

PURE project - RACER - FLOODS

Investigating uncertainties through the model tool chain

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Background

If a river rises above its banks, water will submerge areas which are normally dry, causing damages to people, properties and infrastructures.



Understanding the phenomena involved in a flood and quantifying their effects allows modellers and engineers to design mitigation measures.

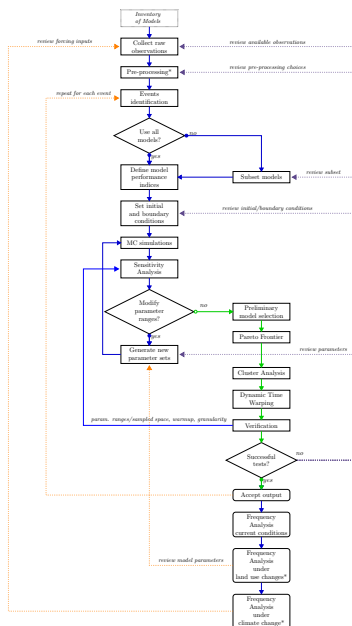
However the complexity of this type of natural hazard and the numerous sources of uncertainties involved make flood risk extremely difficult to quantify.

Aim and scope of the project

The aim of the project is to set guidelines to identify all sources of uncertainties and quantify their effects.

We propose to achieve the scope by making explicit all the steps involved in the modelling exercise.

The workflow on the right illustrates the typical steps of a flood frequency analysis.



Modelling tool chain

We are developing tools to guide modellers through all the steps of the workflow.

All the tools (developed as R-packages) are **open-source projects**.
If you wish to contribute, please get in touch!

The development version is already available from the GitHub public repository.

Each project has a **dedicated homepage and tutorials**.

Open-source projects

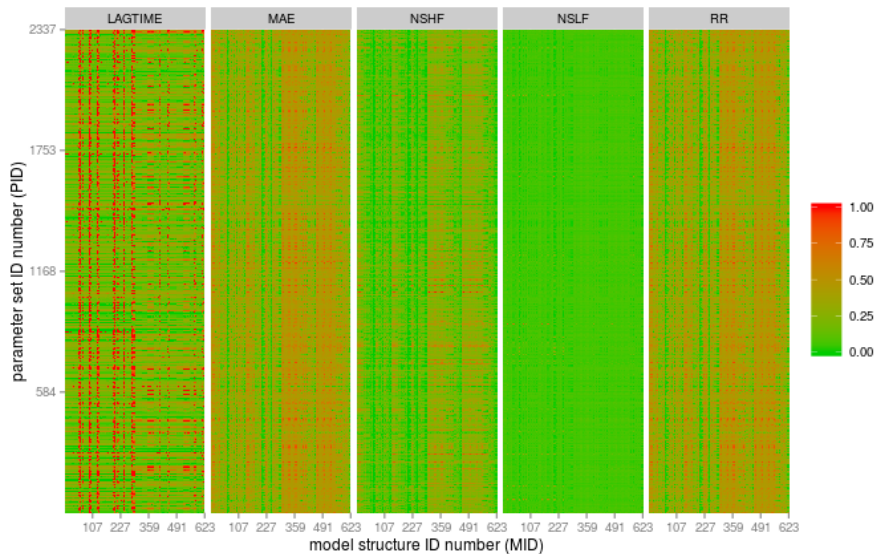
- ▶ **hddtools** to simplify non-programmatic access to open hydrological data (e.g. GRDC, Data60UK, NASA's TRMM, etc.)
http://cvitolo.github.io/r_hddtools/
- ▶ **rnrf** to simplify programmatic access to open hydrological data served by the UK National River Flow Archive
http://cvitolo.github.io/r_rnrf/
- ▶ **fuse** to model the rainfall-runoff mechanism using an ensemble of conceptual models, according to Clark et al. (2008)
http://ichydro.github.io/r_fuse/
- ▶ **amca** to select the most suitable model(s) within the fuse framework
http://cvitolo.github.io/r_amca/
- ▶ **curvenumber** implements an adaptation of the SCS Curve Number method according to Hawkins (1993)
http://cvitolo.github.io/r_CurveNumber/
- ▶ **pure** to pre-process raw data and build the modelling tool chain
http://cvitolo.github.io/r_pure/

Case studies

- ▶ **Plynlimon** highly instrumented catchments, with recorded changes in land use.
- ▶ **Pontbren** FRMRC high-quality experimental data, with much of the measurement uncertainty already characterised.
- ▶ **Eden** Many areas are at risk of flood. We use two small subcatchments already investigated within the EVOp project: Blind Beck and Dacre.



Analysis: data mining



Analysis: emulation

- ▶ Nathan's poster

Deliverables

- ▶ Vitolo, C., Elkhatib, Y., Reusser. D., Macleod C.J.A., Buytaert, W., 2015. Web Technologies for Environmental Big Data. Environmental Modelling & Software 63, 185198.

Future work

- ▶ Develop further the modelling tool chain (e.g. flood frequency analysis under land use/climate changes)
- ▶ Debugging and testing
- ▶ Improve documentation (e.g. provide more examples, add video tutorials, etc.)

Thank You. Questions?