



PROGRAMME OF THE
EUROPEAN UNION

Copernicus
Europe's eyes on Earth



European
Commission

Open Source LISFLOOD hydrological model

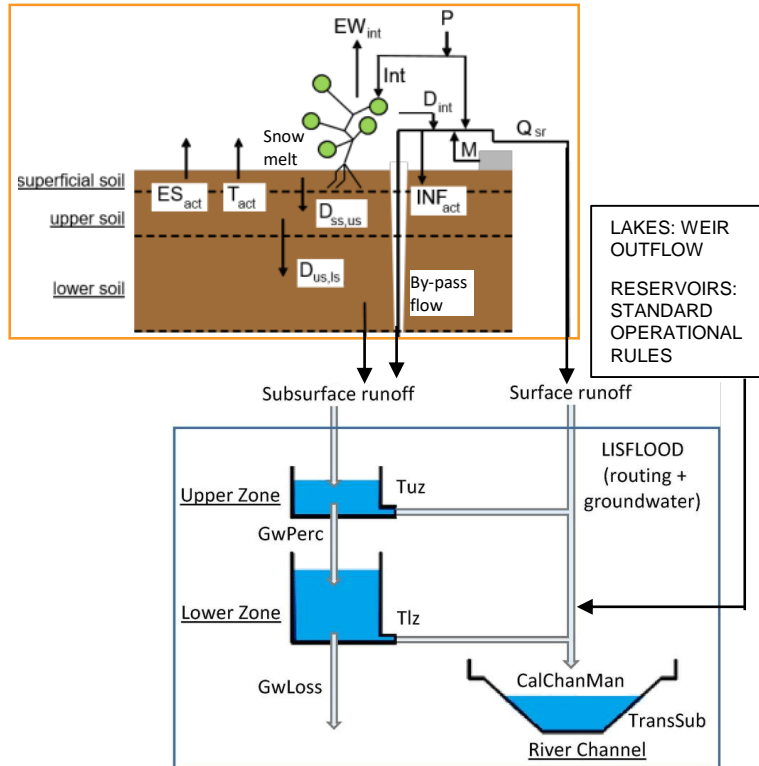
UN-SPIDER / DLR / ZFL International Training Workshop
"Space technologies for flood management"

UN Bonn – 20 February 2023
(Supplementary material)



COPERNICUS
EMERGENCY
MANAGEMENT
SERVICE

OS LISFLOOD hydrological model



LISFLOOD-OS: Semi-distributed, physically based model

- 6 land cover fractions within a pixel;
- 3 soil layers;
- 2 groundwater storages;
- kinematic wave routing in channels and floodplains;
- lakes and dams;
- water abstraction for anthropogenic use.

COMPUTATIONALLY EFFICIENT!

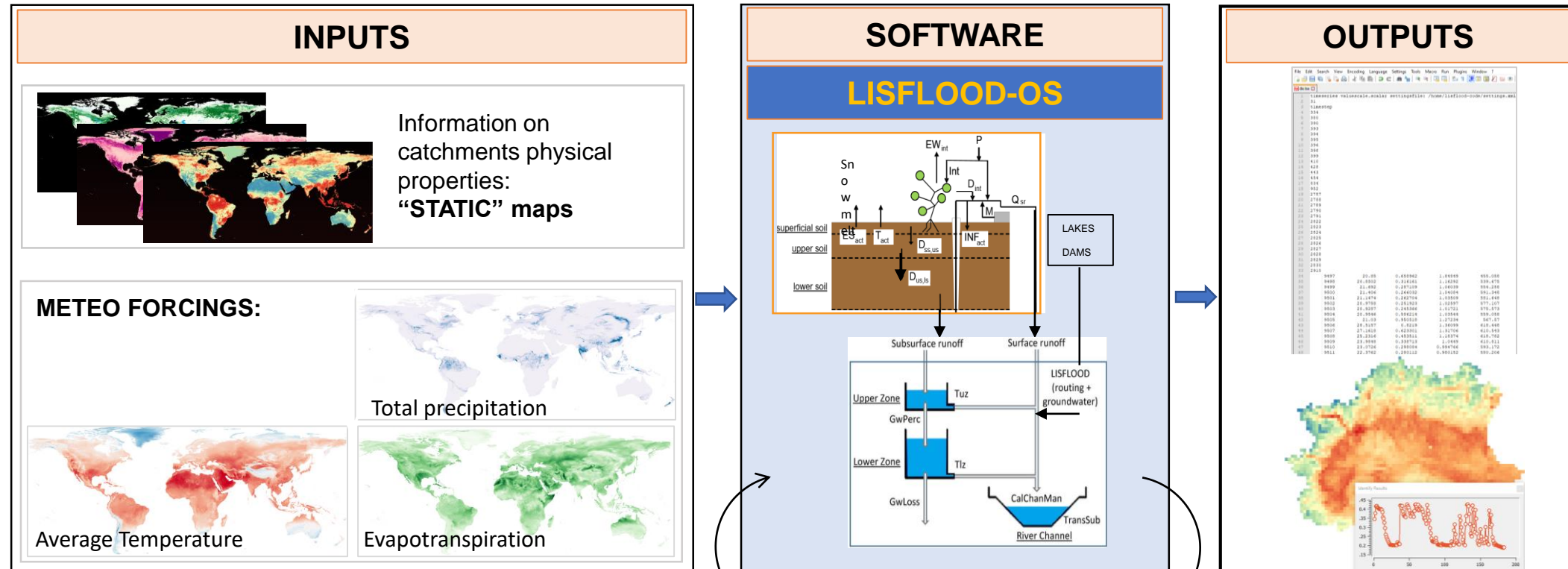
- Optimal management of large input.
- Parallel computations.

Open Source code and documentation:

<https://github.com/ec-jrc/lisflood-code>

<https://ec-jrc.github.io/lisflood-model/>

OS LISFLOOD hydrological model



Command line: 1 argument = file .xml Settings
 Paths to directories of the input maps and of the output maps.
 Switches to select the modules, and the desired outputs.

How do I prepare the inputs?

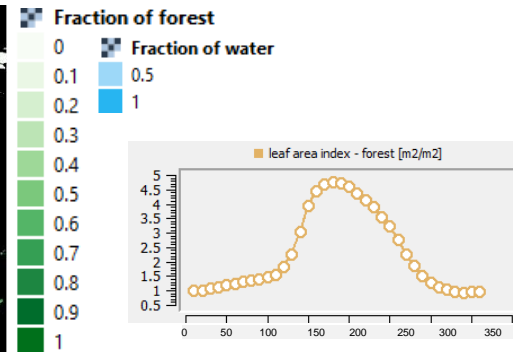
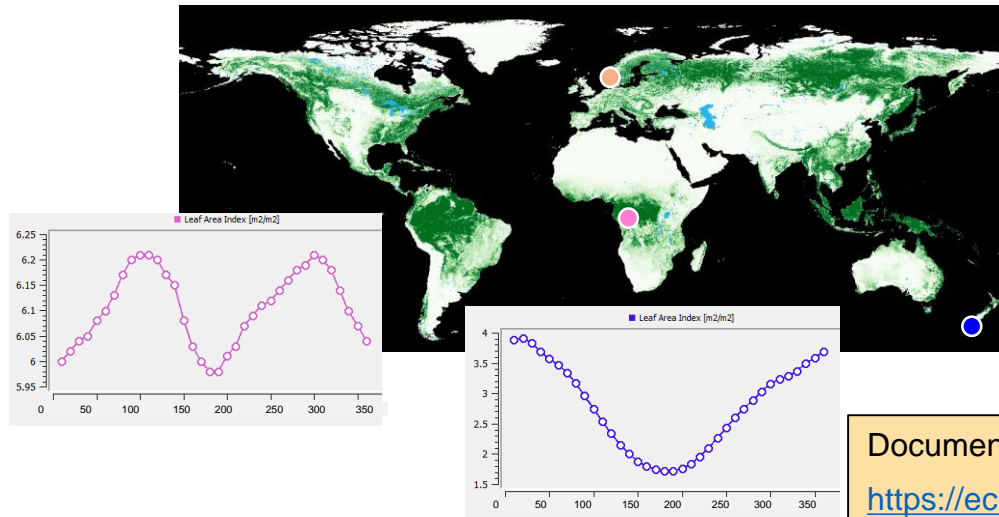
How do I install the code on my laptop?

OS LISFLOOD static maps

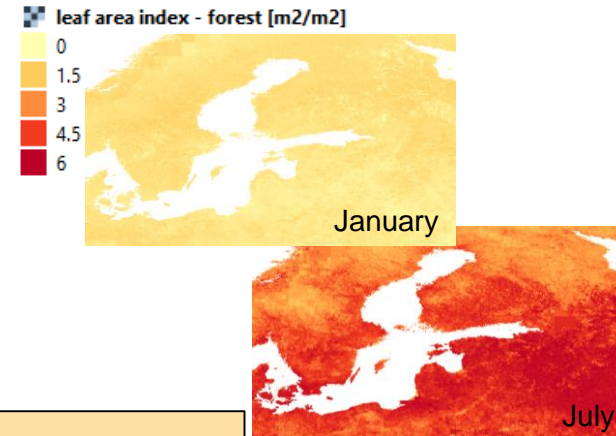
~100 maps providing information on catchments' morphology, land cover and land use, soil properties, water demand for human use.

Examples:

Land use fractions



Leaf area index



Documentation about the static maps:

https://ec-jrc.github.io/lisflood-code/4_Static-Maps-introduction/

Scientific publication and release of the data set: work in progress!

STATIC MAPS

- Introduction
- General maps
- Topography maps
- Land use maps
- Land use depending maps
- Soil hydraulic properties maps
- Channel geometry maps
- Leaf area index maps
- Reservoirs and lakes maps
- Rice calendar maps
- Static maps: appendix

LISFLOOD

Lisflood OS page Model Documentation User Guide Use Cases Utilities LISVAP

INTRODUCTION

About LISFLOOD

About this user guide

INSTALLATION

Installation and testing

STEP-BY-STEP USER GUIDE

Step 0: Essential before getting started

Step 1: Time convention within LISFLOOD model

Step 2: Preparing the settings file

Step 3: Preparing input files

Step 4: Initialisation of LISFLOOD

Step 5: Running LISFLOOD

Step 6: Model output

STATIC MAPS

Introduction

General maps

Topography maps

Land use maps

Land use depending maps

Grid horizontal resolution maps

USER GUIDE FOR THE CREATION OF THE INPUT MAP DATASET

About this user guide

This user guide provides instructions and examples to create static maps required as an input for LISFLOOD hydrological model.

The examples in this user guide have been derived from the generation of the static input maps for the European and Global Flood Awareness Systems (EFAS and GloFAS) of the Copernicus Emergency Management Service. Users are encouraged to create their own static maps for their region of interest and using local, national or any other type of source data. Possible data sources, used as examples in this user guide, are listed in the [Appendix](#).

Maps can be elaborated with any GIS/remote sensing software. Examples in this guide have been performed using CDO, GDAL, Python, and Google Earth Engine platform.

Projection and file type

OS LISFLOOD installation

- How can I install LISFLOOD on my pc?


	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	<ul style="list-style-type: none">• Anyone who want 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 want 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 suite

ec-jrc.github.io/lisflood/

European Commission | Open Source Lisflood | Add-ons | Documents | How to contribute

Open Source Lisflood



Lisflood

LISFLOOD is a spatially distributed water resources model, developed by the Joint Research Centre (JRC) of the European Commission since 1997.

<https://ec-jrc.github.io/lisflood/>

ec-jrc/lisflood-code

Search or jump to... Pull requests Issues Marketplace Explore

<> Code Issues 12 Pull requests Actions Projects Wiki Security Insights

master 19 branches 41 tags

Go to file Add file Code

doc78 Fixed typo in Readme 51d0495 on 13 Jun 495 commits

bin	new compress function	2 years ago
src	Updated requirements and authors	3 months ago
tests	set threads to 1 in test settings files	4 months ago

Model Documentation User Guide Use Cases Utilities LISVAP



LISFLOOD - a distributed hydrological rainfall-runoff model

LISFLOOD Model Documentation

ec-jrc/lisflood-usecases

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master 1 branch 0 tags

Go to file

doc78 Fixed typos in xml files d1de2eb on 1

LF_ETRS89_UseCase	Fixed typos in xml files
LF_lat_lon_UseCase	Fixed typos in xml files
doc	Add Jupyter Notebook

ec-jrc/lisflood-utilities

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master 3 branches 46 tags

Go to file Add file Code

doc78 Merge pull request #29 from ec-jrc/cutmaps_catchments 01dccb3 on 9 Jun 175 commits

bin	19-waterregions_utility	2 years ago
gfit	Merge branch 'master' of https://github.com/ec-jrc/lisflood-utilities	3 years ago
src/lisfloodutilities	Merge branch 'cutmaps_catchments' into bugfix/ctime	4 months ago
tests	Added flexible requirements for most package dependencies. Fixed unit...	5 months ago

ec-jrc/lisflood-lisvap

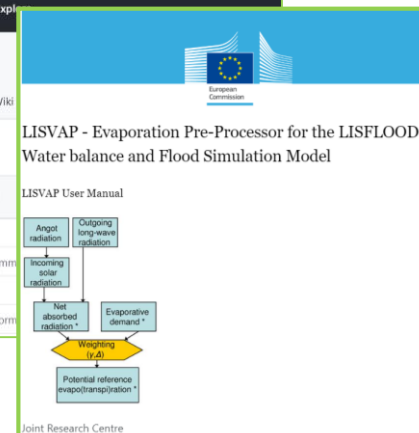
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master 6 branches 19 tags

gnrgomes Merge pull request #54 from ec-jrc/refactor_formulas_selection

basemaps	Resolve Calendar management
bin	add bin script lisvap; setup upload comm
src	Cosmetic
tests	Merge branch 'master' into refactor_form



ec-jrc/lisflood-calibration

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<> Code Issues 4 Pull requests 1 Actions Projects Wiki Security Insights

master 8 branches 3 tags

Go to file Add file Code

corentincarton Merge pull request #5 from ec-jrc/develop bee7be2 on 5 Jul 203 commits

bin	remove check for cache	4 months ago
integration	add deap options	3 months ago
lisval	minor change in restart function	3 months ago
tests	put seed in calibration object	7 months ago

OS LISFLOOD user cases

- LISFLOOD-OS beginners can make use of two complete set-ups to
 - 1) test the installation of the code;
 - 2) get familiar with the code, the static maps, the meteorological forcings.

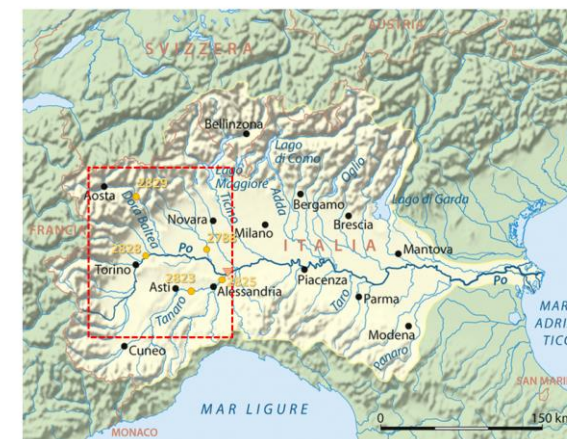
Link to repository: <https://github.com/ec-jrc/lisflood-usecases>



Use case: Fraser River (Canada)

map extent of the use case

- outlet point
station: Quesnel city
river: Fraser River
upstream area: 114,000km²
- inflow points
 - 279 station: Shelley
river: (Upper) Fraser River
upstream area: 32,400 km²
 - 280 station: Isle Pierre
river: Nechako River
upstream area: 42,500 km²
 - 290 station: near Cinema
river: Blackwater river
upstream area: 12,400 km²
 - 305 station: near Quesnel
river: Quesnel river
upstream area: 11,500 km²



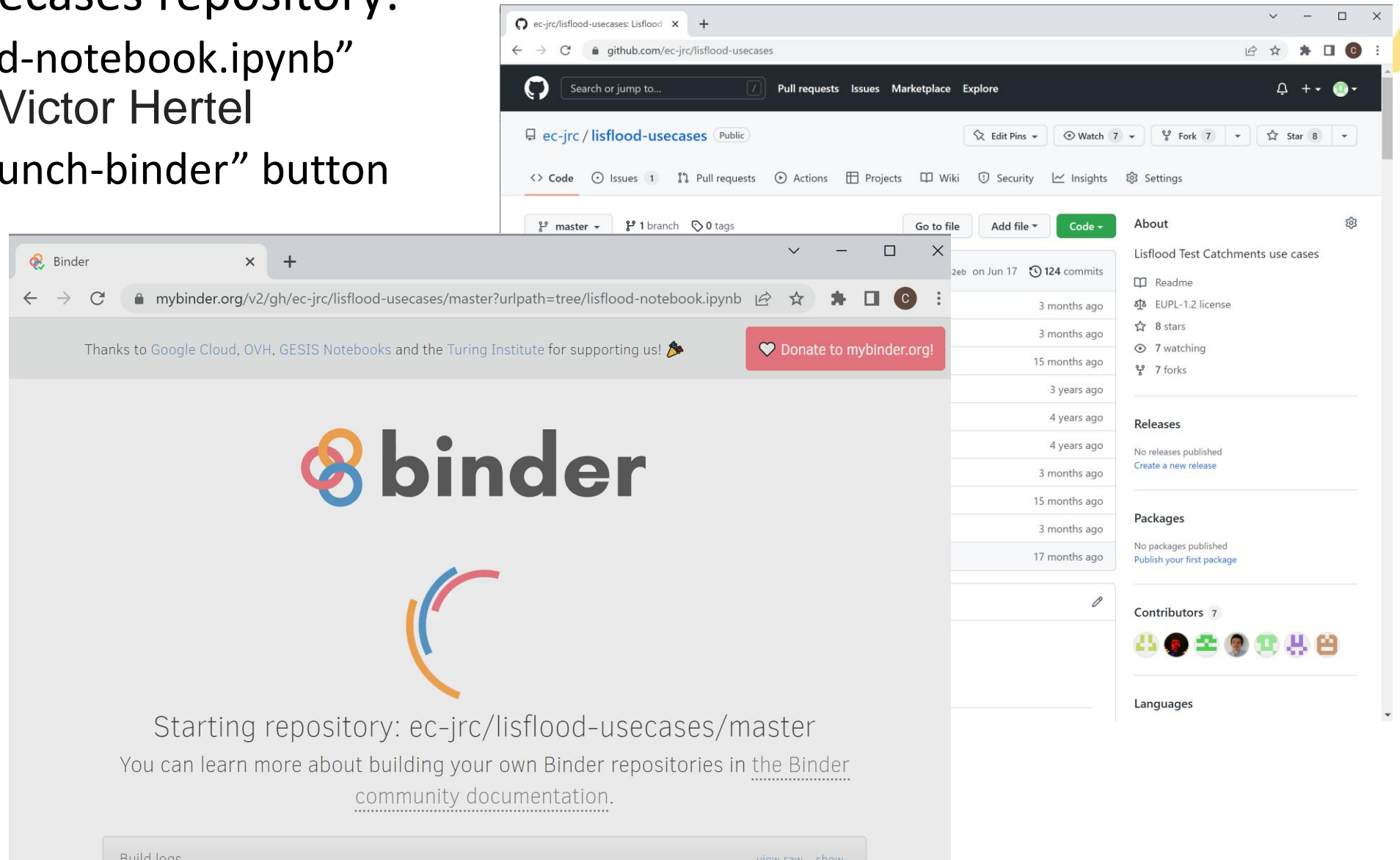
Use case: Po River (Italy)

map extent of the use case

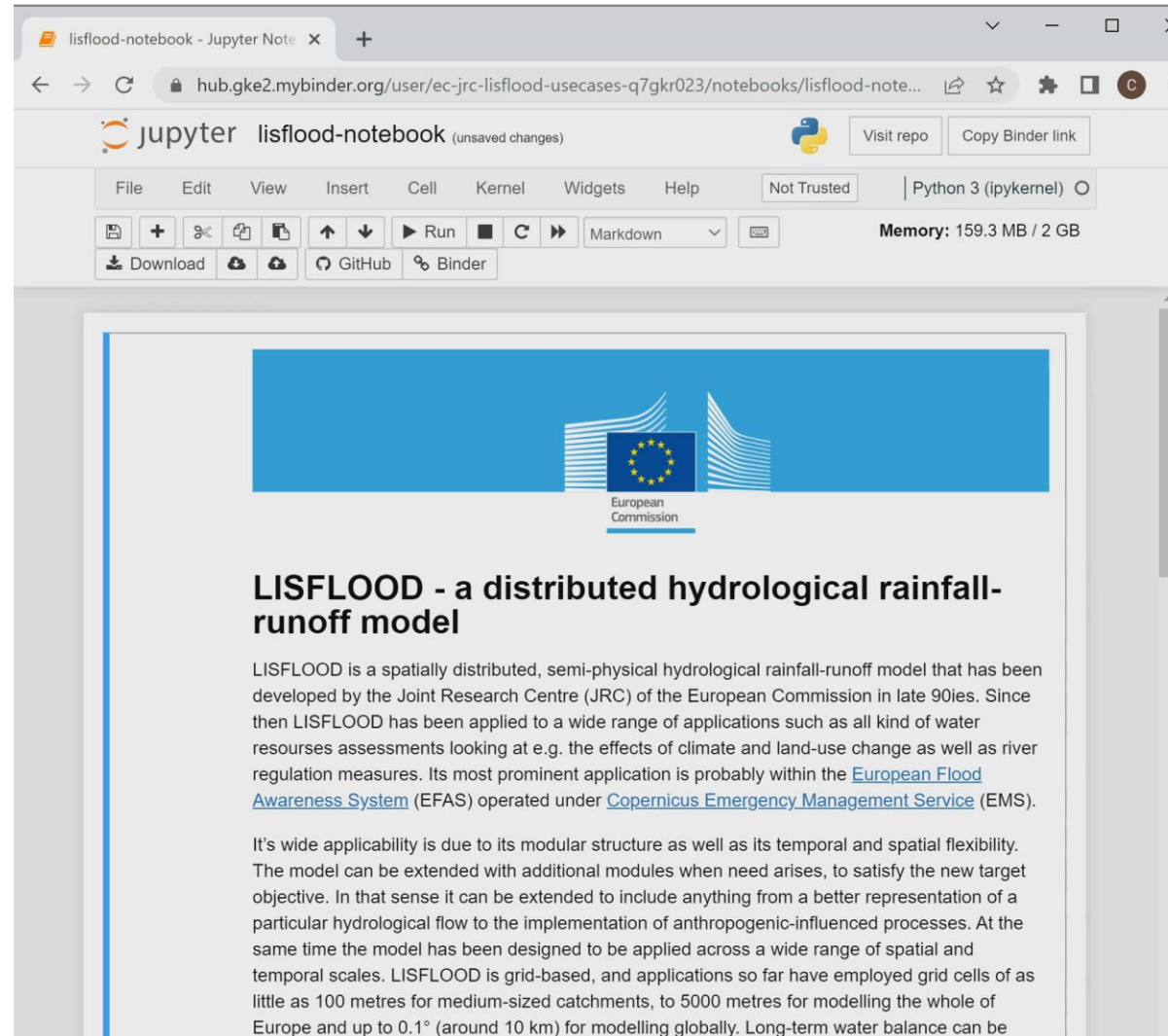
- outlet point
station: Isola S. Antonio
river: Po
upstream area: 25,875km²
- inflow points
 - 2788 station: Palestro
river: Sesia
upstream area: 2,825 km²
 - 2823 station: Masio Tanaro
river: Tanaro
upstream area: 4,400 km²
 - 2825 station: Alessandria
river: Bormida
upstream area: 2,350 km²
 - 2828 station: Castiglione Torinese
river: Po
upstream area: 7,600 km²
 - 2829 station: Hone – Ponte Dora
river: Baltea
upstream area: 2,825 km²

- Jupyter notebook

- In lisflood-usecases repository:
 - File “lisflood-notebook.ipynb” created by Victor Hertel
 - Click on “launch-binder” button



- Jupyter notebook in binder (by Victor Hertel)



lisflood-notebook - Jupyter Note

hub.gke2.mybinder.org/user/ec-jrc-lisflood-usecases-q7gkr023/notebooks/lisflood-note...


jupyter lisflood-notebook (unsaved changes)

Visit repo Copy Binder link

File Edit View Insert Cell Kernel Widgets Help Not Trusted Python 3 (ipykernel)

Download GitHub Binder

Memory: 159.3 MB / 2 GB



LISFLOOD - a distributed hydrological rainfall-runoff model

LISFLOOD is a spatially distributed, semi-physical hydrological rainfall-runoff model that has been developed by the Joint Research Centre (JRC) of the European Commission in late 90ies. Since then LISFLOOD has been applied to a wide range of applications such as all kind of water resources assessments looking at e.g. the effects of climate and land-use change as well as river regulation measures. Its most prominent application is probably within the [European Flood Awareness System](#) (EFAS) operated under [Copernicus Emergency Management Service](#) (EMS).

It's wide applicability is due to its modular structure as well as its temporal and spatial flexibility. The model can be extended with additional modules when need arises, to satisfy the new target objective. In that sense it can be extended to include anything from a better representation of a particular hydrological flow to the implementation of anthropogenic-influenced processes. At the same time the model has been designed to be applied across a wide range of spatial and temporal scales. LISFLOOD is grid-based, and applications so far have employed grid cells of as little as 100 metres for medium-sized catchments, to 5000 metres for modelling the whole of Europe and up to 0.1° (around 10 km) for modelling globally. Long-term water balance can be

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