European Flood Awareness Systems

EFAS
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EFAS Data Availability

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EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS

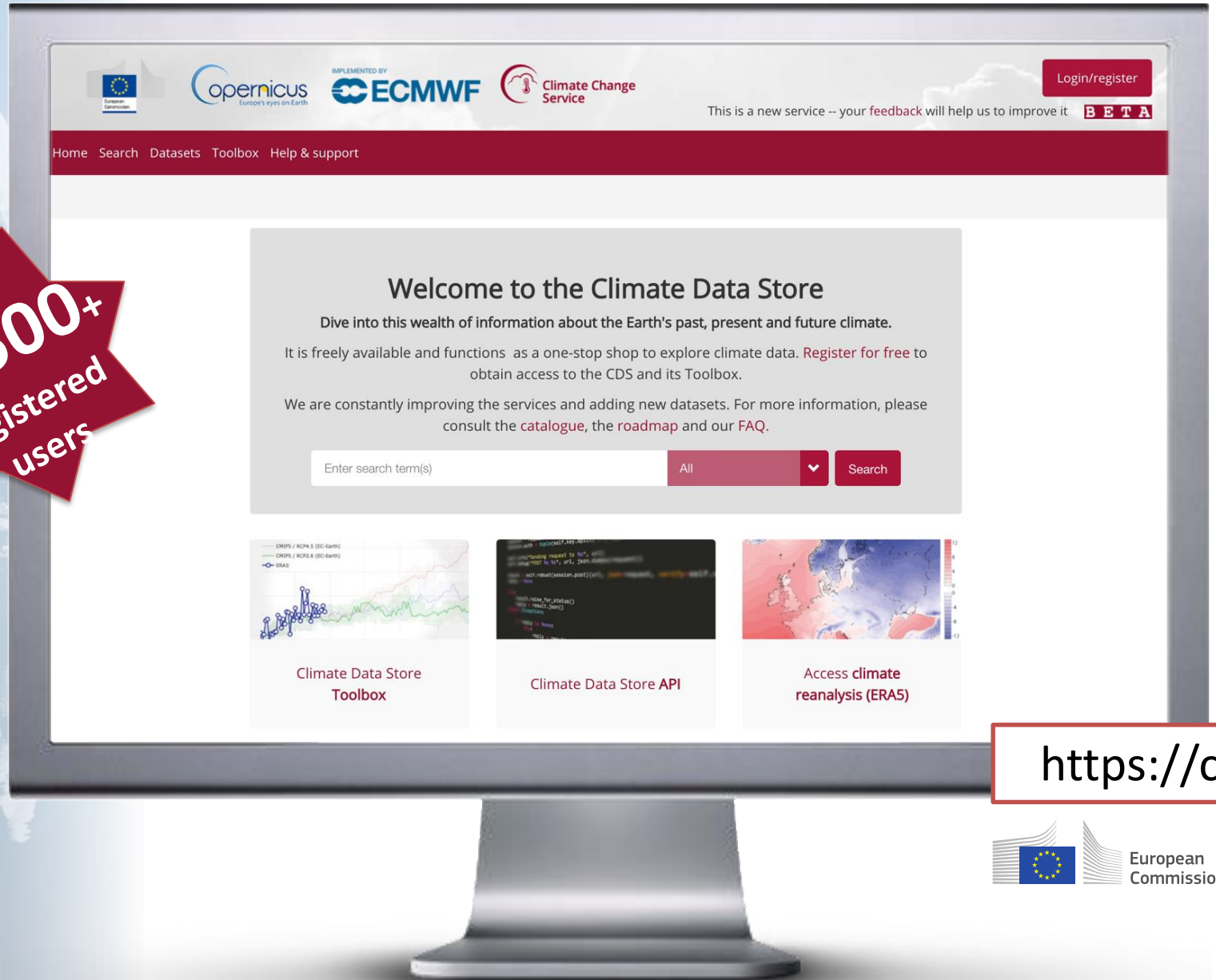
EFAS Data Availability

EFAS Data is now available through the following mechanisms :

	GRIB	NetCDF
Climate Data Store (CDS)	✓	✓
Meteorological Archive and Retrieval System (MARS)	✓	
FTP (dissemination.ecmwf.int)	✓	

Climate Change

How to find, Access, and Use these Data Online?



11500+ registered users

The **Climate Data Store** also called CDS, is **an online open and free service**.

It allows users to browse and access the wide range of climate datasets via a searchable catalogue…

… It allows users to build their own applications, maps and graphs

https://cds.climate.copernicus.eu

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What is the CDS vision?

- Make data discovery, access easy and relevant for users
- Provide scalable data access
- Provide online capabilities to process the data to users
- Provide easy-to-use online applications for users
- Enable reproducible research

➤ **Spend less time handling the data**

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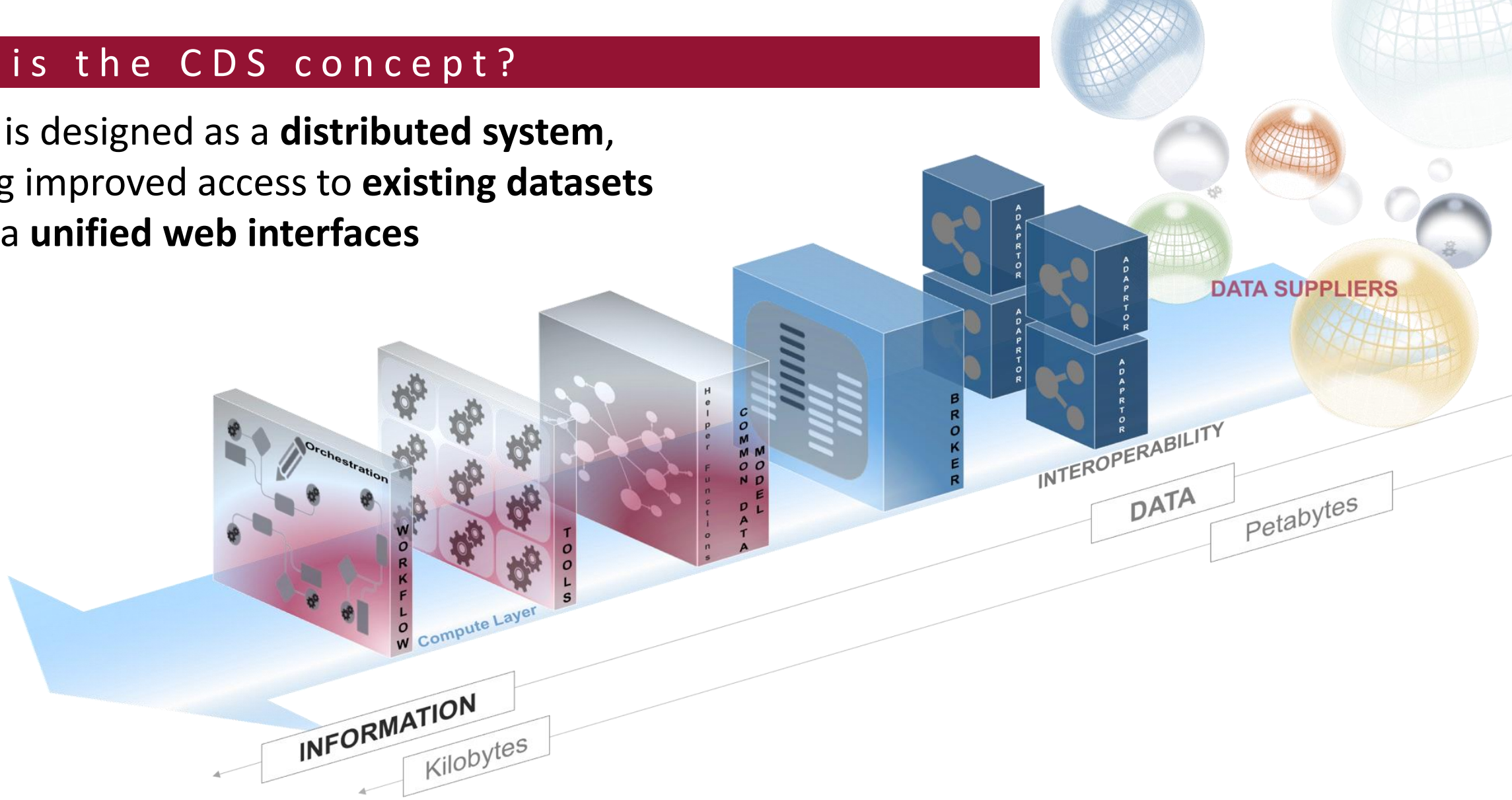
What is the CDS concept?

The CDS is designed as a **distributed system**, providing improved access to **existing datasets** through a **unified web interfaces**



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EFAS Data Availability in CDS

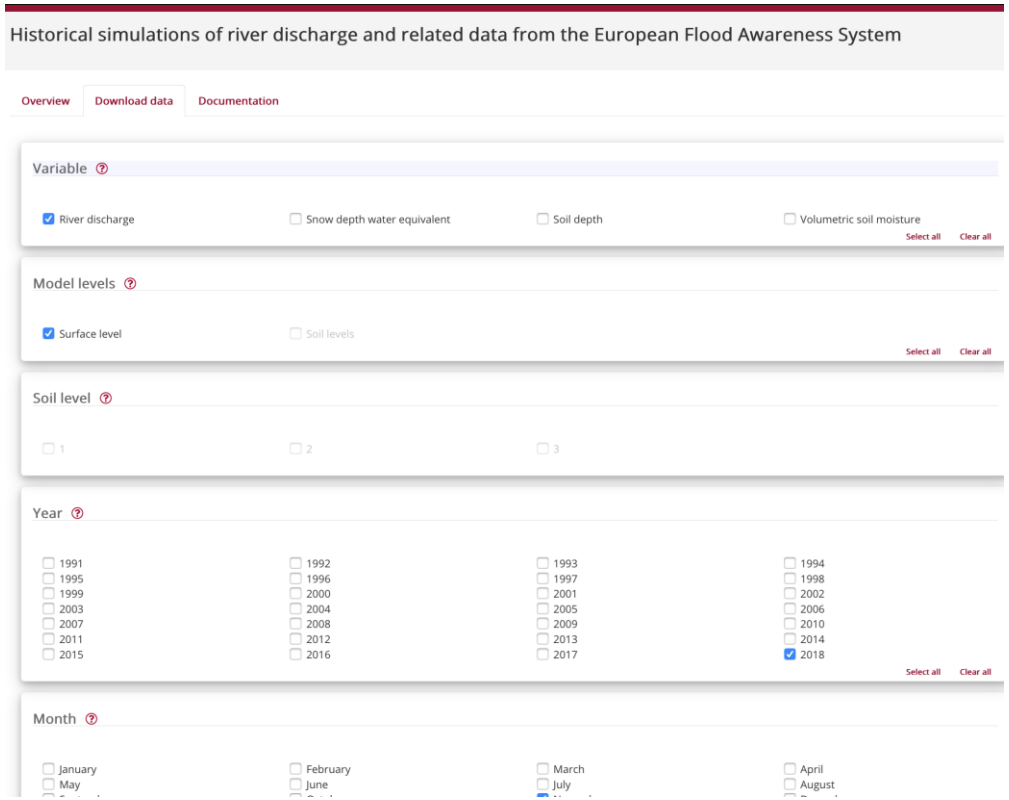
- The CDS contains two EFAS Datasets
- EFAS-Forecast and EFAS-Historical
- CDS is updated once per week.

Forcing	Description	Number of members	Forcing spatial resolution	Lead time	Time step	Comment
ECMWF-HRES	ECMWF high resolution forecast	1	~9km	10d	6h	
ECMWF-ENS	ECMWF ensemble forecasts	51	~18km	15d	24h	Only 24-hourly hydrological simulations are available
COSMO-LEPS	COSMO-LEPS ensemble forecasts	20	~7km	5d	6h	
DWD-Det	COSMO-EU and ICON forecasts	1	~6.5/13km	1-3/4-7d	6h	COSMO-EU is used for day1-3, ICON is used for day 4-7
Gridded obs	Simulation forced with observation	1	5km	24h	24h	Hydrological simulation used to initialise forecasts, available daily at 06:00UTC. It uses the same configuration as the EFAS operational forecasts and historical simulation forced with observations.

Accessing Data through CDS

Data in CDS Can be accessed via

https://cds.climate.copernicus.eu




```
import cdsapi

c = cdsapi.Client()

c.retrieve(
    'efas-historical',
    {
        'variable':'river_discharge',
        'model_levels':'surface_level',
        'hyear':'2018',
        'hmonth':'november',
        'hday':[
            '15','16','17',
            '18','19','20',
            '21','22','23',
            '24','25','26',
            '27','28','29'
        ],
        'format':'netcdf'
    },
    'download.nc')
```

Data can also be accessed via the CDSAPI Python Client

Accessing Data via ftp

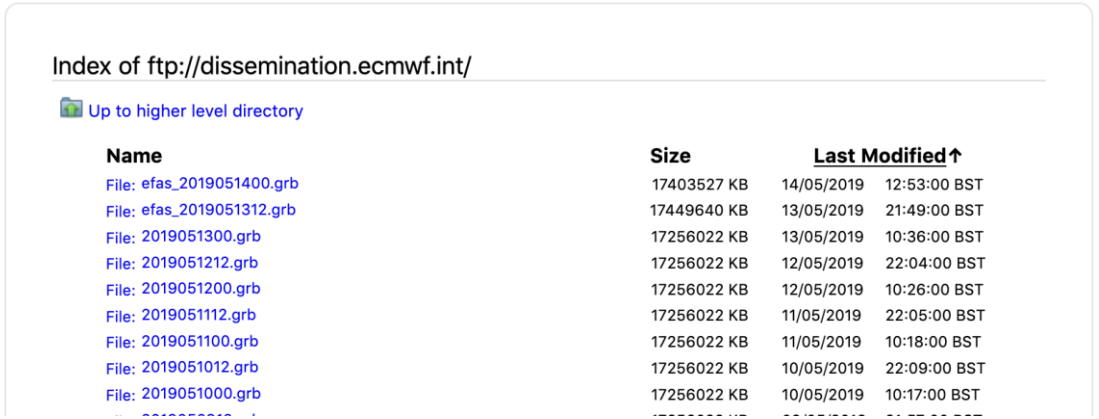
Request access via :

Address ftp://dissemination.ecmwf.int

Data Available for Real Time Forecasts – 60 Days Old in GRIB Format only.

Files are stored by Forecast Date and Cycle.

All variable's that are stored in MARS for the Forecast Day are available in this file.



Index of ftp://dissemination.ecmwf.int/

Up to higher level directory

Name	Size	Last Modified↑
File: efas_2019051400.grb	17403527 KB	14/05/2019 12:53:00 BST
File: efas_2019051312.grb	17449640 KB	13/05/2019 21:49:00 BST
File: 2019051300.grb	17256022 KB	13/05/2019 10:36:00 BST
File: 2019051212.grb	17256022 KB	12/05/2019 22:04:00 BST
File: 2019051200.grb	17256022 KB	12/05/2019 10:26:00 BST
File: 2019051112.grb	17256022 KB	11/05/2019 22:05:00 BST
File: 2019051100.grb	17256022 KB	11/05/2019 10:18:00 BST
File: 2019051012.grb	17256022 KB	10/05/2019 22:09:00 BST
File: 2019051000.grb	17256022 KB	10/05/2019 10:17:00 BST

Interpreting the EFAS Data

- EFAS Data is stored in GRIB but can also be converted to NetCDF using the efas_netcdf_tool
- The EFAS_NetCDF Tool is built into the CDS for conversion on demand.
- EFAS Data can be accessed easily in Python using eccodes with the cfgrib Python Library.
- Cfgrib uses eccodes to convert the data in the grib file to an Xarray Dataset.
- From here this data can be interrogated and plotted.
- We have created a few **Jupyter** Notebooks as examples.
- Large datasets will take a long time to convert, we recommend users install eccodes as it provides facilities to split the GRIB file prior to conversion.
- Large datasets may struggle to convert on PC's with Limited resource due to Memory.
- We recommend users download data from CDS and use the NetCDF Converter that is built in.

Further Information

- We have created some pages with information about the data availability on the Copernicus Services Confluence at ECMWF
- Copernicus Emergency Management Service – CEMS
- From here you will find links to download the tools needed to access the Grib and NetCDF Data.
- Please report any CDS Failures or Feedback via the CDS Pages and they will be passed to the relevant parties.

Where are we now?

- EFAS went Live in CDS on 9/05/19
- CDS has received and processed 530 Requests up until 17/05/19

Examples of Using EFAS Data : WINDOWS

	MAC	LINUX	WINDOWS
GIT	INSTALL GIT	INSTALL GIT	INSTALL GIT
DOCKER	DOCKER	DOCKER	DOCKER

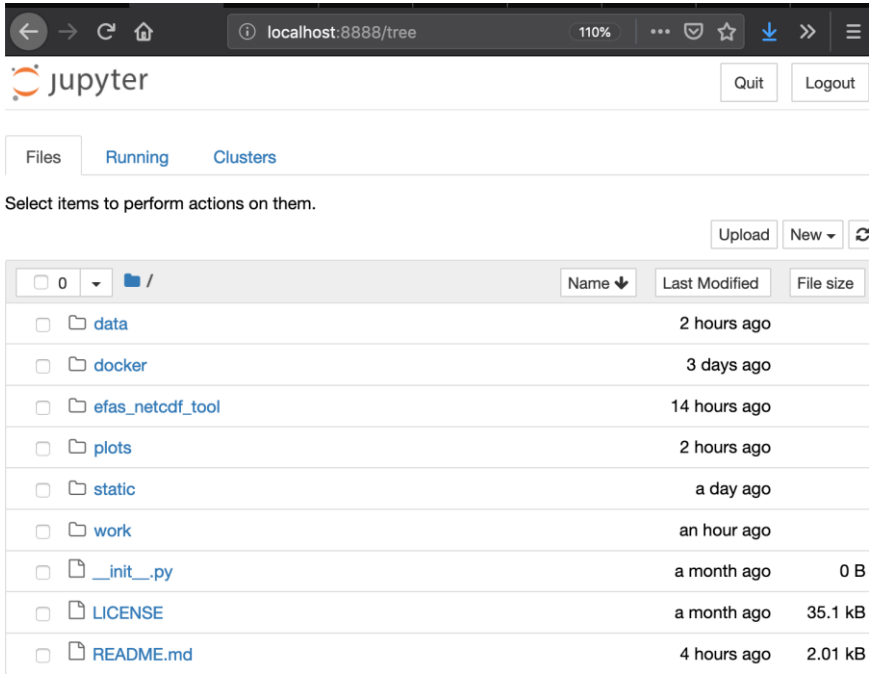
- You will need to install git and docker. Docker will require an account to download.
- Installing git, we can simply hit next each time and install defaults.
- Docker will logoff twice, one to install, one to start HyperV.
- Start GIT BASH and Run the whole line below.
- cd c:\; mkdir git; cd git; git clone –recurse-submodules https://github.com/enyfeo/efas.git
- cd efas & git lfs install & git lfs pull
- Open a CMD Window in Windows and cd c:\git\efas
- docker pull enyfeo/efas:1.0.0
- docker run –publish 8888:8888 –volume c:\git\efas:/home/jovyan enyfeo/efas:1.0.0

Unix GIT/Docker Setup

- **On UNIX :**
- You will need to install git and docker. Docker will require an account to download..
- sudo apt install git-all
- Most linux distributions docker : sudo apt-get install docker-engine -y; sudo service docker start; sudo docker run hello-world
- cd /var/tmp; mkdir git; cd git; git clone –recurse-submodules https://github.com/enyfeo/efas.git
- cd /var/tmp/git/efas
- docker pull enyfeo/efas:1.0.0
- docker run –publish 8888:8888 –volume ${PWD}:/home/jovyan enyfeo/efas:1.0.0

Examples of Using the EFAS Data

- Docker will start a container publishing jupyter to port 8888 and sharing a volume from your PC to the system inside the container as expressed by the –volume option
- Do not close the terminal window.
- Copy the Token offered in the Terminal Window
- Take your browser to http://localhost:8888/
- Paste the token into the box
- You will arrive on the / of the Jupyter Work Tree, which should contain the files from inside the EFAS Git REPO.
- Static folder contains some static files needed for Soil Moisture and Station Data for Discharge Time Series.
- Inside the work folder you will find some Jupyter Notebooks that you can run and try out.



Adding CDS API Key

- On Windows for JUPYTER
- cd c:\git\efas
- Copy the code from CDS API How To
- notepad .cdsapirc
- Paste into the file and save
- Close notepad and DIR to check the file is actually called .cdsapirc
- Running the CDSAPI on native windows please see the CDS Help Pages

- On linux cd /var/tmp/git/efas
- Copy the code from CDS API How To
- cat > .cdsapirc
- paste and CTRL+D to save the file

Data Required for Jupyter Notebooks

Required For Soil Moisture	Required for Discharge	Required for Snow
import cdsapi c = cdsapi.Client() c.retrieve('efas-forecast', { 'origin':'ecmwf', 'type':'high_resolution_forecast', 'variable':['soil_depth','volumetric_soil_moisture'], 'model_levels':'soil_levels', 'soil_level':['1','2','3'], 'year':'2019', 'month':'04', 'day':'01', 'time':'00:00', 'step':['0','102','108', '114','12','120', '126','132','138', '144','150','156', '162','168','174', '18','180','186', '192','198','204', '210','216','222', '228','234','24', '240','30','36', '42','48','54', '6','60','66', '72','78','84', '90','96'], 'format':'netcdf' }, 'eud.nc')	import cdsapi c = cdsapi.Client() c.retrieve('efas-forecast', { 'origin':'ecmwf', 'type':'ensemble_perturbed_forecast', 'variable':'river_discharge_in_the_last_24_hours', 'model_levels':'surface_level', 'year':'2019', 'month':'04', 'day':'01', 'time':'00:00', 'step':['24','48','72', '96','120','144', '168','192','216', '240','264','288', '312','336','360'], 'format':'netcdf' }, 'eue_15111800.nc')	import cdsapi c = cdsapi.Client() c.retrieve('efas-forecast', { 'origin':'ecmwf', 'type':'high_resolution_forecast', 'variable':'snow_depth_water_equivalent', 'model_levels':'surface_level', 'year':'2019', 'month':'04', 'day':'01', 'time':'00:00', 'step':['0','102','108', '114','12','120', '126','132','138', '144','150','156', '162','168','174', '18','180','186', '192','198','204', '210','216','222', '228','234','24', '240','30','36', '42','48','54', '6','60','66', '72','78','84', '90','96'], 'format':'netcdf' }, 'snow.nc')

The data is included in the GIT REPO and once the REPO is cloned it can be retrieved using the git lfs pull command to pull large files. Otherwise the CDSAPI Requests here can be submitted to the CDS API

What's next?

- New Historical Simulations based on 13/05/19 update will be available in CDS Soon.
- Improved monitoring of CDS to hopefully improve user experience
- Make EFAS Data compatible with the toolbox.
- Move Docker Image to ECMWF Docker Hub (hopefully next week)
- Move Git Repo to ECMWF Git Hub. (hopefully next week)

- For help:
- CDS – contact: copernicus-support@ecmwf.int
- MARS/ ftp: contact servicedesk@ecmwf.int