PROGRAMME OF THE EUROPEAN UNION

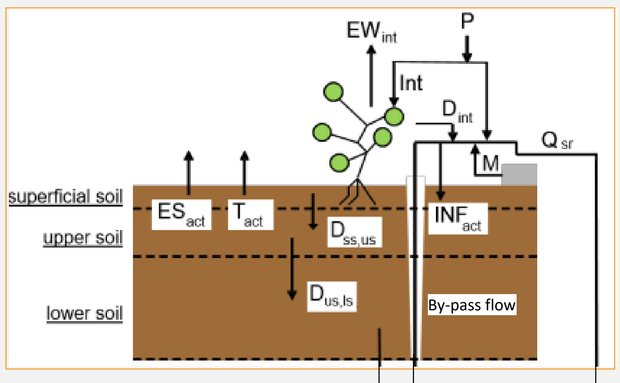
Implemented by European Commission

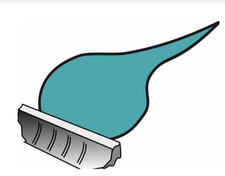
Open Source hydrological model LISFLOOD

Modelling approach

Physically based, distributed.

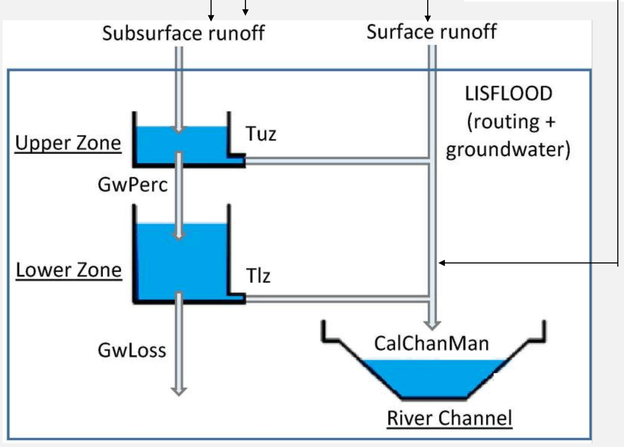
- Sub-grid modelling approach: 6 land covers in 1 pixel;
- 3 soil layers;
- 2 groundwater storages;
- kinematic wave routing in channels and floodplains;
- lakes and dams;
- water abstraction for human use.

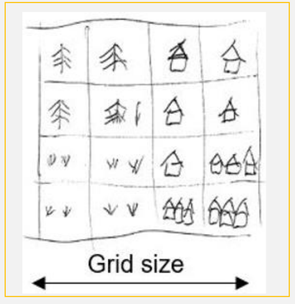




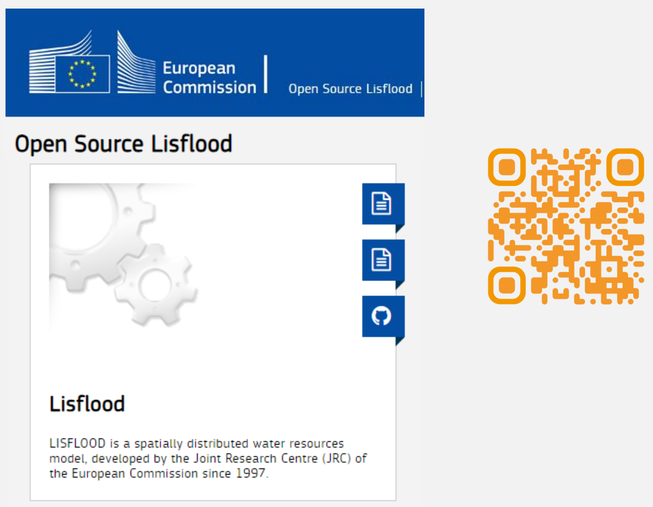
LAKES: WEIR OUTFLOW

RESERVOIRS: STANDARD OPERATIONAL RULES



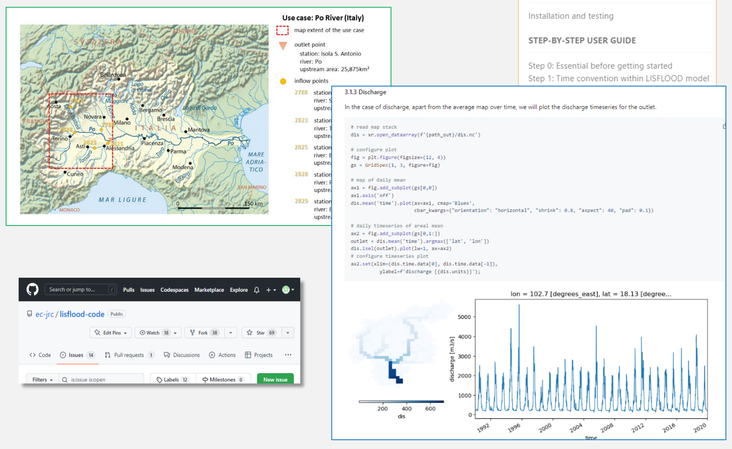


Landing page

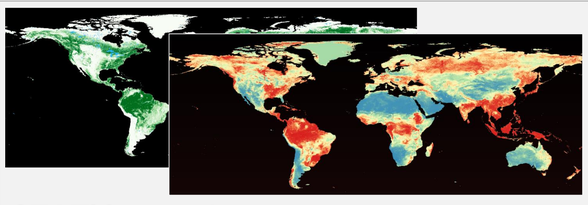


Documentation and users support

- Model documentation
- Model user guide
- User cases (ready-to-use set-ups)
- Jupyter notebook
- Users' support: GitHub issues



Simulation set-up



STATIC maps*

Terrain morphology, river network, soil properties, land cover and land use features, water demand for human use, …

METEO forcings*

Total precipitation
Average temperature
(Evapo)transpiration

Command line: 1 argument = file .xml Settings

Paths to inputs and outputs.
Switches to select the modules.

```
<!--
##########################################################
##      ####  ######  ######## ##      ########  ######  ########
##       ##  ##    ## ##     ## ##      ##     ## ##    ##    ##
##       ##  ##       ##     ## ##      ##     ## ##          ##
##       ##   ######  ######## ##      ##     ## ##          ##
##       ##        ## ##       ##      ##     ## ##          ##
##       ##  ##    ## ##       ##      ##     ## ##    ##    ##
######## ####  ######  ##       ######## ########  ######     ##
##########################################################
-->
<lfsettings>
    <lfoptions>
        #-------------------------------------------------------
        # modelling and reporting options
        #-------------------------------------------------------
        <setoption choice="1" name="SplitRouting"/>
        <setoption choice="1" name="simulateLakes"/>
        <setoption choice="1" name="simulateReservoirs"/
        <setoption choice="1" name="wateruse"/>
        <setoption choice="1" name="TransientWaterDemandChange"/>
        <setoption choice="0" name="useWaterDemandAveYear"/>
        <setoption choice="1" name="wateruseRegion"/>
        <setoption choice="1" name="drainedIrrigation"/>
        <setoption choice="1" name="riceIrrigation"/>
        <setoption choice="1" name="openwaterevapo"/>
        #-------------------------------------------------------
        # report time series
        #-------------------------------------------------------
        # report discharge TS
        <setoption choice="1" name="repDischargeTs"/>
```

MAPS, and TIME SERIES: discharge, soil moisture, snow cover, …

Computational efficiency

OS LISFLOOD can be used as a **library**: it is possible to run multiple instances in a thread-safe environment.

- **Optimal management of large input** : NetCDF reader for forcings based on Xarray; all the static maps and forcings can be stored in cache.
- **Parallel computations** using numba python package.

https://github.com/ec-jrc/

- lisflood-code,
  the hydrological model
- lisflood-lisvap
  utility to generate reference (evapo)transpiration
- lisflood-calibration
  parameter optimization (DEAP)
- lisflood-utilities
  collection of tools
- lisflood-usecases
  ready to use setups and Jupyter Notebook for beginners
- pyg2p
  Interpolation of gridded meteorological forecasts, and of in-situ meteo measurements

How to install and use OS LISFLOOD

	pros	cons	For whom it is recommended
Docker	Easy to install and use for beginners, powerful for experts. One image file containing everything, including source code. Scalable	Large image size for a single application. Changes in container are not saved automatically	• Anyone who wants to start testing without long installation steps. • Users that are more confident with docker and want to use the docker scalability features.
Pip package	Easy to install. Can be installed in conda environment	Can have some dependency issues. Source files not easy to handle ("hidden" in environment folders)	Anyone who just wants to run the model in few steps and is more confident with conda environment.
Source code	Full control on the model source code.	Requires more steps and expertise to install and use. Can have same dependency issues as pip package	Expert users

***OS LISFLOOD publicly available datasets**

Meteorological forcings EFAS v5.0
0.0167 degrees

Static Maps EFAS v5.0
0.0167 degrees

Static Maps GloFAS v4.0
0.05 degrees

References: https://egusphere.copernicus.org/preprints/2023/egusphere-2023-1306/
https://essd.copernicus.org/articles/14/3249/2022/

Copernicus Emergency
emergency.copernicus.eu

CopernicusEMS