CEMS Week – EFAS Annual Meeting 2021

A sneak preview to EFASNext (EFAS 5)

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Copernicus Europe's eyes on Earth

European Commission

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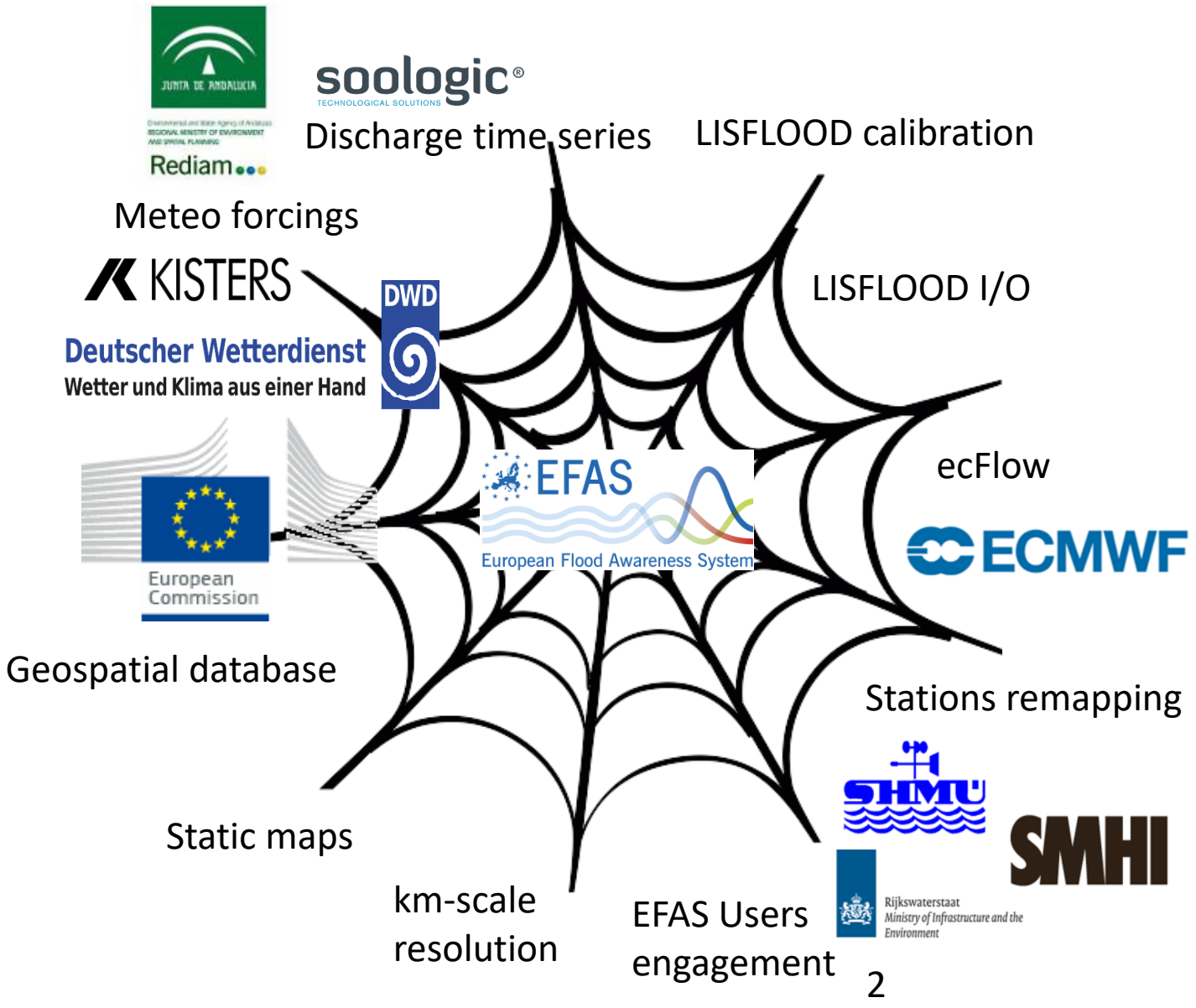
A joint effort

EFASNext in a nutshell:

- **Spatial resolution increases** to 1arcmin (~1.3 km)
- New **meteo and hydro datasets** (longer time series, more stations, improved interpolation algorithm)
- New improved **static maps**
- New **LISFLOOD calibration** (more stations, longer calibration periods)



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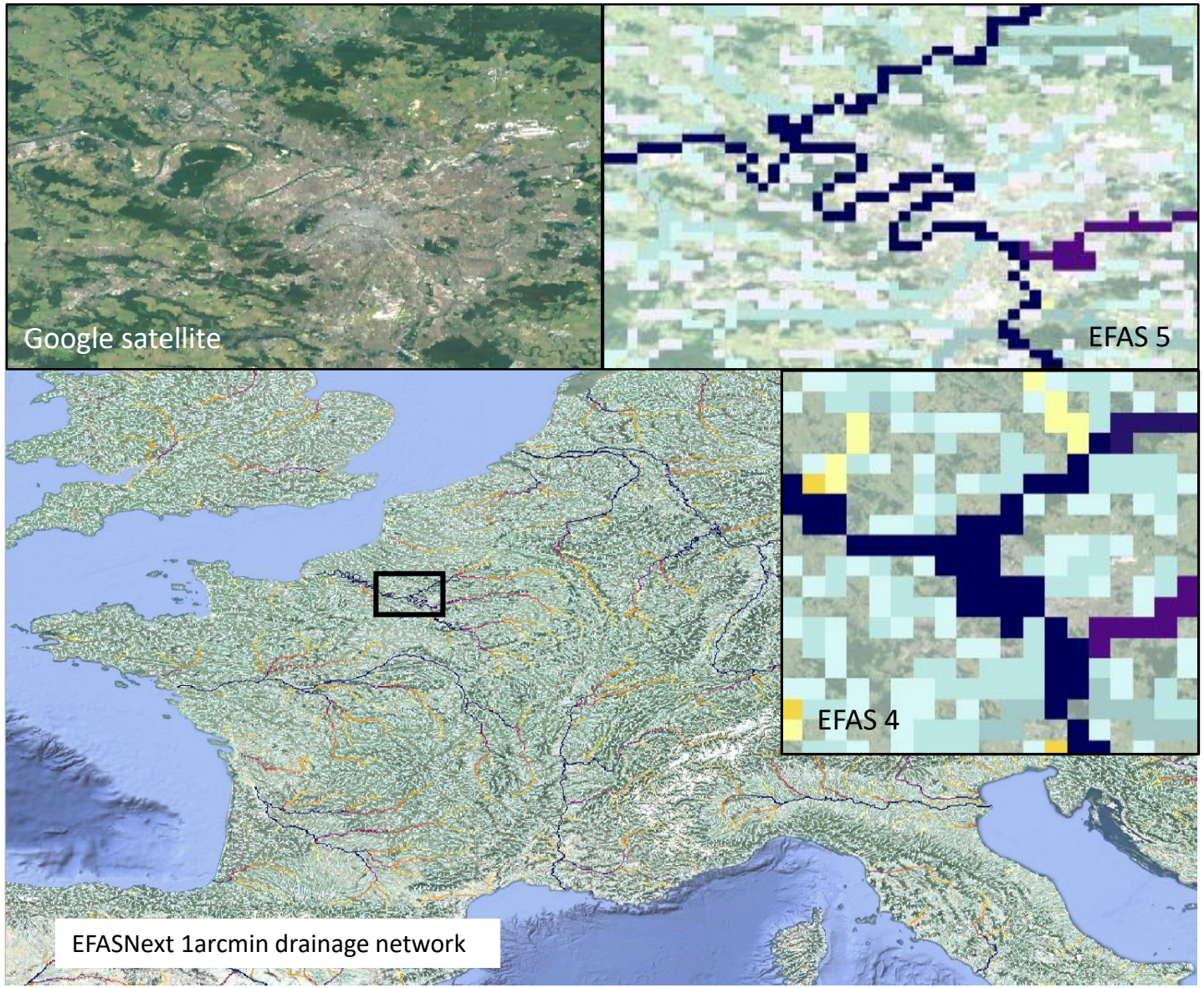
Increasing the spatial resolution: from 5 km to 1 arcmin (~1.3 km)

- A **km-scale EFAS**
- Improved representation of the drainage network
- Better modelling for **small scale catchments**

Large increase in the number of model cells (~ factor 14) !!!



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An improved set of “static” maps

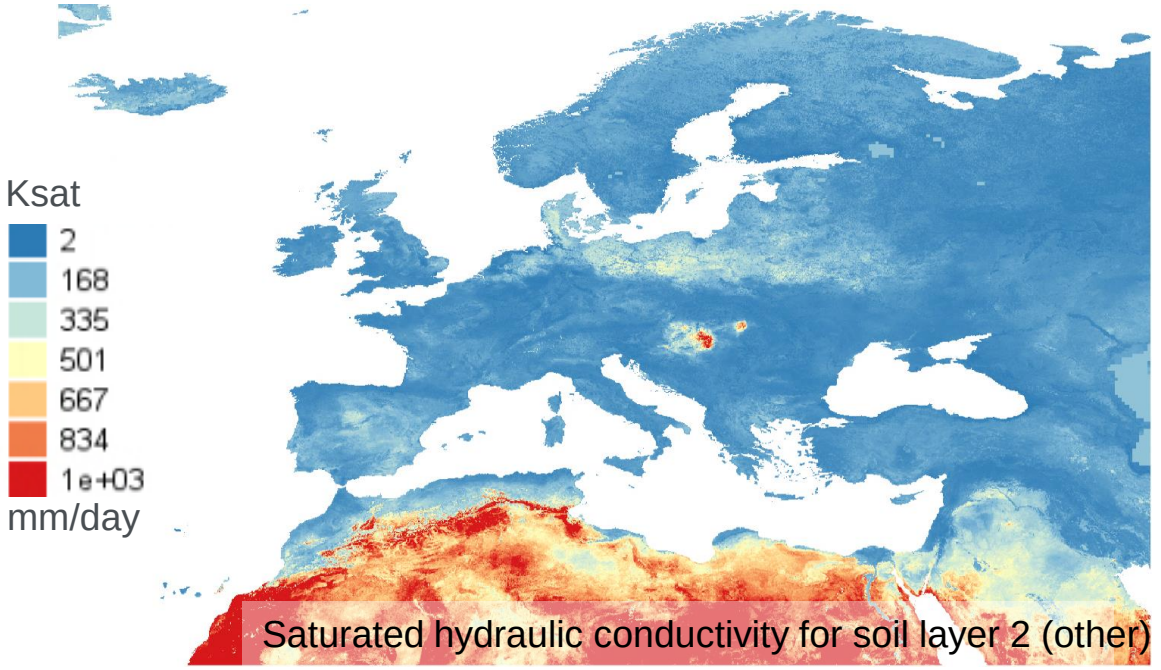
“Static” maps describe the geo-physical properties of the catchments and define LISFLOOD parameters

- ❑ More **physically based** LISFLOOD parameters
- ❑ Improve **LISFLOOD hydrological performance**
- ❑ Improve soil moisture modelling

- ➢ Fractions
- ➢ Land use depending maps
- ➢ Soil hydraulic properties maps
- ➢ Leaf Area Index maps
- ➢ Rice calendar maps
- ➢ Reservoirs and lakes location

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

MERIT DEM
CORINE Land Cover 2018 CLC2018
Copernicus Global Land Cover Layers: CGLS-LC100 collection 2
Global Lakes and Wetlands Database (GLWD)
Copernicus Global Land Service LAI Collection Version 2
SoilGrids250m 2017
RiceAtlas, a spatial database of global rice calendars and production Version 3
…



Saturated hydraulic conductivity for soil layer 2 (other)

New meteorological dataset

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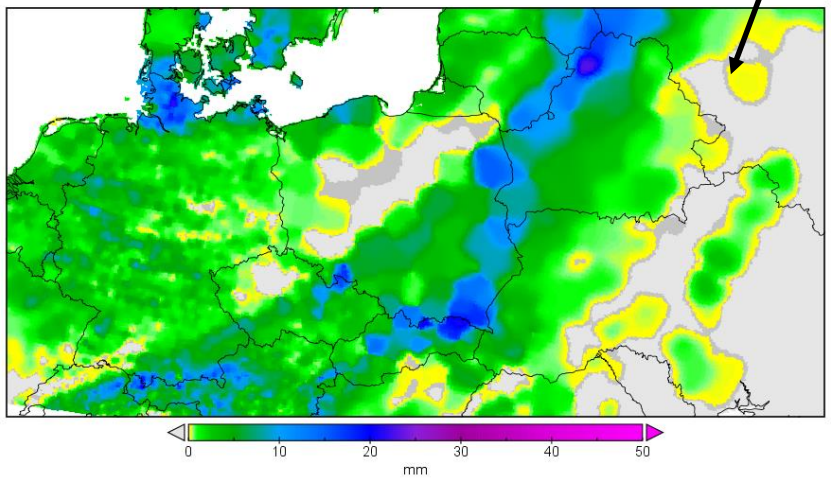
Meteorological input are used by LISFLOOD model calibration and by EFAS in operations

- ❑ Increased spatial resolution
- ❑ Improvements to **duplicated and clustered stations handling** during the grids generation
- ❑ Reduction of steep gradients and plateaus around clustered stations

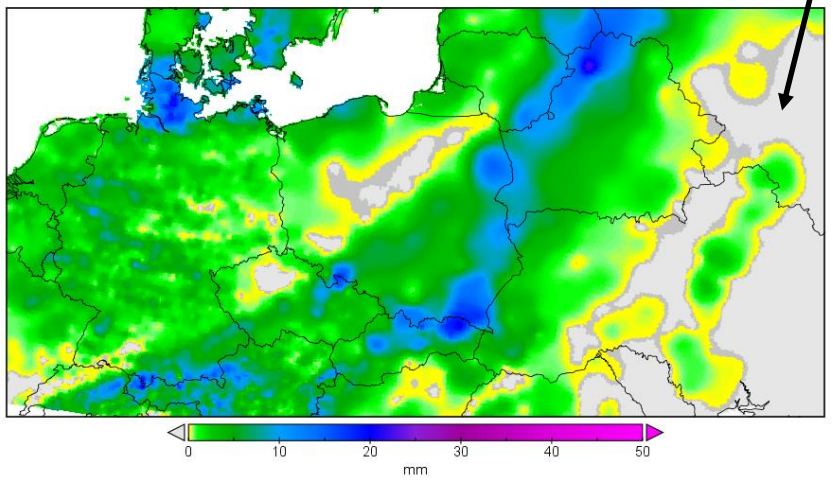
Data for one station could be received from multiple data providers and used multiple times as input for the grids generation.

Multiple provided stations identified before the gridding (station code and coordinates)
Best quality station used for clusters
Data (and metadata) average used for clusters with same quality

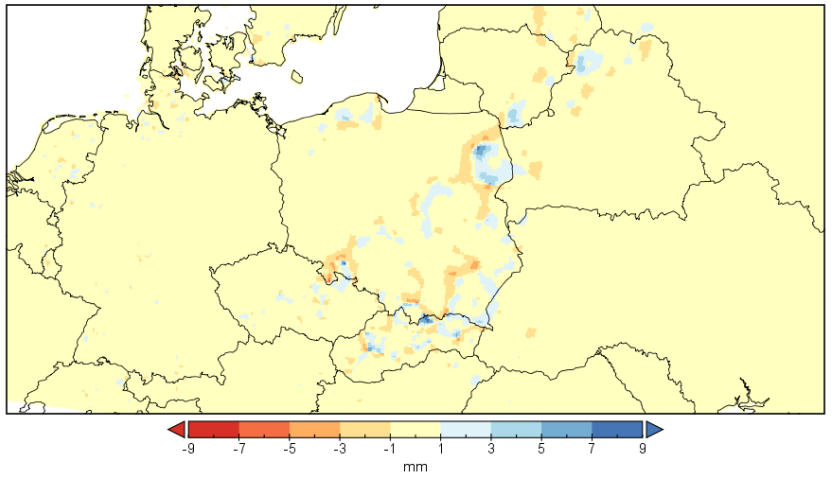
Precipitation with stations duplicates



Precipitation without station duplicates



Difference “with” minus “without” duplicates



New hydrological dataset

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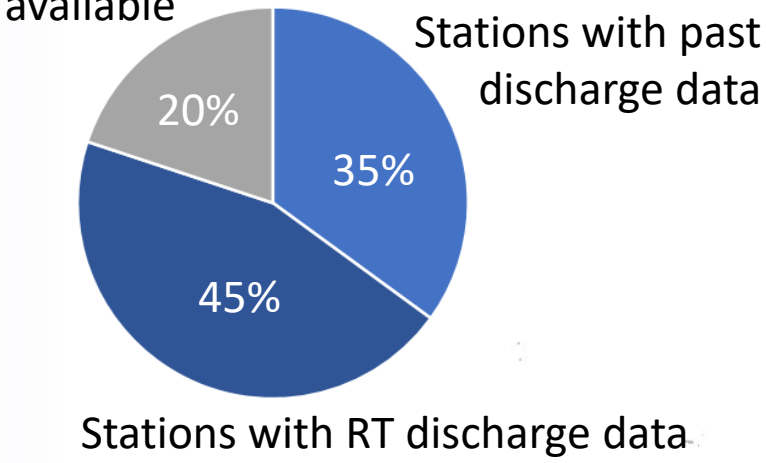
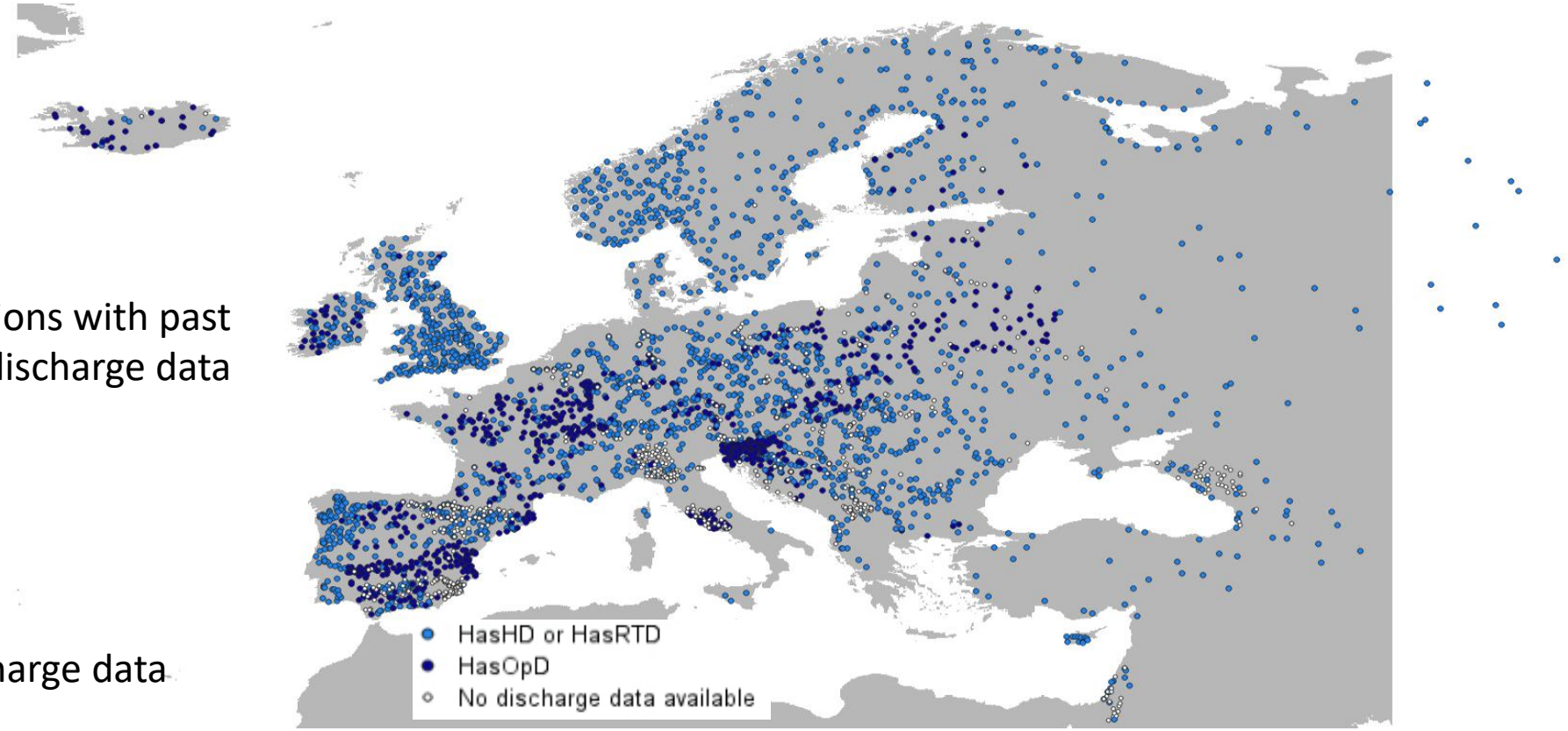
Discharge data are used for LISFLOOD model calibration, post-processing and EFAS evaluation

- **~4000 hydrological stations** (up from 2459 for EFAS4 in 2018)
- ~80% with discharge data, ~54% with sub-daily discharge data
- Calibration period from Jan 1990 to July 2021





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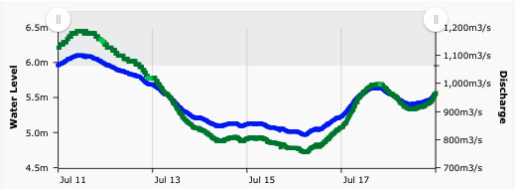
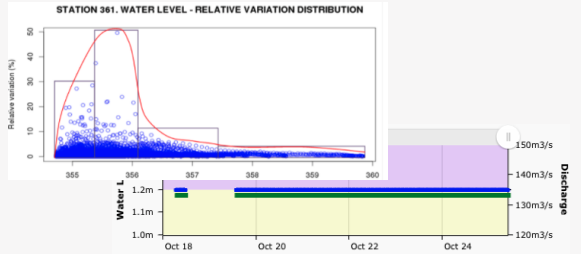
Improved Quality Checks for hydrological observations

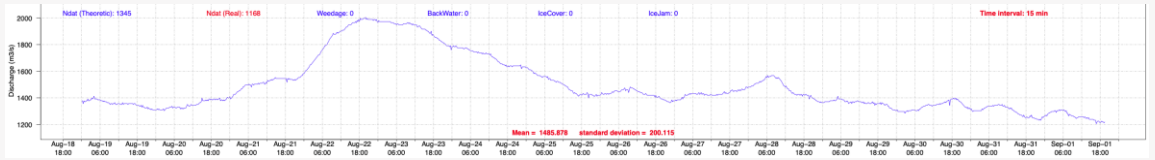
HDCC performs **quality checks on hydrological data** received by Data Providers

Quality Checks

- **Related with observation values**
  - Range Control
  - Negative discharges
  - Comparison with max/min of the month
- **Related with observation behaviour**
  - Variation with respect to prevous value
  - Variation with respect to previous day - same time
  - Repetitive values
- **Others**
  - Visual inspection
  - Regression analysis (pending of definition)







New LISFLOOD calibration

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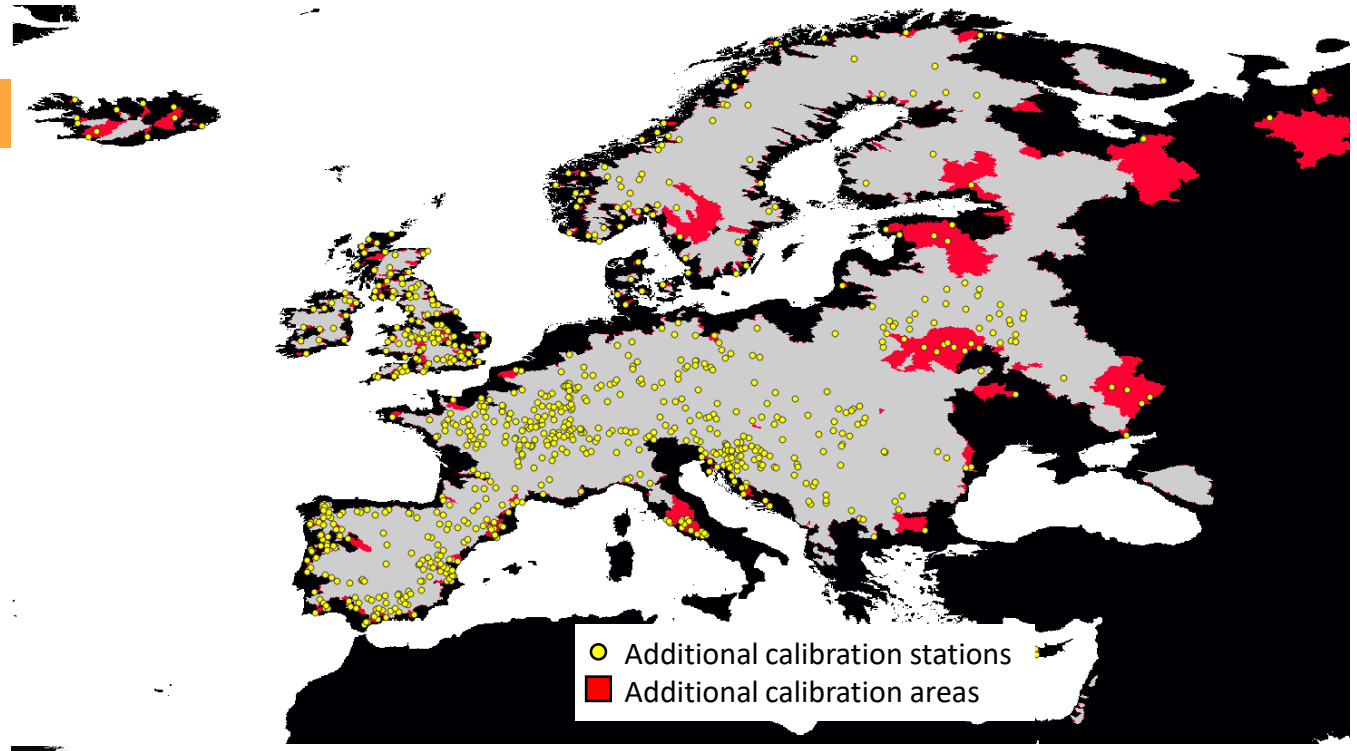
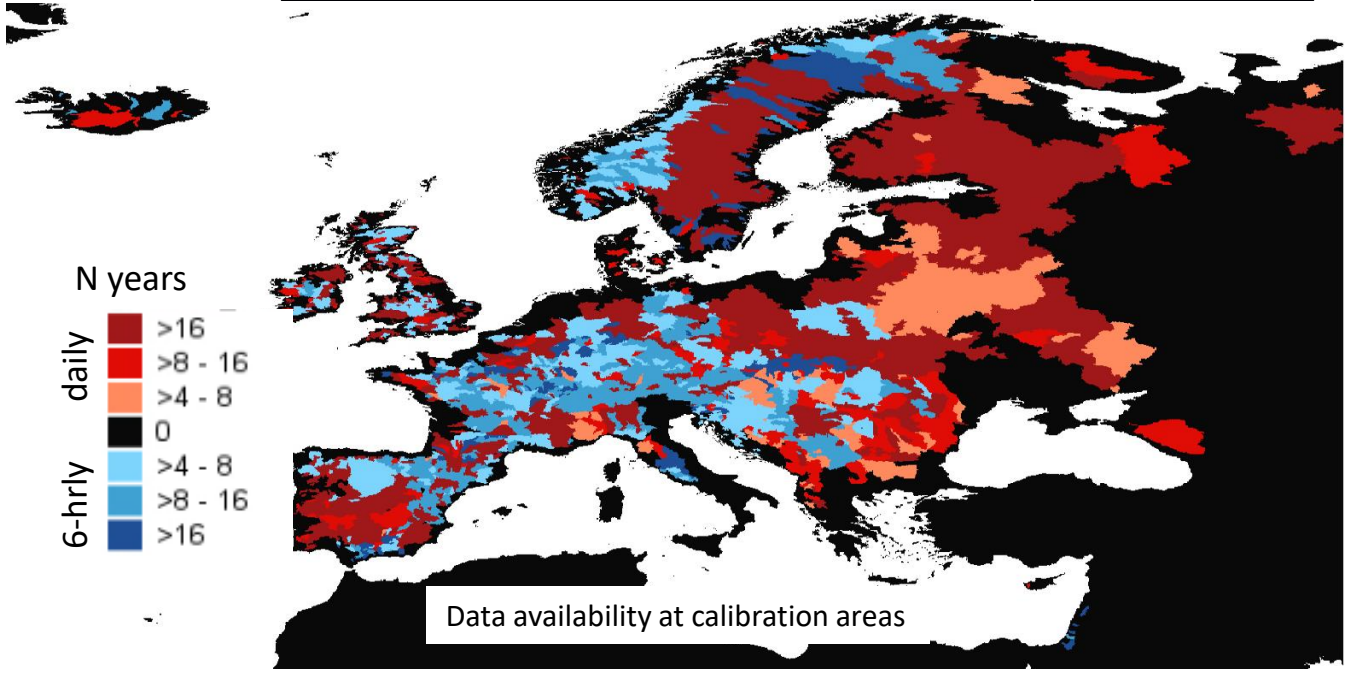
- **Minimum catchment area is 150km2**
- **1886 calibration stations** (971 with 6-hourly and 915 with daily data)
- Jan 1990 – Jun 2021
- **Dual calibration** (same as EFAS 4), 4yrs data min, up to 8 yrs or half data period used
- Performed on **14 LISFLOOD parameters** with 6-hourly modelling steps
- Used **modified KGE** as objective function

Is my station there?
Join the breakout session to find out!





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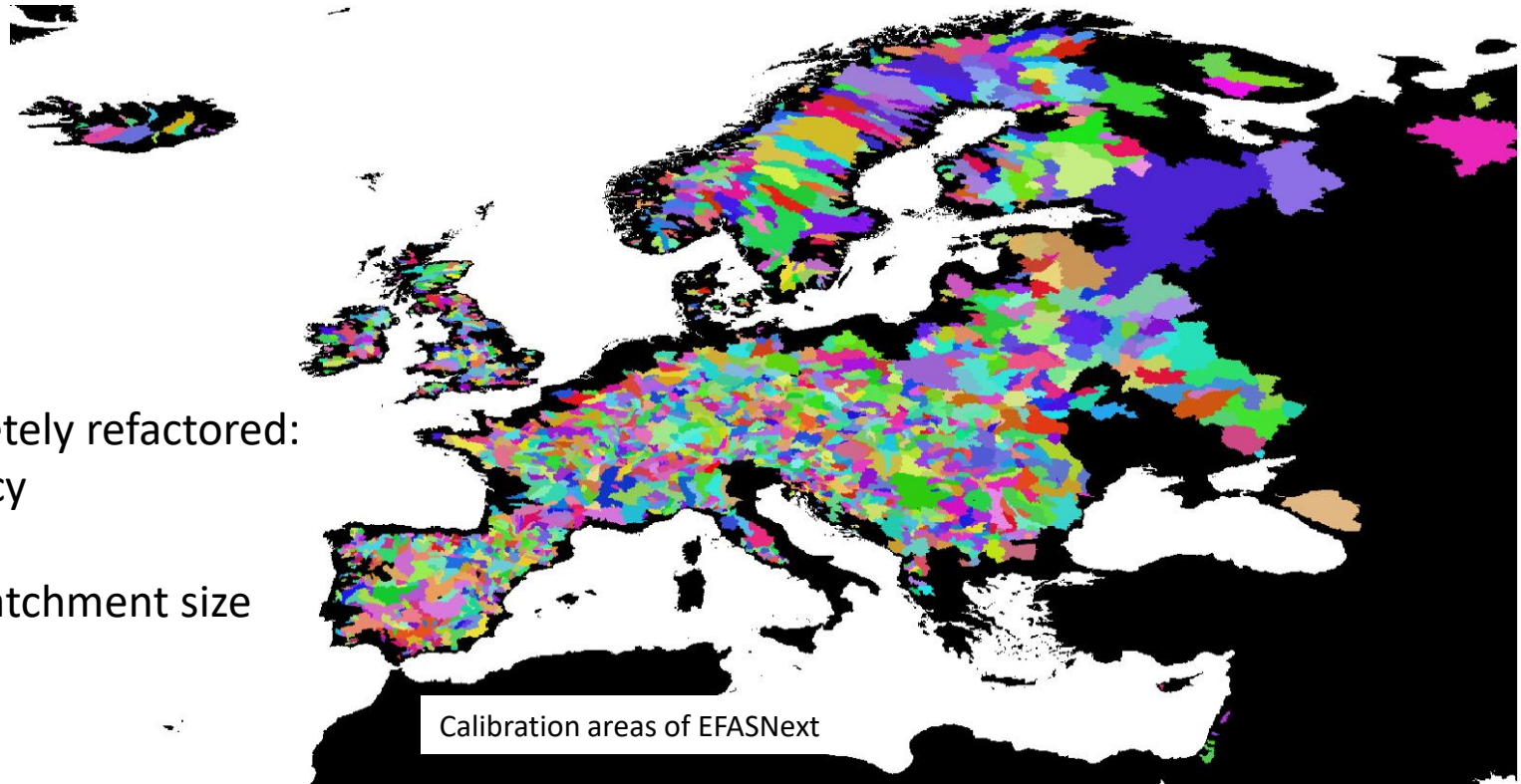
Improvements to LISFLOOD and the calibration tools

LISFLOOD model:

- ❑ New NetCDF reader for forcings based on **Xarray**: 30 times performance gain in calibration mode (i.e. without NetCDF outputs)
- ❑ All the static maps and forcing maps can be stored in a **cache**
- ❑ Lisflood can be used as a library. It is now possible to run multiple instances of Lisflood in a **thread-safe** environment
- ❑ Water abstraction
- ❑ Parallelized “Soilloop” module

Calibration tools:

- ❑ LISFLOOD calibration package completely refactored: improved CI, modularity and efficiency
- ❑ Based on ecFlow scheduler
- ❑ Optimize HPC reseources based on catchment size



Calibration areas of EFASNext

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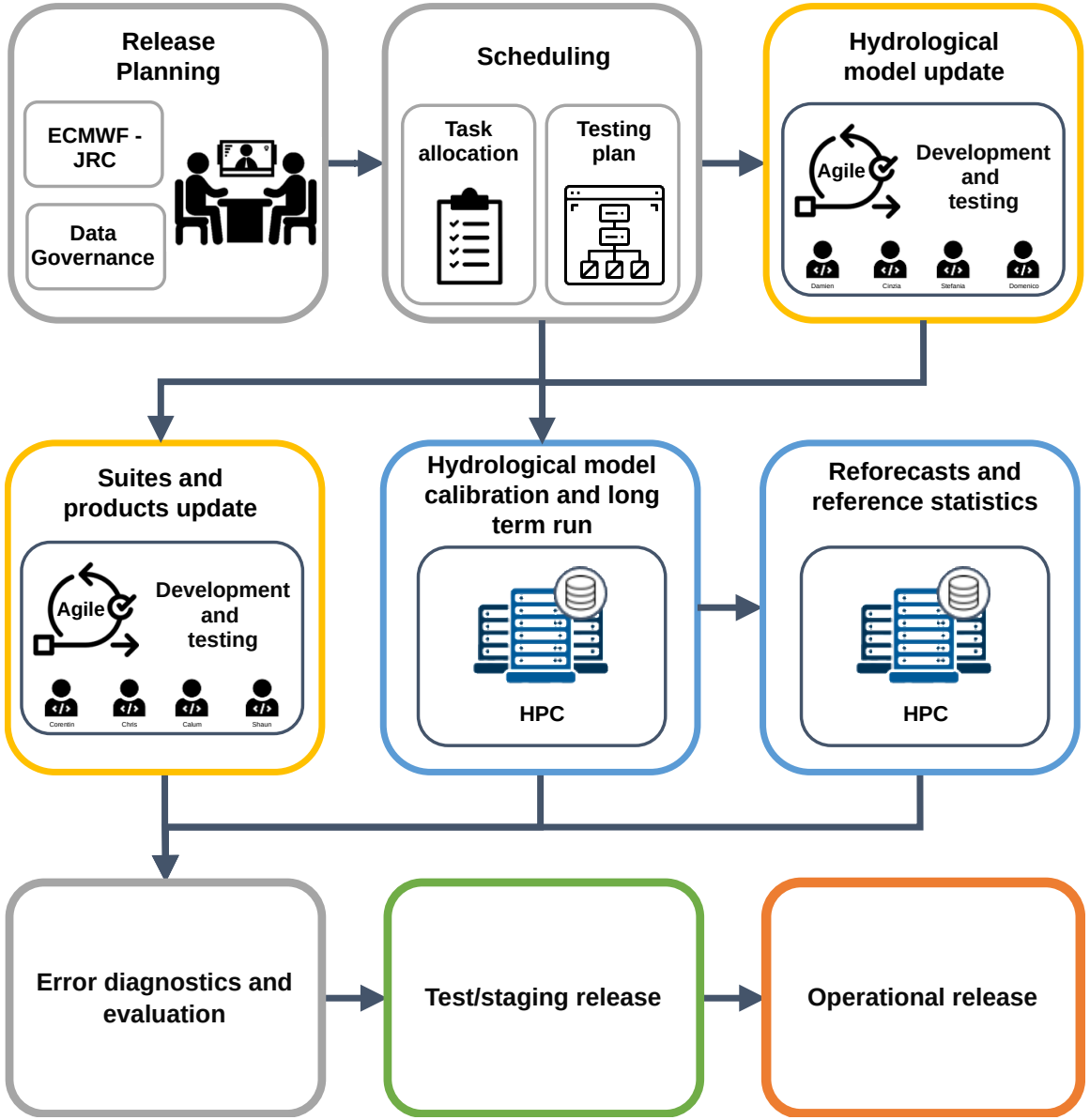
Roadmap to EFASNext

Q2/2019 -> Q4 /2021

Q4/2021 -> Q3 /2022

Q4 /2022



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Thank you!