open-access datasets and processing tools, you are requested to fill in the project registration form :

- http://www.oceanflux-ghg.org/Products/Tools

By registering for access to the OceanFlux GHG and Nephalae Cloud system you are agreeing to the Ifremer data access and systems terms and conditions.

Terms and Conditions

Connecting



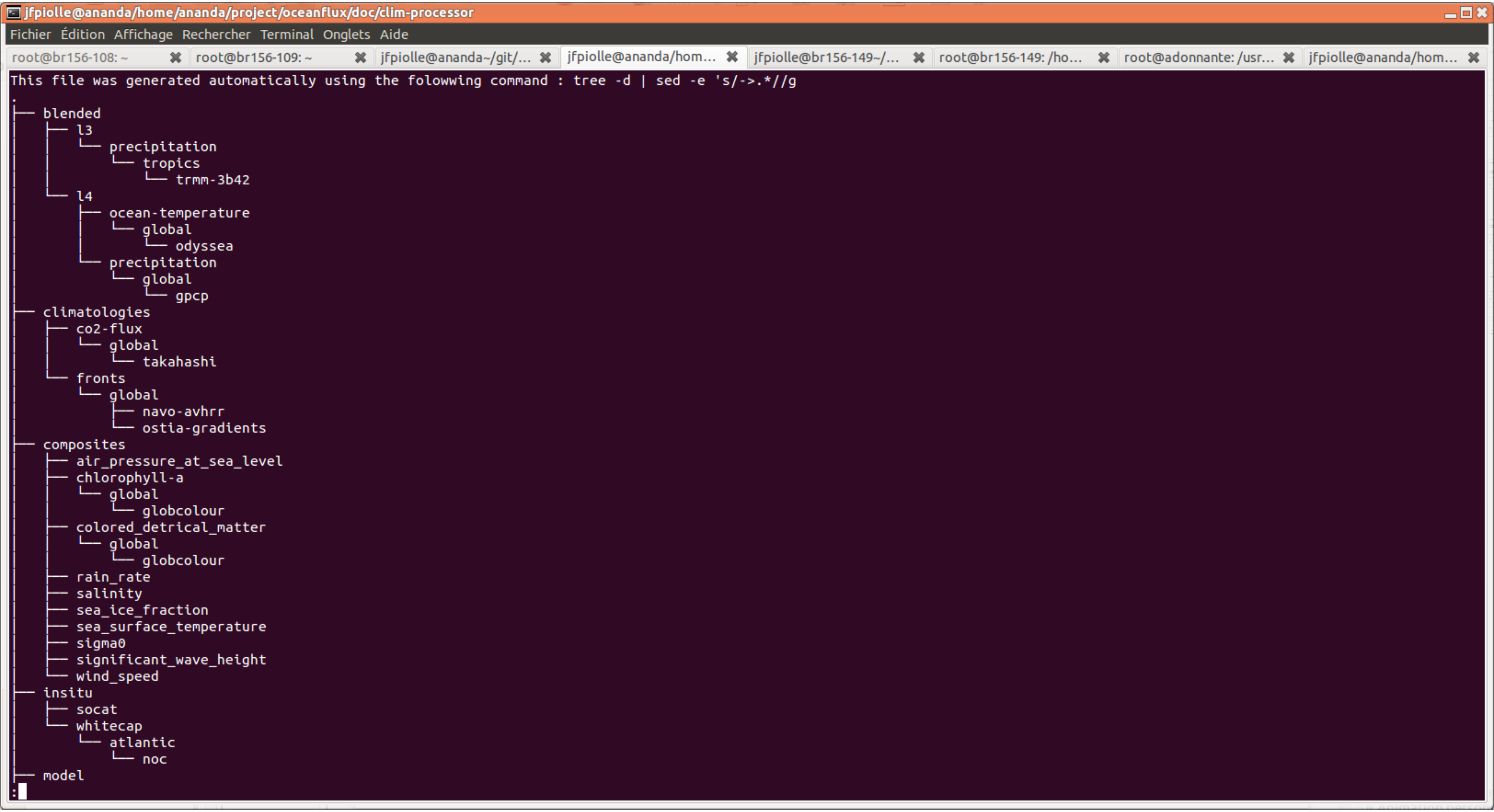
```
ssh -X <user>@<server address>
```

```
br156-167:~% ls
Bureau     Images    mail     Musique         OCEANFLUX-SHARED  restit           Vidéos
Documents  internet  Modèles  OCEANFLUX-DATA  Public            Téléchargements  workspace
br156-167:~%
```

```
br156-167:~% ls OCEANFLUX-SHARED/*
OCEANFLUX-SHARED/src:
climatology  socat

OCEANFLUX-SHARED/workspace:
climatology  lgoddijn  socat
br156-167:~%
```

README.OCEANFLUX.DATATREE.TXT



jfpiolle@ananda/home/ananda/project/oceanflux/doc/clim-processor

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root@br156-108: ~ | root@br156-109: ~ | jfpiolle@ananda~/git/... | jfpiolle@ananda/hom... | jfpiolle@br156-149~/... | root@br156-149: /ho... | root@adonnante: /usr... | jfpiolle@ananda/hom...

```
This file was generated automatically using the folowwing command : tree -d | sed -e 's/->.*//g
.
├── blended
│   ├── l3
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│   │       └── tropics
│   │           └── trmm-3b42
│   └── l4
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│       │   └── global
│       │       └── odyssea
│       └── precipitation
│           └── global
│               └── gpcp
├── climatologies
│   ├── co2-flux
│   │   └── global
│   │       └── takahashi
│   └── fronts
│       └── global
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│   │       └── globcolour
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├── insitu
│   ├── socat
│   └── whitecap
│       └── atlantic
│           └── noc
├── model
:
```

Editing your configuration file (manually)

To generate your own climatology you first of all you need to create your own workspace. e.g.:

```
mkdir -p ~/OCEANFLUX-SHARED/workspace/<user>/MyClimatology
```

and hit enter, where <*user*> is your username. Next copy the default configuration into your new workspace directory. e.g.

```
cp ~/OCEANFLUX-SHARED/src/climatology/ofluxghg-default-climatology-configuration.conf ~/OCEANFLUX-
```

Next, change into your new workspace directory e.g.:

```
cd  ~/OCEANFLUX-SHARED/workspace/<user>/MyClimatology/
```

where <*user*> is your username.

Requires deep knowledge of processor source code!

```
bias_k_value = 0
bias_k_biology_value = 0
bias_k_wind_value = 0


#
# switches to enable k parameterisation, options are 'yes' or 'no'
# only one k selection can be enabled at one time
# ie only one can be set to '= yes'
#
k_Ho2006 = no
k_Nightingale2000 = no
kt_OceanFluxGHG = no
k_Wanninkhof1992 = no
k_McGillis2001 = no
k_Ho1997 = yes
kd_OceanFluxGHG_backscatter = no
kd_OceanFluxGHG_wind = no
kb_OceanFluxGHG = no
kt_OceanFluxGHG_kd_wind = no

# generic k parameterisation, assumes normalisation using sc=600
k_generic = no
k_generic_a0 = 0
k_generic_a1 = 0
k_generic_a2 = 0.26
k_generic_a3 = 0


#
# Weighting for kb and kd components of k_GoddijnMurphy_Fangohr2012 k parameterisation
# Setting both equal to 1.0 means that the total k will simply be a linear combination
# These need to both be valid real numbers
#
kd_weighting = 1
kb_weighting = 1

# asymmetry switch for OceanFlux k paramterisation
# default is 1.0 ie no asymmetry
# the option above 'k_t_OceanFluxGHG =' must be set to 'yes' for this to be used
#
kb_asymmetry = 1


# Rain specific components
# rain bias influence on sstskin
bias_sstskin_due_rain = no
# values for bias influence and conditions
```

Oceanflux Home Configuration Saved files Process

Experiment with OceanFlux data!

Parameterize your own greenhouse gas climatology with the OceanFlux online configurator.

Current features include:

- Guided creation of a configuration to generate your climatology
- Upload of generated config files to your workspace on Ifremer cloud

Online processing will also be possible soon...

What for? Start now!

For more information on how to get your account, run your climatology and analyze your results, please refer to our online tutorial

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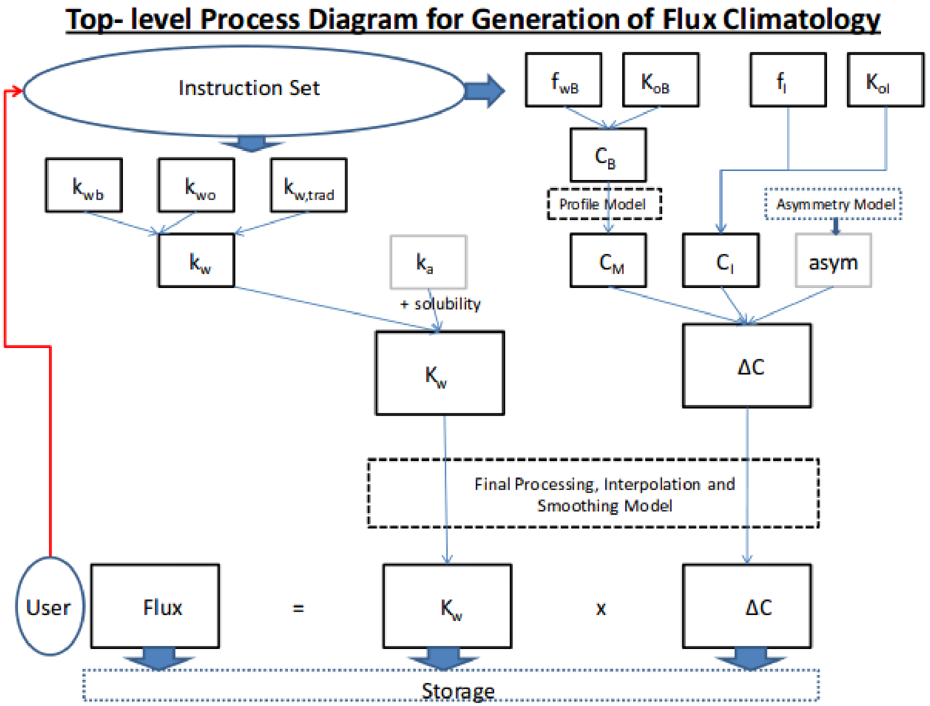
Introduction

Gridded values of flux are calculated as the product of transfer velocity and an appropriate concentration (or a concentration difference):

Flux = Kw * ΔC



The following steps will help you configuring both terms.

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1 Introduction 2 Input datasets

Missing a dataset? Tell us !

Configuration of processing inputs

You can select here a dataset for each input parameter to the climatology.
Random noise and bias can be set for some of these parameters.

SST skin

Dataset: ARC/(A)ATSR Global Monthly Sea Surface Temperature Composite on a 1°x1° geographical grid by Oceanflux

Change dataset

- Bias: 0
- Random noise
- Rain induced bias

  bias value: 0.0

  minimum rain rate: 0.0

  maximum wind speed: 0.0

SST foundation

Dataset: OSTIA Global Monthly Sea Surface Temperature Composite on a 1°x1° geographical grid by Oceanflux

Change dataset

- Bias: 0
- Random noise
- Calculate from SST_{skin}

Wind speed

Dataset: Altimeter Global Monthly Significant Wave Height on a 1°x1° geographical grid by Oceanflux

Change dataset

- Bias: 0
- Random noise

CO2 climatology

Dataset: Global Monthly Climatology of Carbon Dioxide on a 1°x1° geographical grid by Takahashi

Change dataset

- Bias: 0
- Random noise

Salinity

Dataset: SMOS Global Monthly Sea Surface Salinity on a 1°x1° geographical grid by CATDS/CECOS

Change dataset

- Correction of salinity to skin value:

  0

Significant wave height

Dataset: Altimeter Global Monthly Significant Wave Height on a 1°x1° geographical grid by Oceanflux

Change dataset

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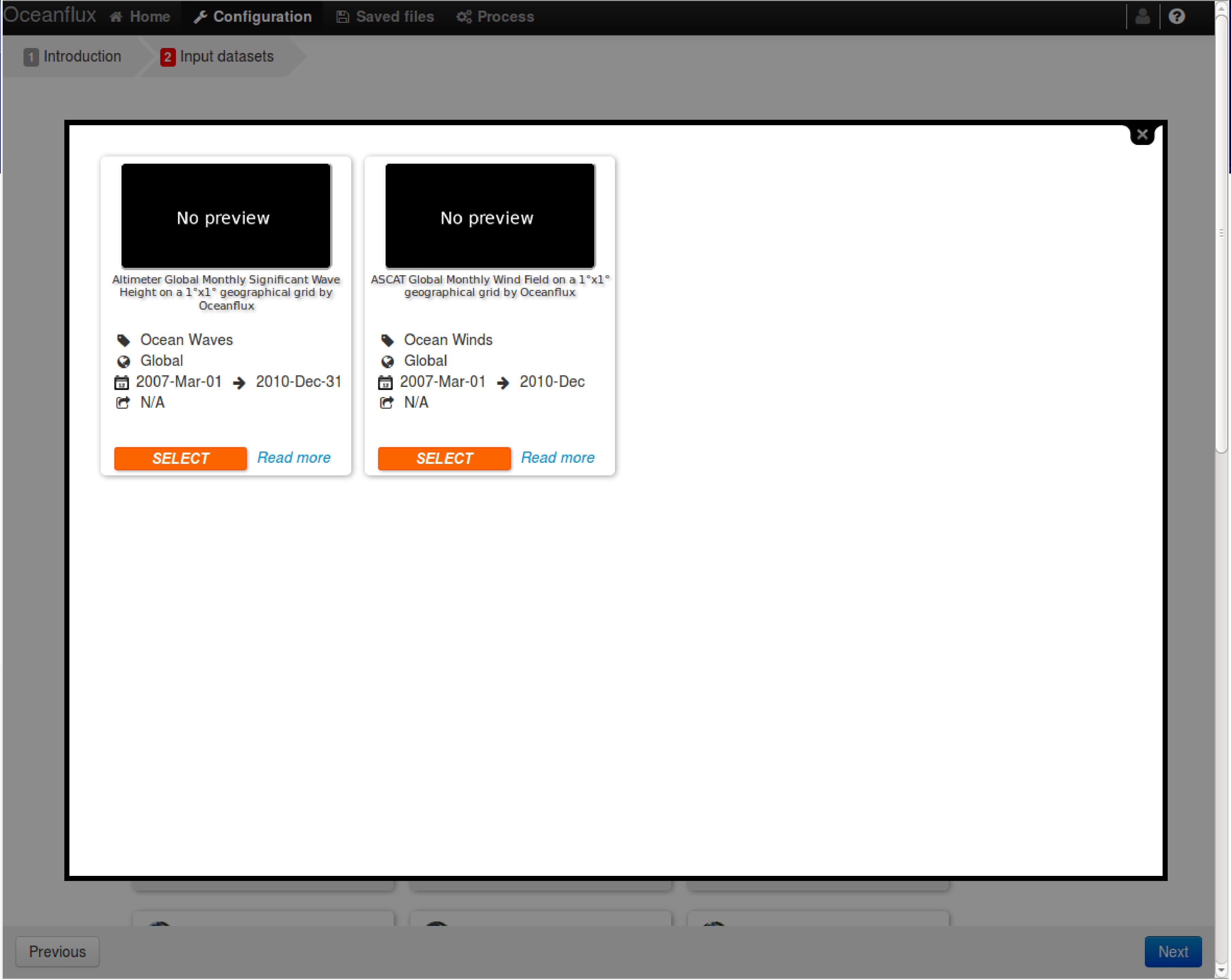
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Transfer velocity

The transfer velocity can be computed using :

- (selected) Traditional (wind dependent) transfer velocity algorithms
- Direct transfer velocity algorithms
- Bubble mediated transfer velocity algorithm
- Total transfer velocity algorithms
- Rain driven transfer velocity algorithms

Traditional wind dependent transfer velocity

Use one of the following well-known parameterisations, where Sc_{skin} is the Schmidt number at skin depth (SST dependent) and U_{10} the wind speed at 10 meter :

- (selected) Ho et al 2006 => Schmidt skin

  $k = \sqrt{(600.0/Sc_{skin})} * 0.266\ U_{10}^2$

- Nightingale et al., 2000

  $k = \sqrt{(600.0/Sc_{skin})} * (0.222\ U_{10}^2 + 0.333\ U_{10})$

- Wanninkhof and McGillis 1999

  $k = \sqrt{(600.0/Sc_{skin})} * 0.0283\ U_{10}^3$

- McGillis et al., 2001

  $k = \sqrt{(600.0/Sc_{skin})} * (3.3 + 0.026\ U_{10}^3)$

- Or define your own wind speed dependant transfer velocity :

  $k = Sc^{-1/2}\ (a_0 + a_1\ U_{10} + a_2\ U_{10}^2 + a_3\ U_{10}^3)$

where :

- a_0 = 0
- a_1 = 0
- a_2 = 0.26
- a_3 = 0
- and Sc is a constant Schmidt Number value set to 600.

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Add correction to your previously defined transfer velocity

☐ Add rain component to the existing k parameterisation

◉ Ho, 1997

$$k = k + \sqrt{(600.0/Sc_{skin})} * (0.929 + 0.679\ R_n - 0.0015*R_n^2)$$

where

- R_n is the rain rate

☐ Add correction based on biology and wind conditions

if chlorophyll-a is over a minimum value and wind below a maximum value, k is modified by a bias value either in percentage (k = k - bias / 100) or absolute value (k = k + bias)

- minimum chlorophyll_a value :
- maximum wind speed :
- bias : (use '%' to indicate a correction in percentage)

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Schmidt Number of CO_2

Temperature and salinity data is combined with standard formulae for kinematic viscosity and the molecular diffusivity of carbon dioxide, to calculate 1x1 degree, monthly climatology of the Schmidt number of CO_2, Sc.

Currently, the Schmidt number formulation is (for SST <= 30°C) :

$$Sc = 2073.1 - 125.62\ SST + 3.6276\ SST^2 - 0.043219 * SST^3$$

It is calculated :

- at foundation depth (Sc_{fnd}) using : …… (SST_{fnd} selection ou skin + correction)
- at skin depth (Sc_{skin}) using : ….. (SST_{skin} selection)

Solubility of CO_2

Radiometric SST and skin salinity data is combined with standard formula for solubility (s_{skin}) to calculate the solubility of the sea surface. Bulk STT and data is combined with standard formula for solubility to calculate the solubility ($s_{interfacial}$) of the water column. These properties are calculated for each month that in situ oceanic fugacity data is available and for each grid square.

- (selected) Wanninkkhof, JGR, 1992

$$s = \exp(-60.2409 + 93.4517 / (100/SST) + 23.3585 \log(SST/100) + (SSS * (0.023517 - 0.023656\ SST/100 + 0.0047036\ (SST/100)^2))$$

where

- SST is the sea surface temperature, in K (skin for s_{skin} and foundation for $s_{interfacial}$)

Flux model applied

- (selected) Rapid, Woolf 2012

$$s_{interfacial} = s(SST_{fnd})$$

- Equilibrium , Woolf 2012

$$s_{interfacial} = s * (1 - 0.015\ \Delta SST)$$

where

- ΔSST is the difference between skin and foundation SST.

Currently selected inputs :
Skin SST : ....
Foundation SST : ...
Skin Salinity : .....

Oceanic fugacity

Water fugacity $fCO2_{water}$ is calculated as follow :

$$fCO2_{water} = fCO2_{eq} \times \exp(0.0423\ (SST_{fnd} - T_{eq}) - 0.0000435\ (SST_{fnd}^2 - T_{eq}^2))$$

where :

- SST_{fnd} is the foundation sea surface temperature
- T_{eq} is the equilibrator temperature

Correction for salinity [Not yet implemented]

Corrections for salinity variation will only be applied where a data source for inter-annual salinity variation is applied and not for an unchanging salinity field (e.g. Takahashi et al., 2009).

Interfacial fugacity

For carbon dioxide, vertical gradients in its molar fraction of dry air are negligible. The molar fraction of the lower atmosphere (including regional, seasonal and secular variation) is known accurately (compared to oceanic values). The interfacial fugacity is calculated from the fraction of dry air, atmospheric pressure and the interfacial temperature and salinity. Gridded climatologies of each of these inputs is used to calculate the interfacial fugacity for each calendar month of the reference year and each grid square.

air fugacity $fCO2_{air}$

calculated as follow :

- equation 26, Kettle et al, 2009, ACP

$$fCO2_{air} = xCO2_{air} (P - pH_2O)$$

where :

- P is the sea level pressure
- $xCO2_{air}$ is the CO2 molar fraction of the atmospheric air (in ppm) [Takashashi]
- pH_2O is the water vapour pressure. For calculating atmospheric fCO2, we assume that the gas is at 100% humidity because it is the air just above the sea. The water vapour pressure must then be taken into account at sea surface temperature (SST in K) and salinity (S). It is given (in atmospheres) by the following formula (Weiss and Price, 1980) :

$$pH_2O = 1013.25 \exp (24.4543 - 67.4509 (100/SST - 4.8489 \ln (SST / 100) - 0.000544 S)$$

where :

- S is the salinity salinity
- SST is the sea surface temperature in Kelvin

Corrections applied

- Long-term trend correction

Fugacity data is corrected to the reference year using an assumed long-term trend in fugacity (1.5 ppm/year) as defined by Takahashi et al., (2009). This assumption will inherit the uncertainties as described and calculated by Takahashi et al., (2009).

$$fCO2_{air} = fCO2_{air} + (year - 2010) *1.5$$

Flux calculation

The concentration at the base of the mass boundary layer is assumed equal to the bulk concentration ("rapid model"). Each bulk concentration is calculated from the solubility of the water column for the specific month and grid square multiplied by the individual fugacity measurement corrected to the reference year. The full set of individual values are used to construct a climatological grid of concentrations for each calendar month of the reference year using geospatial optimal interpolation methods.

The concentration at the sea surface for each calendar month of the reference year and each grid square is calculated from the sea surface solubility and the interfacial solubilities

Mass boundary layer concentration (ie concentration in the water)

$$C_{water} = s_{interfacial} * fCO2_{water}$$

Interfacial concentration (ie at the interface between the ocean and the atmosphere)

$$C_{air} = s_{skin} * fCO2_{air}$$

Flux formula

$$flux = k * (C_{water} - C_{air})$$

☑ Add flux component for wet deposition due to rain

◉ Komori et al., 2007

$$R_n * s_{skin}(\text{distilled water}) * C_{air})$$

where:

- R_n is rain rate
- s_{skin}(distilled water) is the solubility in zero salinity water

Additional layers

- [x] Whitecapping
  - ○ Goddijn-Murphy et al., 2010

$$W = 0.00159\ U_{10}^{2.7}$$

- [x] SST gradients
  - SST gradient: _
- [x] Low wind indicator
  - Wind: _
- [x] Biological activity indicator
  - Biology: _
- [x] Diurnal warming

$$sst_{skin} - sst_{fnd}$$

  - sst_{skin}: _
  - sst_{fnd}: _
- [x] Longhurst biogeographical provinces

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6 Schmidt Number of carbon dioxide 7 Solubility of carbon dioxide 8 Oceanic fugacity 9 Interfacial fugacity 10 Flux calculation 11 Additional layers

12 Output settings

Output settings

Output directory

Choose the directory that will be used to store the results.
The path should be relative to the user home directory (no leading slash).

$HOME/OCEANFLUX-SHARED/workspace/$user/ directory

Comments

Describe here the characteristics of this configuration. This will be useful later, when browsing your different configuration files.

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Result

```
# OceanFlux Greenhouse Gases default climatology configuration file
# created 12/12/2012 Jamie Shutler, jams@pml.ac.uk
#
# note: use of '=' between the variable name and its value/path/string etc is optional
# note: all entries are required

#
# Input datasets and identifiers, path/location definition needed for all entries
# Required input dataset names are: windu10, sstskin, sstfnd, ecmwf, pco2, sigma0, sig_wv_ht
# The data product name is the name of the data set within the netcdf file. This can be checked using 'ncdump -h | less'
# An example file is '20100101_OCF-SST-GLO-1M-100-MGD-OSTIA.nc' , where the data identifier is 'MGD-OSTIA' and data product name is
# 'analysed_sst_mean'
#
# Issues to note:
# - all entries are needed
# - entries should start 'OCEANFLUX-DATA/'
# - the ~/ need to be kept as these specify your home directory
# - the filename structure of these datasets is assumed within the perl program, so if you decide to use an unusual dataset
# then you may need to edit the perl to account for this.
#

# location of source code
# this is set to the default for SOLAS users (definable by project members for testing purposes)
# default is OCEANFLUX-SHARED/src/climatology
src_home = workspace/mkII

# calculation options, options are 'no' or 'yes'
# 'rapid' and 'equilibrium' are in relation to the flux model as described in Woolf et al., 2012. only one of these
# can be selected at any one time. 'sstfnd_input' can be enabled (sstfnd_input = yes) to allow a sstfnd dataset to be used.
# disabling it (sstfnd_input = no) will set sstfnd = sstskin + 0.14K
rapid = yes
equilibrium = no
use_sstfnd_data = no
```

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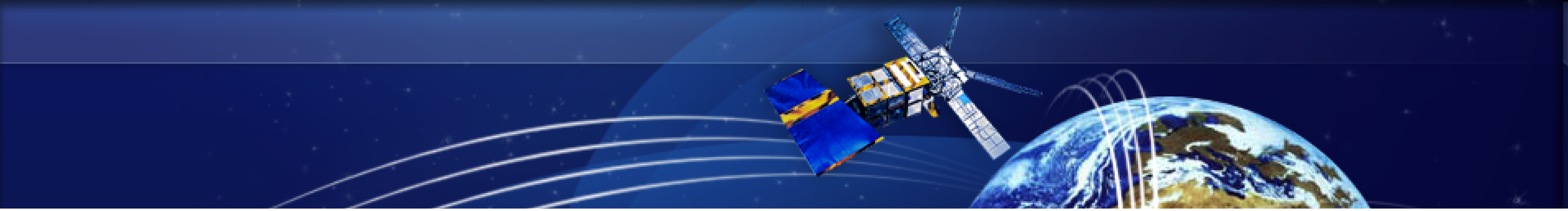
Running the processing

Loading the environment :

```
source /home/cercache/tools/environments/scientific_toolbox_cloudphys_precise/bin/activate.csh
```

Running the processor

```
perl ~/OCEANFLUX-SHARED/src/climatology/ofluxghg-run-climatology.pl --config ~/OCEANFLUX-SHARED/workspace/<user>/MyClimatology/myconfig.cfg -s 2002 -e 2010
```



jfpiolle@br156-149~/OCEANFLUX-SHARED/workspace/jfpiolle/MyClim1

Fichier Édition Affichage Rechercher Terminal Onglets Aide

root@br156-108: ~ | root@br156-109: ~ | jfpiolle@ananda~/git/... | jfpiolle@ananda/hom... | jfpiolle@br156-149~/... | root@br156-149: /ho... | root@adonnante: /usr... | jfpiolle@ananda/hom...

```
KD_OCEANFLUXGHG_BACKSCATTER: no
KD_OCEANFLUXGHG_WIND: no
KB_OCEANFLUXGHG: no
KT_OCEANFLUXGHG_KD_WIND: no
K_GENERIC: no
K_GENERIC_A0: 0.0
K_GENERIC_A1: 0.0
K_GENERIC_A2: 0.26
K_GENERIC_A3: 0.0
KD_WEIGHTING: 1.0
KB_WEIGHTING: 1.0
KB_ASYMMETRY: 1.00
RAIN_WET_DEPOSITION: no
K_RAIN_ADDITIVE_HO1997: no
BIAS_SSTSKIN_DUE_RAIN: no
BIAS_SSTSKIN_DUE_RAIN_VALUE: 0.0
BIAS_SSTSKIN_DUE_RAIN_WIND: 0.0
BIAS_SSTSKIN_DUE_RAIN_INTENSITY: 0.0

(ofluxghg-run-climatology.pl, main) Executing on br156-149 at Wednesday_25September2013_25/09/2013_at_09:27:24GMT
(ofluxghg-run-climatology.pl, main) Config file: ofluxghg-default-climatology-configuration.conf
(ofluxghg-run-climatology.pl, main) Config file read successfull, all required keys found.
(ofluxghg-run-climatology.pl, main) Using Takahashi climatological pco2 data (with lat grid +90 to -90 degrees).
(ofluxghg-run-climatology.pl, main) Running year: 2008/home/ananda/jfpiolle/OCEANFLUX-SHARED/src/climatology/ofluxghg-flux-calc.py /home/ananda/jfpiolle/OCEANFLUX-DATA/composites
/sea_surface_temperature/arc/atsr/data//2008/20080101_OCF-SST-GLO-1M-100-ATS-ARC.nc /home/ananda/jfpiolle/OCEANFLUX-DATA/composites/sea_surface_temperature/arc/atsr/data//2008/20
080101_OCF-SST-GLO-1M-100-ATS-ARC.nc /home/ananda/jfpiolle/OCEANFLUX-DATA/composites/wind_speed/globwave/multisensor/data//2008/20080101_OCF-WSP-GLO-1M-100-MGD-GW.nc /home/ananda
/jfpiolle/OCEANFLUX-DATA/composites/air_pressure_at_sea_level/ncep/cfsr//2008/20080101_OCF-PRE-GLO-1M-100-CSFR.nc /home/ananda/jfpiolle/OCEANFLUX-SHARED/data/Takahashi2009//M2001
001.1200.a7.all_products.BIN.01jan011200.v1.20132321105.data.nc /home/ananda/jfpiolle/OCEANFLUX-DATA/climatologies/co2-flux/global/takahashi//M2001001.1200.a7.all_products.BIN.01
jan011200.v1.20112491544.data.nc /home/ananda/jfpiolle/OCEANFLUX-DATA/composites/sigma0/globwave/multisensor/data//2008/20080101_OCF-SIO-GLO-1M-100-MGD-GW.nc /home/ananda/jfpioll
e/OCEANFLUX-DATA/composites/significant_wave_height/globwave/multisensor/data//2008/20080101_OCF-SSH-GLO-1M-100-MGD-GW.nc /home/ananda/jfpiolle/OCEANFLUX-DATA/blended/l4/precipit
ation/global/gpcp/data/netcdf//2008/gpcp_v22.200801.nc /home/cercache/project/oceanflux-shared/data/ESA-CCI//2008/ESACCI-OC-MAPPED-OC_PRODUCTS-MERGED-1M_MONTHLY_1degree_PML_OC4v6
_QAA-200801-fv0.95.nc /home/cercache/project/oceanflux-shared/data/ESA-CCI//2008/ESACCI-OC-MAPPED-OC_PRODUCTS-MERGED-1M_MONTHLY_1degree_PML_OC4v6_QAA-200801-fv0.95.nc /home/anand
a/jfpiolle/OCEANFLUX-DATA/composites/sea_ice_fraction/data//2008/20080101_OCF-ICE-GLO-1M-100-MGD-SSMI.nc /home/ananda/jfpiolle/OCEANFLUX-SHARED/data/masks/World_Seas-IHO-mask.nc
/home/ananda/jfpiolle/OCEANFLUX-SHARED/data/masks/World_Seas-IHO-mask.nc /home/ananda/jfpiolle/OCEANFLUX-SHARED/data/masks/World_Seas-IHO-mask.nc /home/ananda/jfpiolle/OCEANFLUX-
SHARED/data/masks/World_Seas-IHO-mask.nc /home/ananda/jfpiolle/OCEANFLUX-SHARED/data/masks/Longhurst-provinces-mask.nc /home/ananda/jfpiolle/OCEANFLUX-DATA/climatologies/fronts/g
lobal/ostia-gradients/01-UKMO-L4LRfnd-GLOB-v01-fv02-OSTIAGRADclim.nc /home/ananda/jfpiolle/OCEANFLUX-SHARED/workspace/jfpiolle/MyClim1//OceanFluxGHG-month01-jan-2008-v0.nc sst_sk
in_mean analysed_sst_mean wind_speed_cor_mean sigma0_cal_mean swhcor_mean sea_ice_fraction_mean pCO2_sw SST_t vCO2_air msl_mean salinity Precip chlor_a Rrs_555 sea-mask sea-mask
gradient_fields 2008 0 0 0 0 0 0 0 0 0 0.0 0.0 0.0 0.0 0.0 0 0.0 0.0 0 0 1 6 0.0 0.0 0.26 0.0 1.0 1.0 1.00 0 0.0 0.0 0.0 0 0 1 0 0 0.0 ofluxghg-default-climatology-configuration.
conf br156-149 Wednesday_25September2013_25/09/2013_at_09:27:24GMT

(ofluxghg-run-climatology.pl, main) Output file: /home/ananda/jfpiolle/OCEANFLUX-SHARED/workspace/jfpiolle/MyClim1//OceanFluxGHG-month01-jan-2008-v0.nc
^CTraceback (most recent call last):
  File "/home/ananda/jfpiolle/OCEANFLUX-SHARED/src/climatology/ofluxghg-flux-calc.py", line 32, in <module>
    from netCDF4 import Dataset
```

Result

```
br156-167:~% ls OCEANFLUX-SHARED/workspace/climatology/
OceanFluxGHG-month01-jan-2010-v0.nc  OceanFluxGHG-month05-may-2010-v0.nc  OceanFluxGHG-month09-sep-2010-v0.nc
OceanFluxGHG-month02-feb-2010-v0.nc  OceanFluxGHG-month06-jun-2010-v0.nc  OceanFluxGHG-month10-oct-2010-v0.nc
OceanFluxGHG-month03-mar-2010-v0.nc  OceanFluxGHG-month07-jul-2010-v0.nc  OceanFluxGHG-month11-nov-2010-v0.nc
OceanFluxGHG-month04-apr-2010-v0.nc  OceanFluxGHG-month08-aug-2010-v0.nc  OceanFluxGHG-month12-dec-2010-v0.nc
br156-167:~%
```

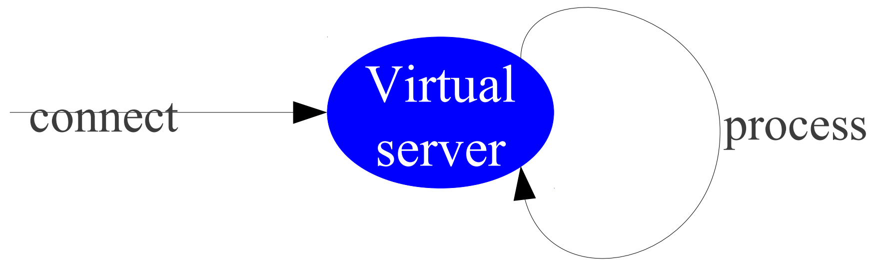
```
scp <user>@<server address>:<full directory to output>/*.nc .
```

Result

```
br156-167:~% ls OCEANFLUX-SHARED/workspace/climatology/
OceanFluxGHG-month01-jan-2010-v0.nc  OceanFluxGHG-month05-may-2010-v0.nc  OceanFluxGHG-month09-sep-2010-v0.nc
OceanFluxGHG-month02-feb-2010-v0.nc  OceanFluxGHG-month06-jun-2010-v0.nc  OceanFluxGHG-month10-oct-2010-v0.nc
OceanFluxGHG-month03-mar-2010-v0.nc  OceanFluxGHG-month07-jul-2010-v0.nc  OceanFluxGHG-month11-nov-2010-v0.nc
OceanFluxGHG-month04-apr-2010-v0.nc  OceanFluxGHG-month08-aug-2010-v0.nc  OceanFluxGHG-month12-dec-2010-v0.nc
br156-167:~%
```

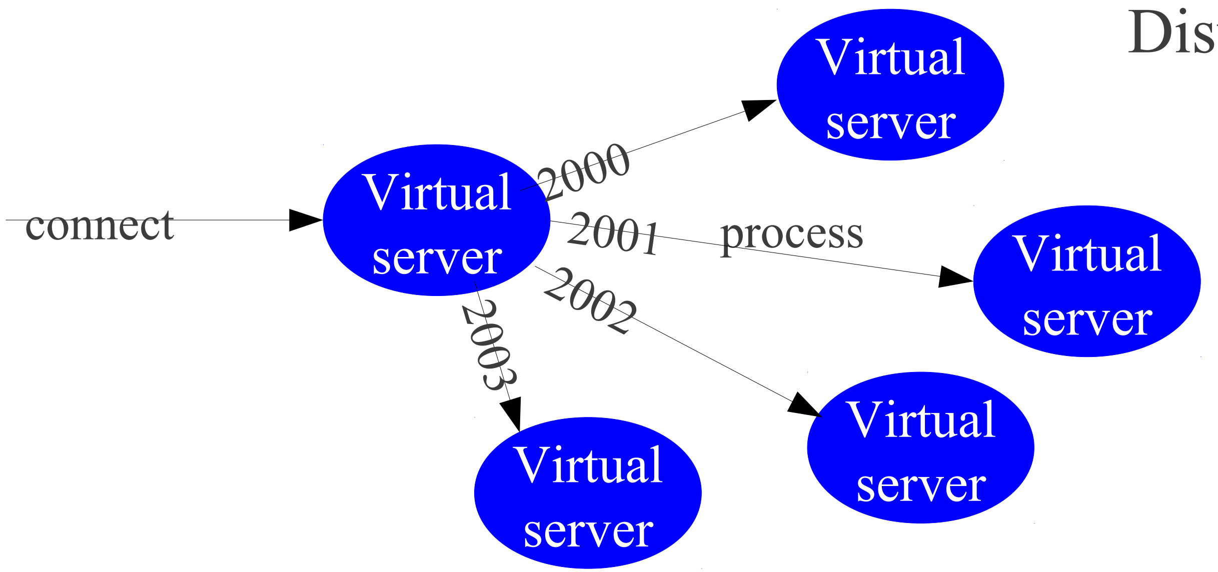
```
scp <user>@<server address>:<full directory to output>/*.nc .
```

Performances improvement



Standard run

Distributed run



Distributed processing

Put the years to process in a text file : *processed_years.txt*

2000
2001
2002
2003
2004

Submit to job scheduler :

cat *processed_years.txt* | /home5/begmeil/tools/gogolist/bin/gogolist.py -w ./workspace --stdin -e 'perl ~/OCEANFLUX-SHARED/src/climatology/ofluxghg-run-climatology.pl --config ~/OCEANFLUX-SHARED/workspace/<user>/MyClimatology/myconfig.cfg -s GOGOLINE -e GOGOLINE' --qsub-options '-l nodes=1:cloudphys-precise'

A simple script will be provided in the coming days to ease this.