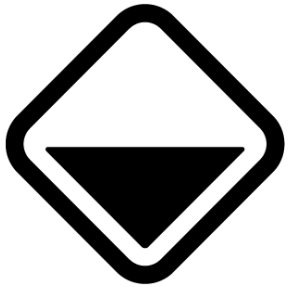


RIESGOS

MULTI-RISK ANALYSIS AND INFORMATION SYSTEM COMPONENTS
FOR THE ANDES REGION

SPONSORED BY THE

Federal Ministry of Education and Research

AN USER FOCUSED APPROACH TO USE WPS PROCESSES FOR THE NATURAL HAZARD DOMAIN AND MULTI-RISK ASSESSMENT

Nico Mandery, Michael Langbein, Mathias Böck, Benjamin Pross, Monika Friedemann, Torsten Riedlinger

DLR GFZ Helmholtz-Zentrum Potsdam AWI TUM 52north exploring horizons geomer EOMAP plan + risk DIALOGIK

ABOUT THE PROJECT

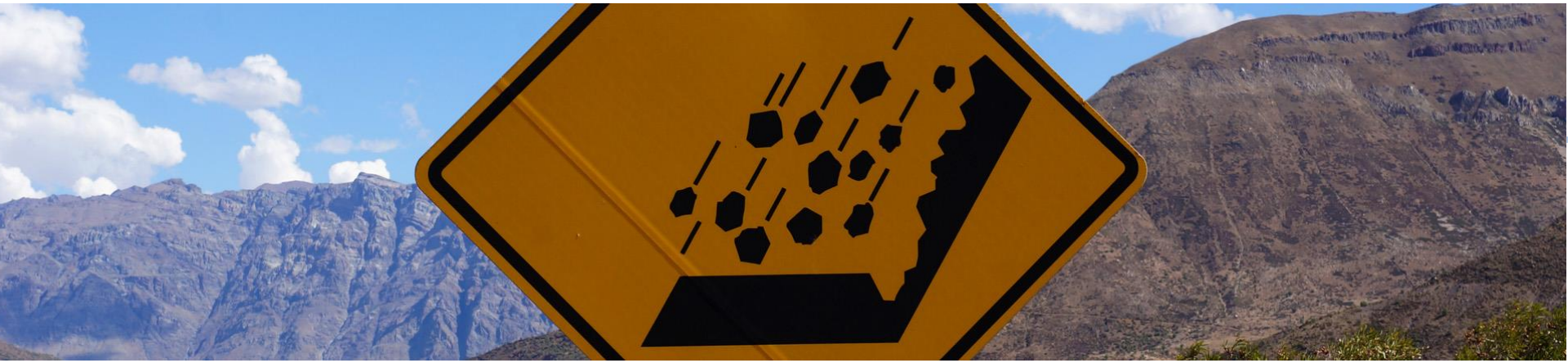
RIESGOS – Motivation & Overall Goal

In recent decades, the **risk to society due to natural hazards has increased** around the globe. To counteract this trend, an efficient risk management is necessary, for which **reliable information is essential**.

Assessment of multi-hazards compound risk, including **dynamic multi-hazard exposure** and **vulnerability analysis**, aimed at the modelling of **cascading and interaction effects.**

RIESGOS – Key facts

PARTNERS	▫ DLR ▫ GFZ ▫ AWI	▫ TUM ▫ 52°North ▫ geomer	▫ EOMAP ▫ plan + risk ▫ Dialogik
ASSOCIATED PARTNERS	▫ GIZ ▫ Munich RE	▫ UNOOSA / UN-SPIDER ▫ UNESCO	
REGION	Chile, Ecuador and Peru		
TOPIC	Natural risks		
FUNDING	BMBF – CLIENT II		
DURATION	01/11/2017 – 30/10/2020 (3 years)		



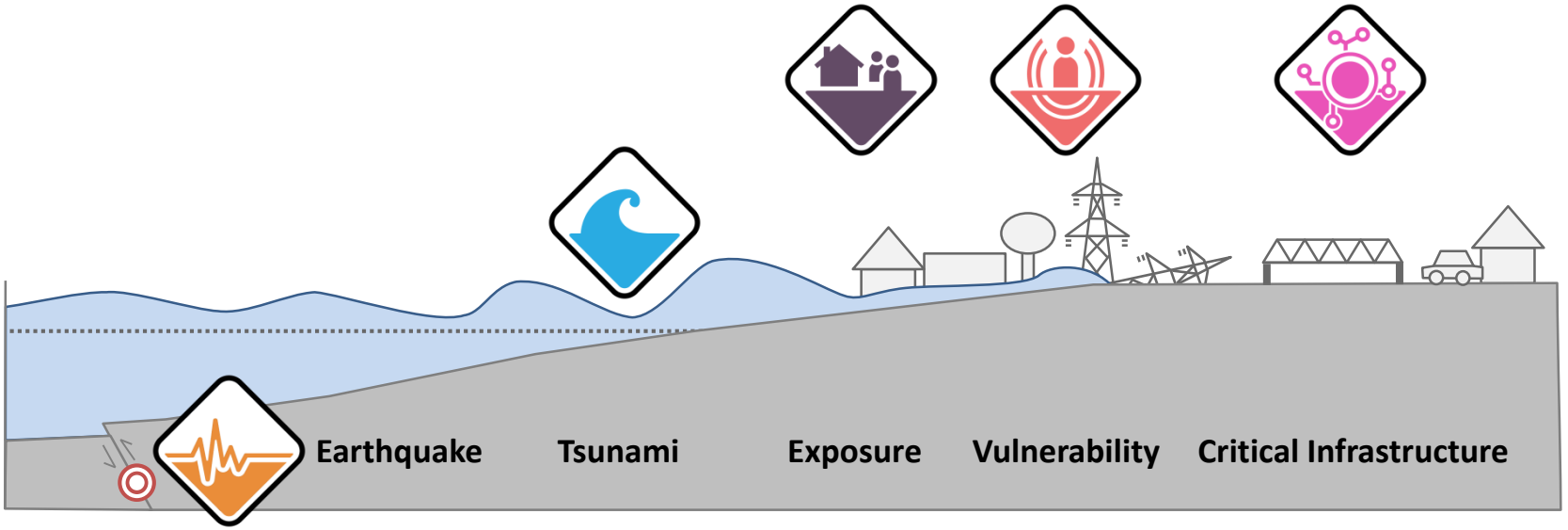

TSUNAMI
RUTA DE EVACUACIÓN
EVACUATION ROUTE
miraflores


VÍA DE
EVACUACIÓN

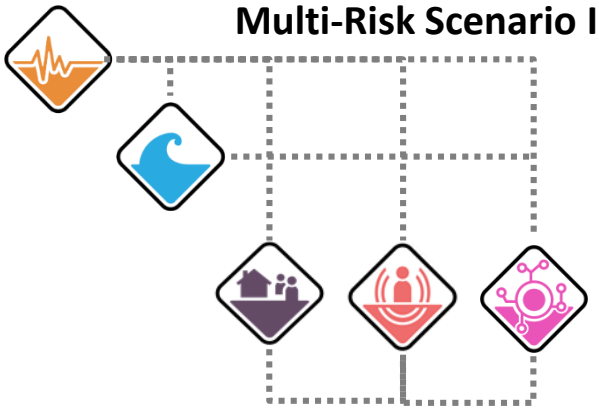

SOCIBER
OCEAN
MAERSK
MAERSK
TPS
TPS


30.00
25.00
20.00
15.00
10.00
5.00
0.00
Flow height (m)

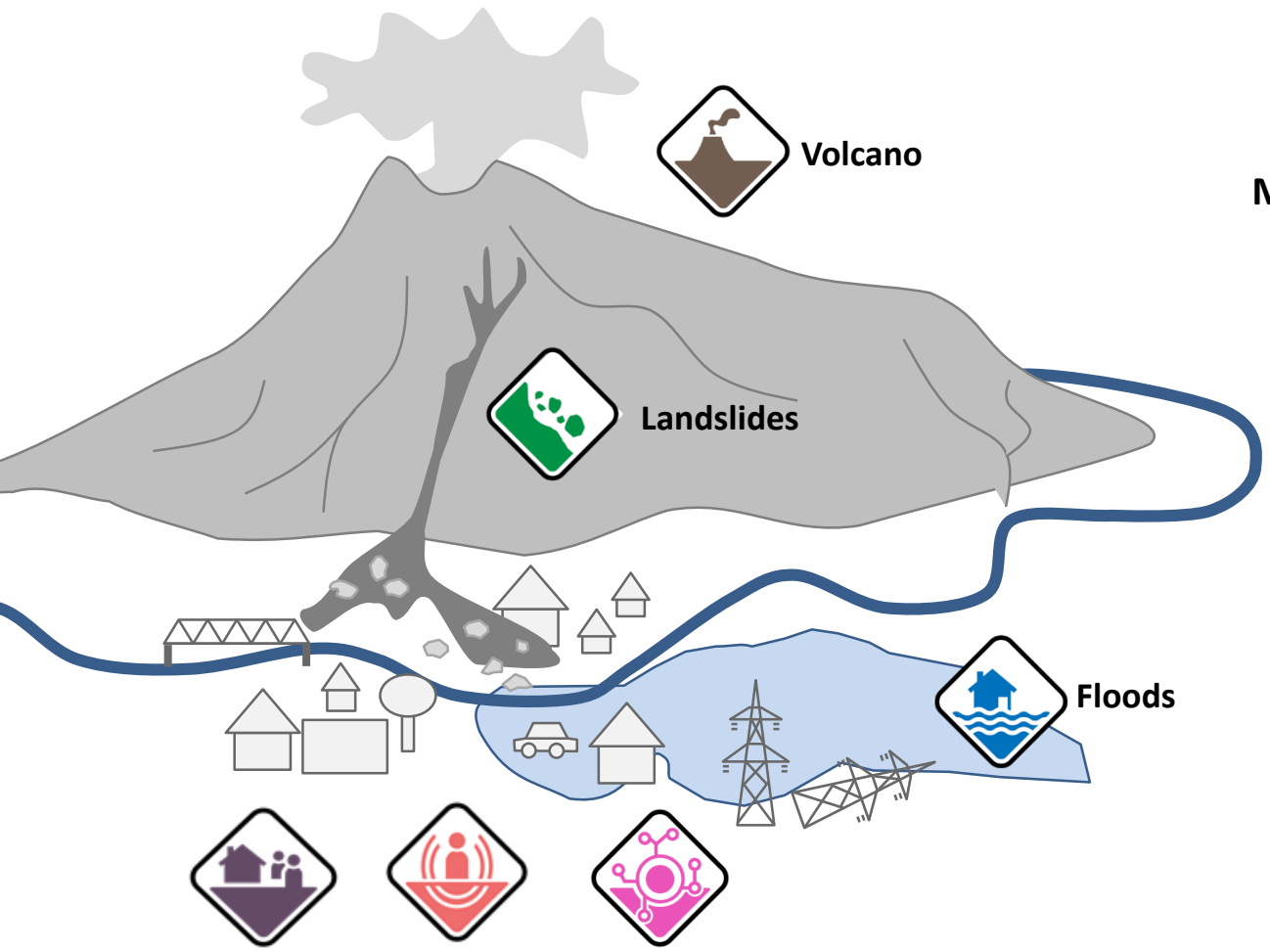
Showcases



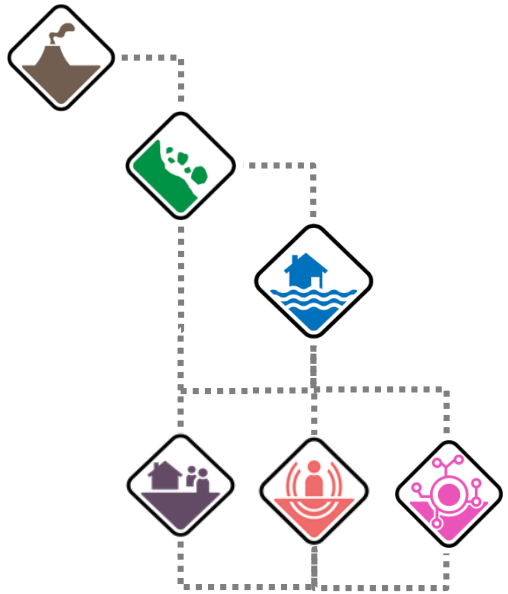
Multi-Risk Scenario Integration



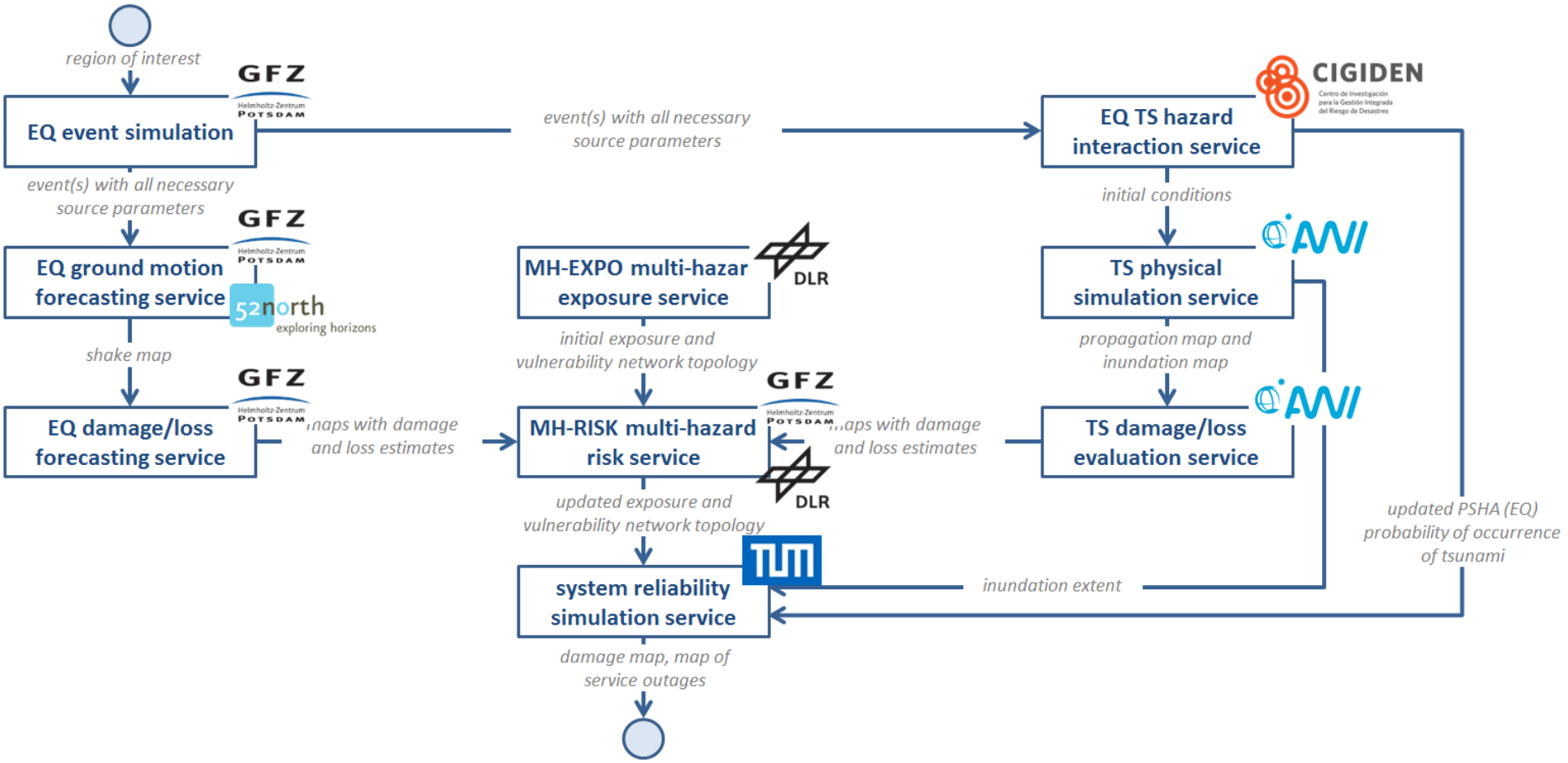
Showcases



Multi-Risk Scenario Integration



Workflow for one of the showcases



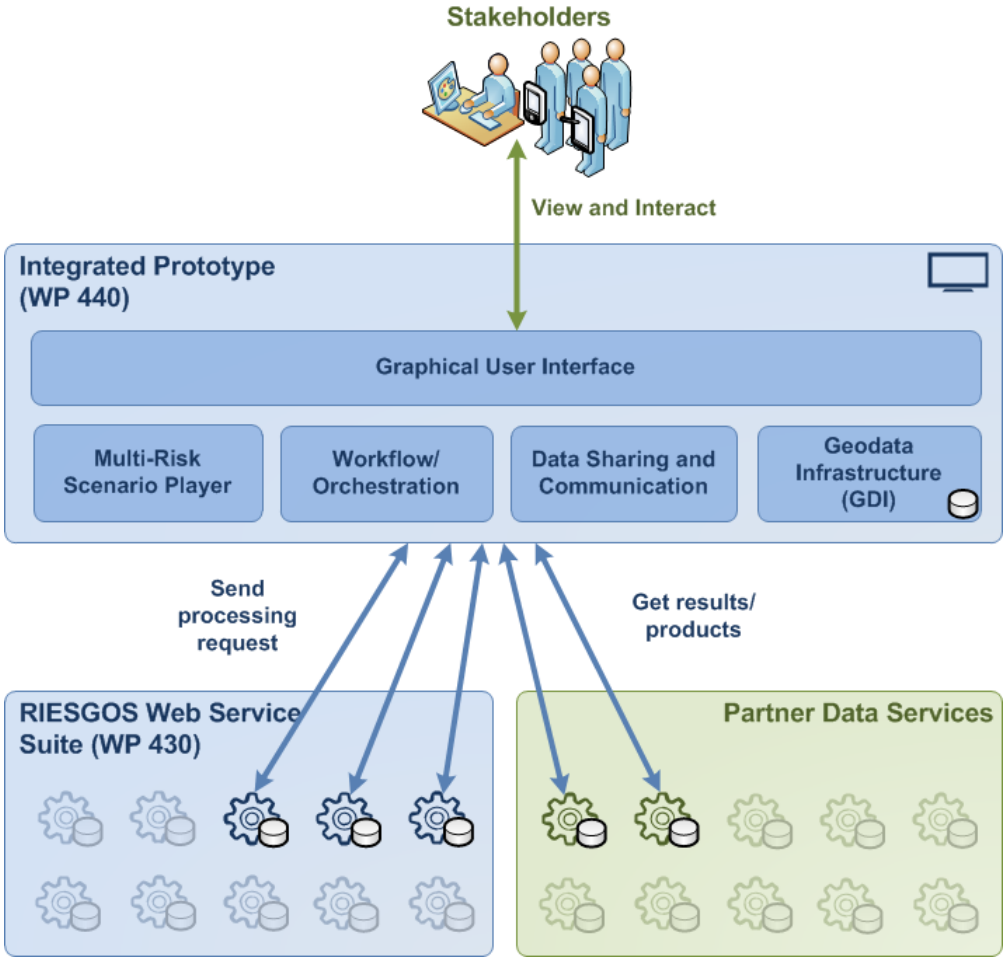
BUILDING THE RIESGOS SYSTEM

Designfactors

- **Mixed user audience** like local authorities, scientists, …
- The application shall facilitate “exploring” the showcases by allowing the user to **“play” with different parameters**.
- **Multiple workflows** which differ from showcase to showcase.
- Processing capabilities distributed across multiple partners
  - Partners **host their own** computing resources
  - Partners may use proprietary algorithms / software

Architecture

- Processing nodes are accessed using the OGC **WPS Protocol** from a central user interface application.
- **Domain specific standards** for information exchange (QuakeML, Shakemap, vector features, rasters)



Architecture assumption

- Process results become available after **a few seconds**
  - Longer processing times …
    - … would **discourage the user from „playing“** with the application
    - … would require some kind of **middleware** to allow to user to come back later.

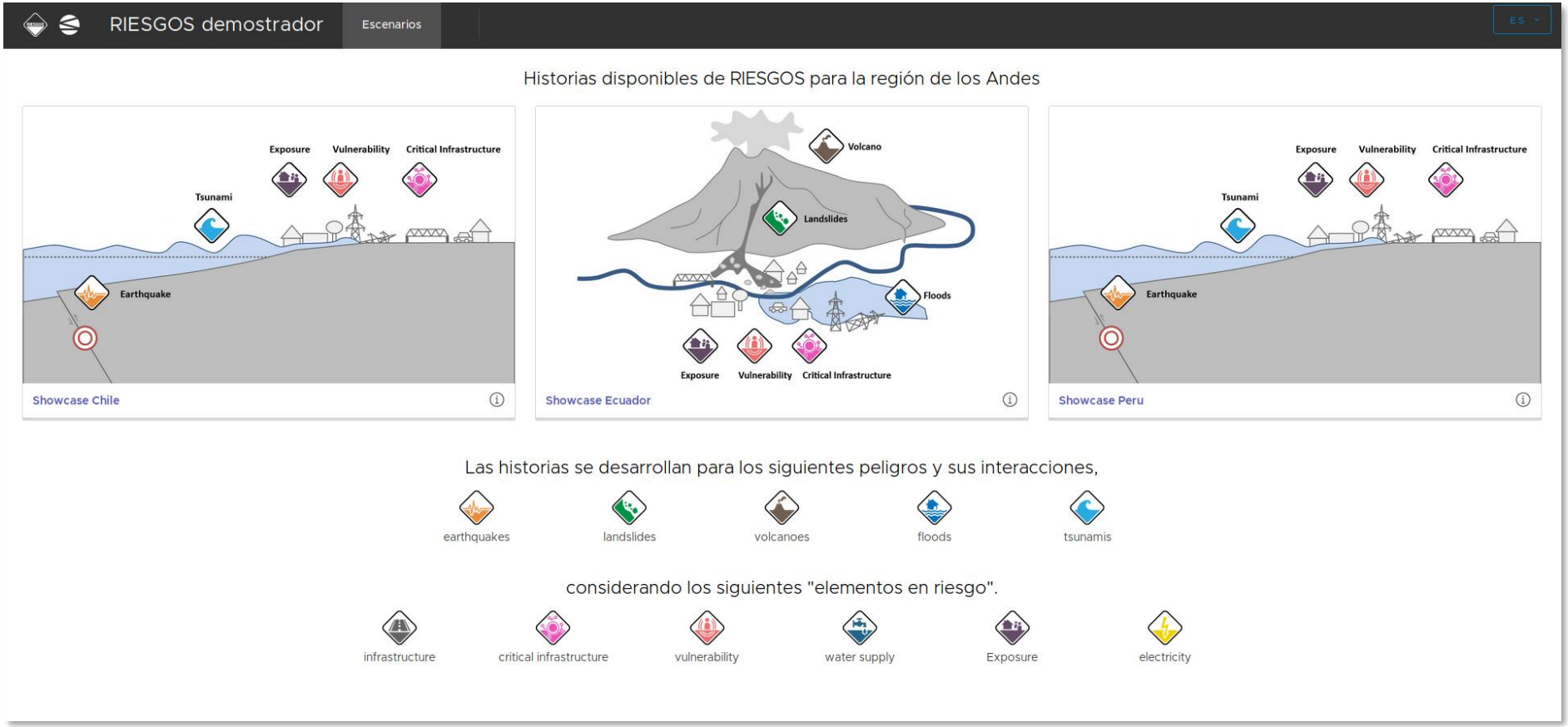
User interface

"A software **wizard** or **setup assistant** is a user interface type that presents a user with a sequence of dialog boxes that **lead the user** through a series of **well-defined steps**. Tasks that are **complex**, **infrequently performed**, or unfamiliar may be easier to perform using a wizard."

https://en.wikipedia.org/wiki/Wizard_(software)

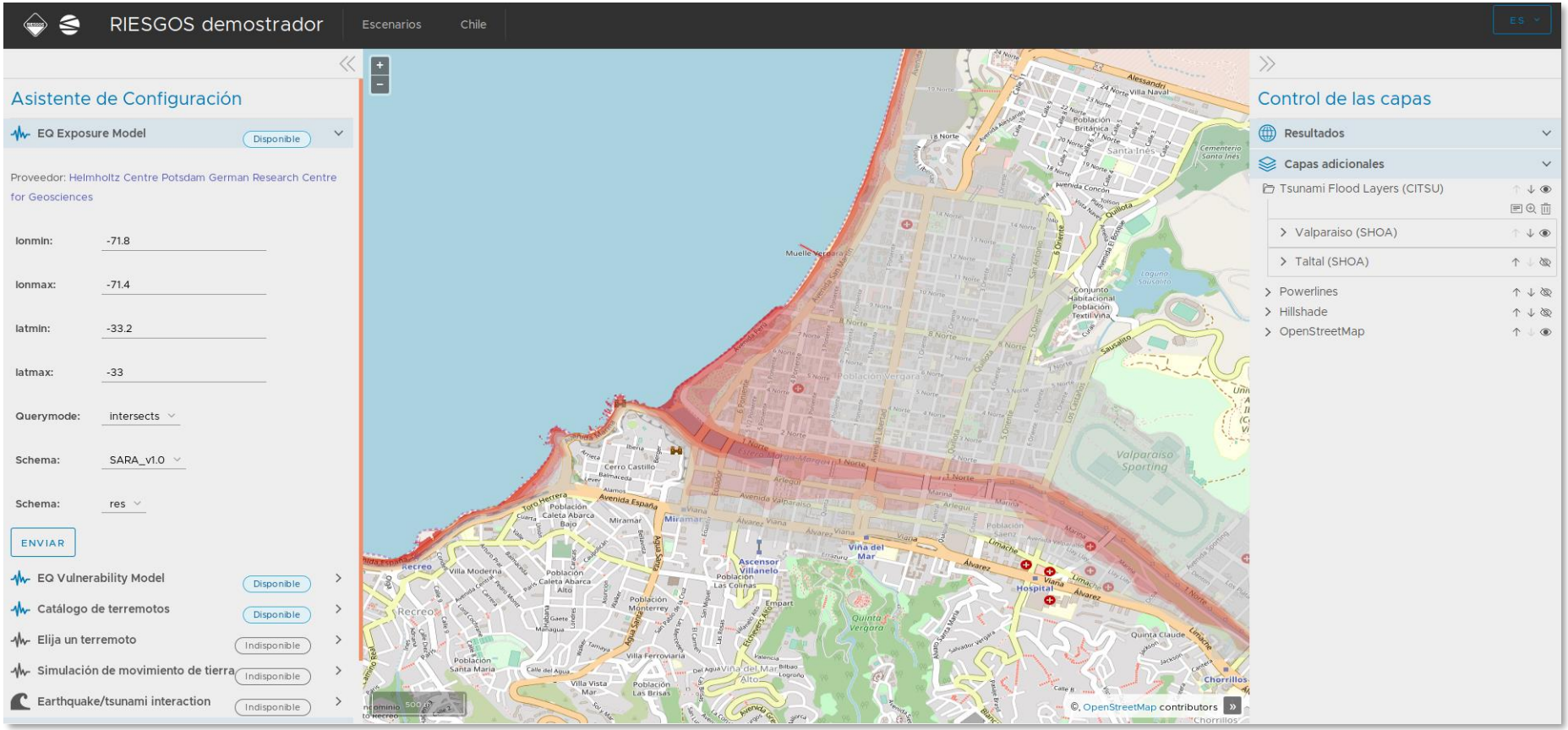
User interface

Work in progress



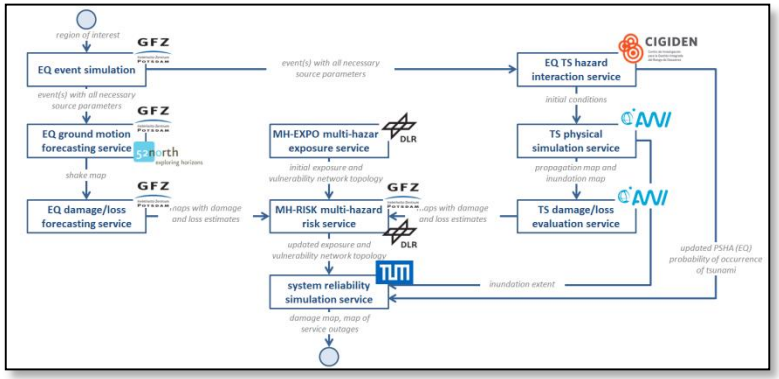
User interface

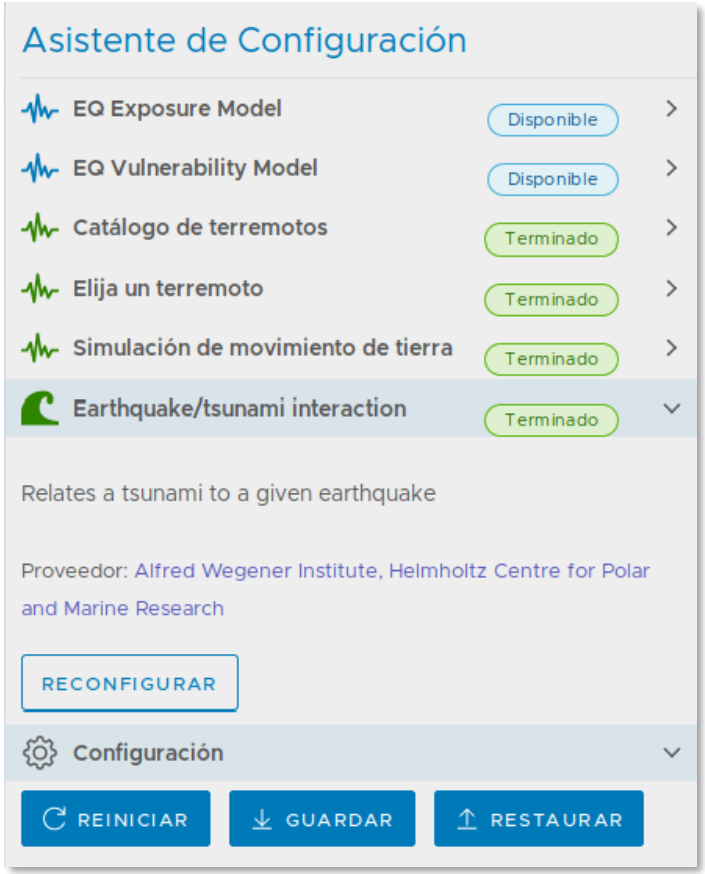
Work in progress



Workflow modelling

- **Topological sorting** of the processing steps to **simplify** a workflow into a list of steps.

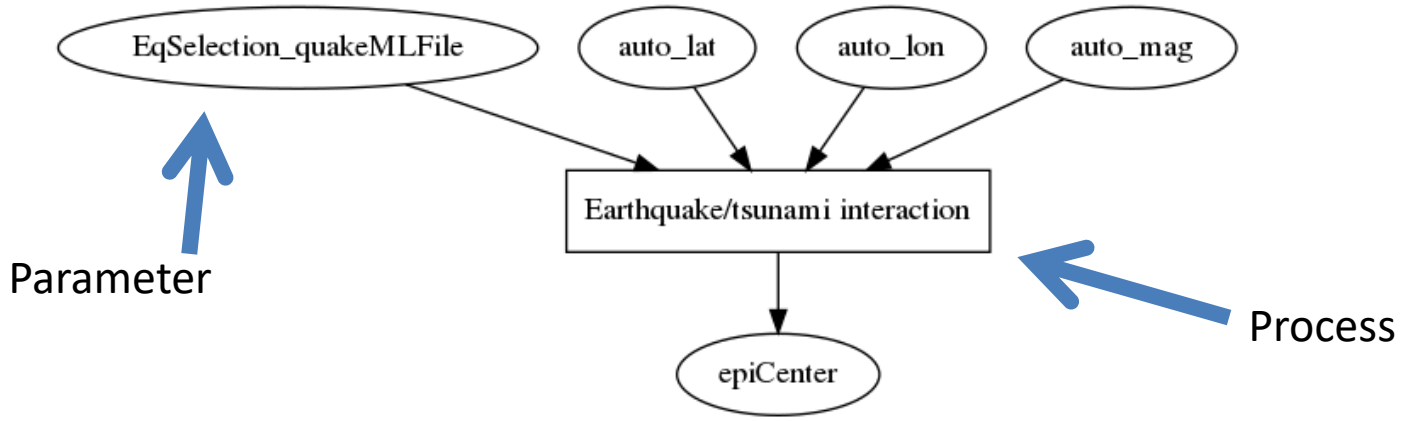




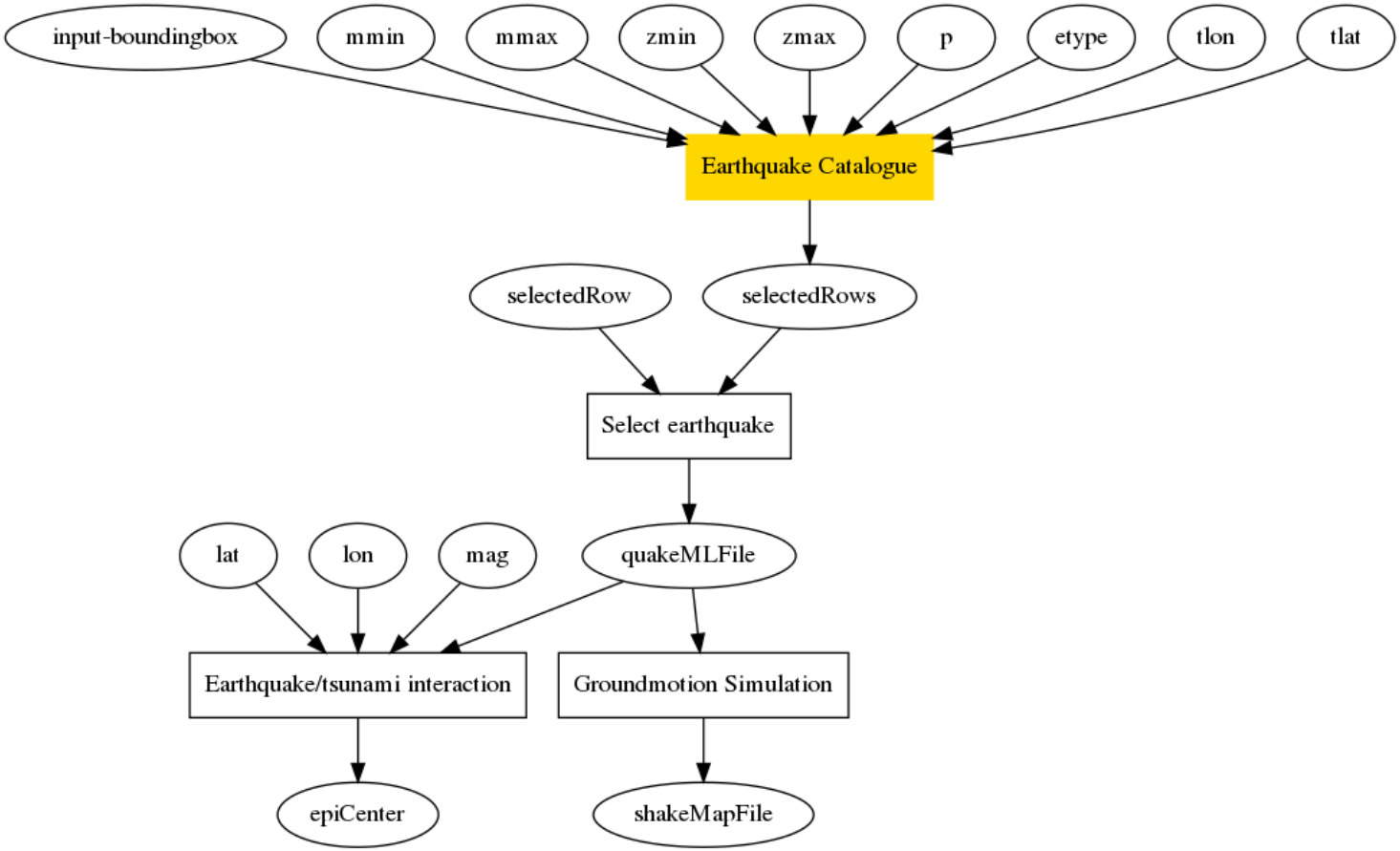
Workflow modelling

- Workflows are currently defined **in application code** as process nodes in a graph

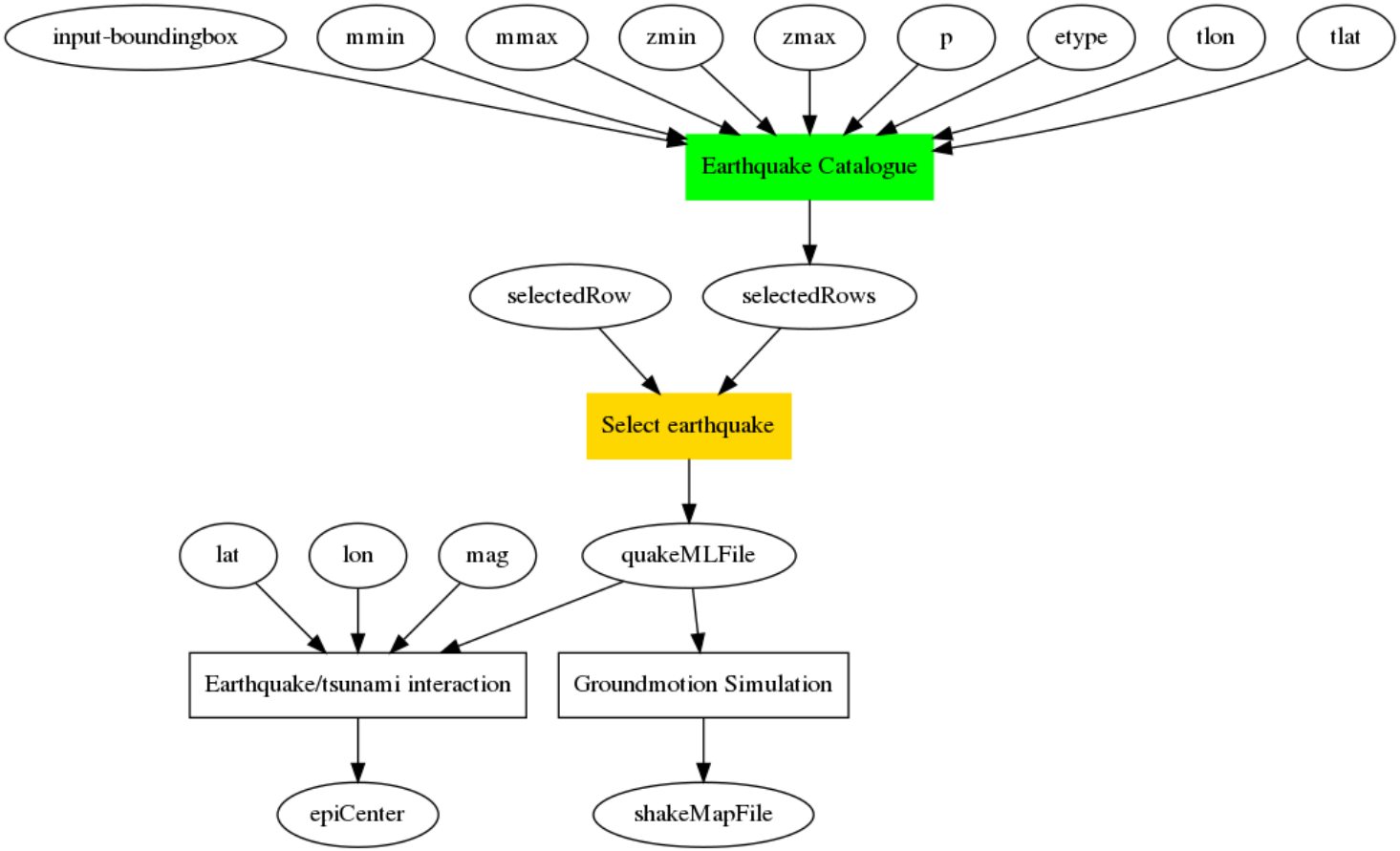
- The focus is not to integrate a complete buisness workflow engine



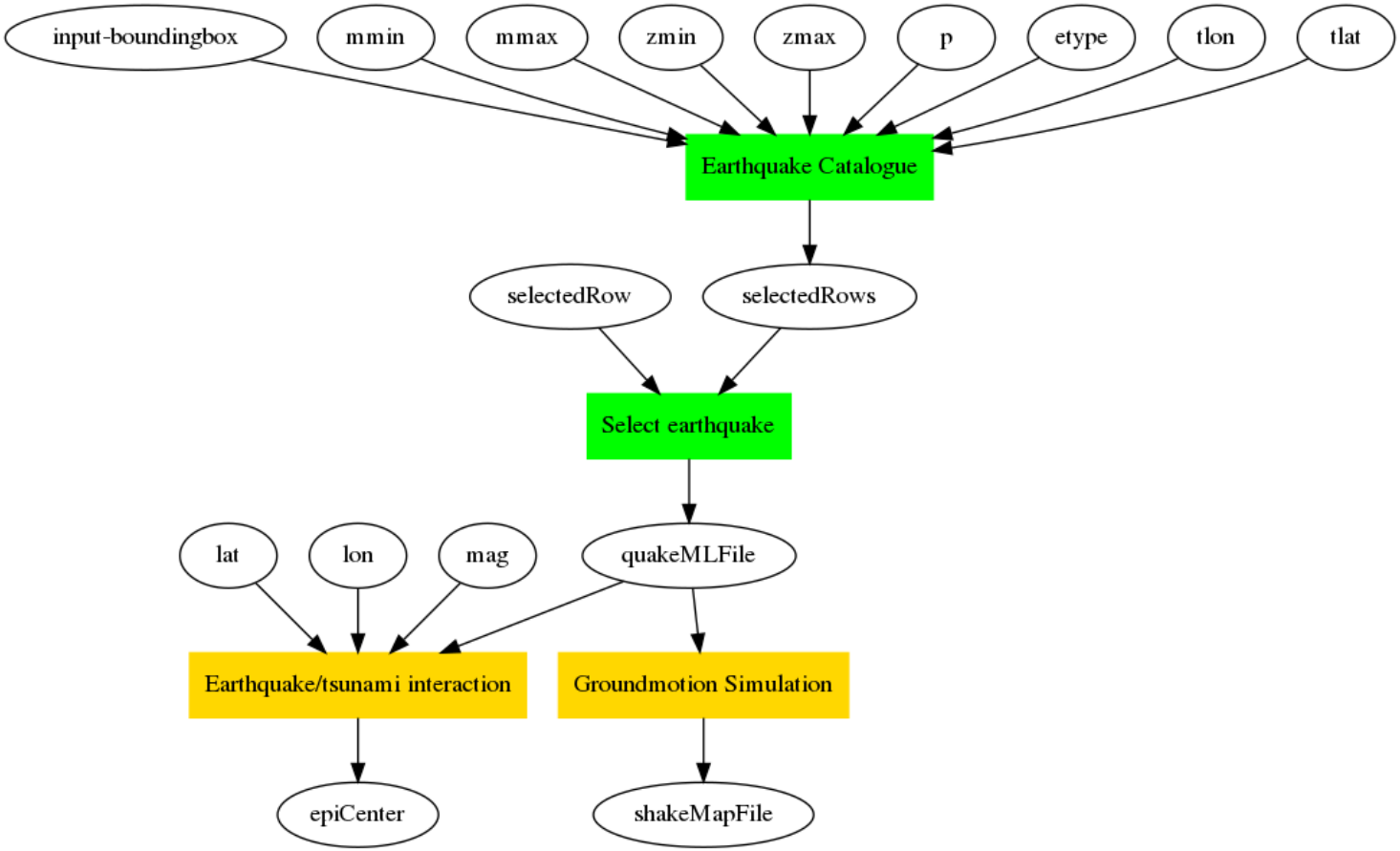
Workflow graph



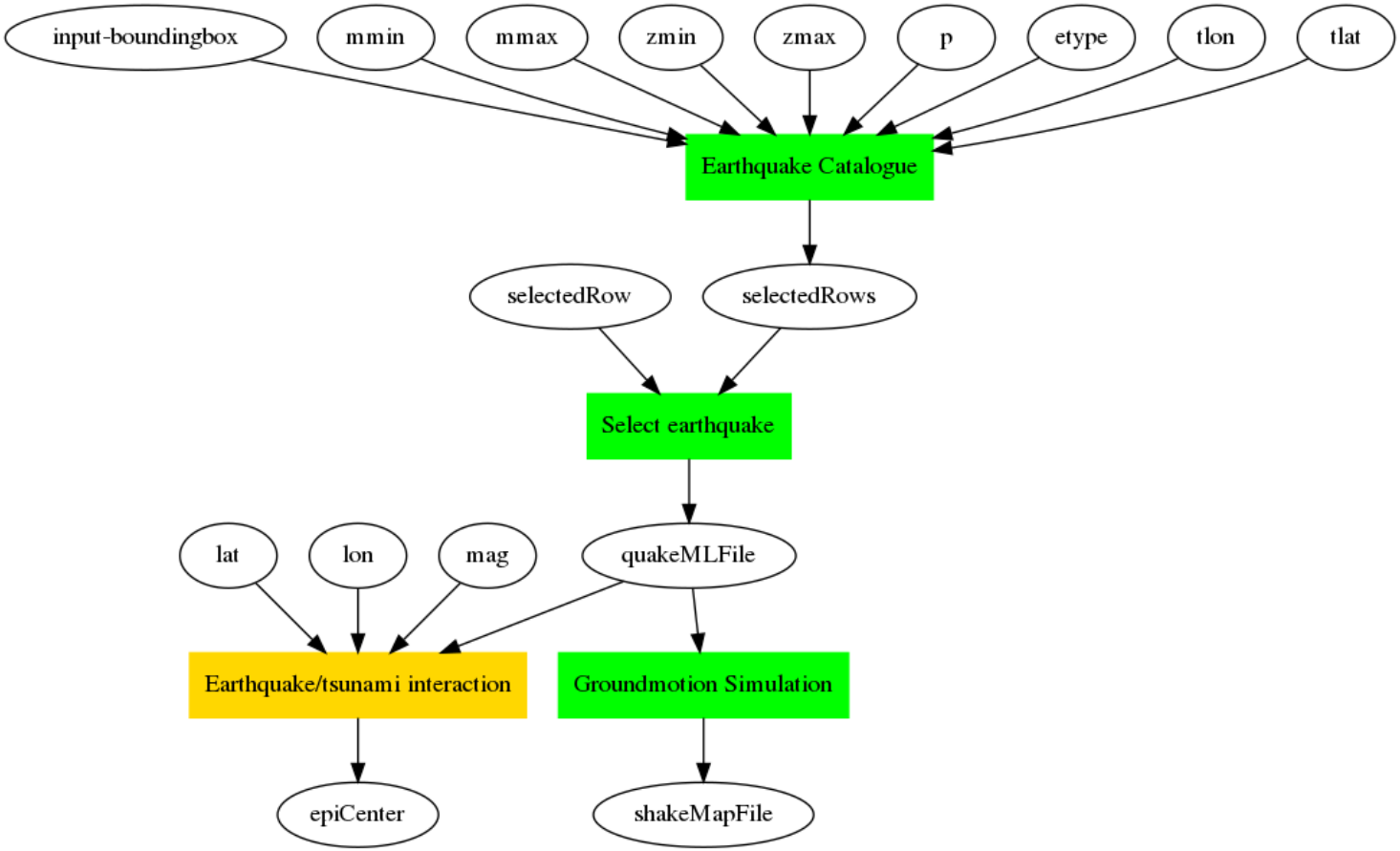
Workflow graph



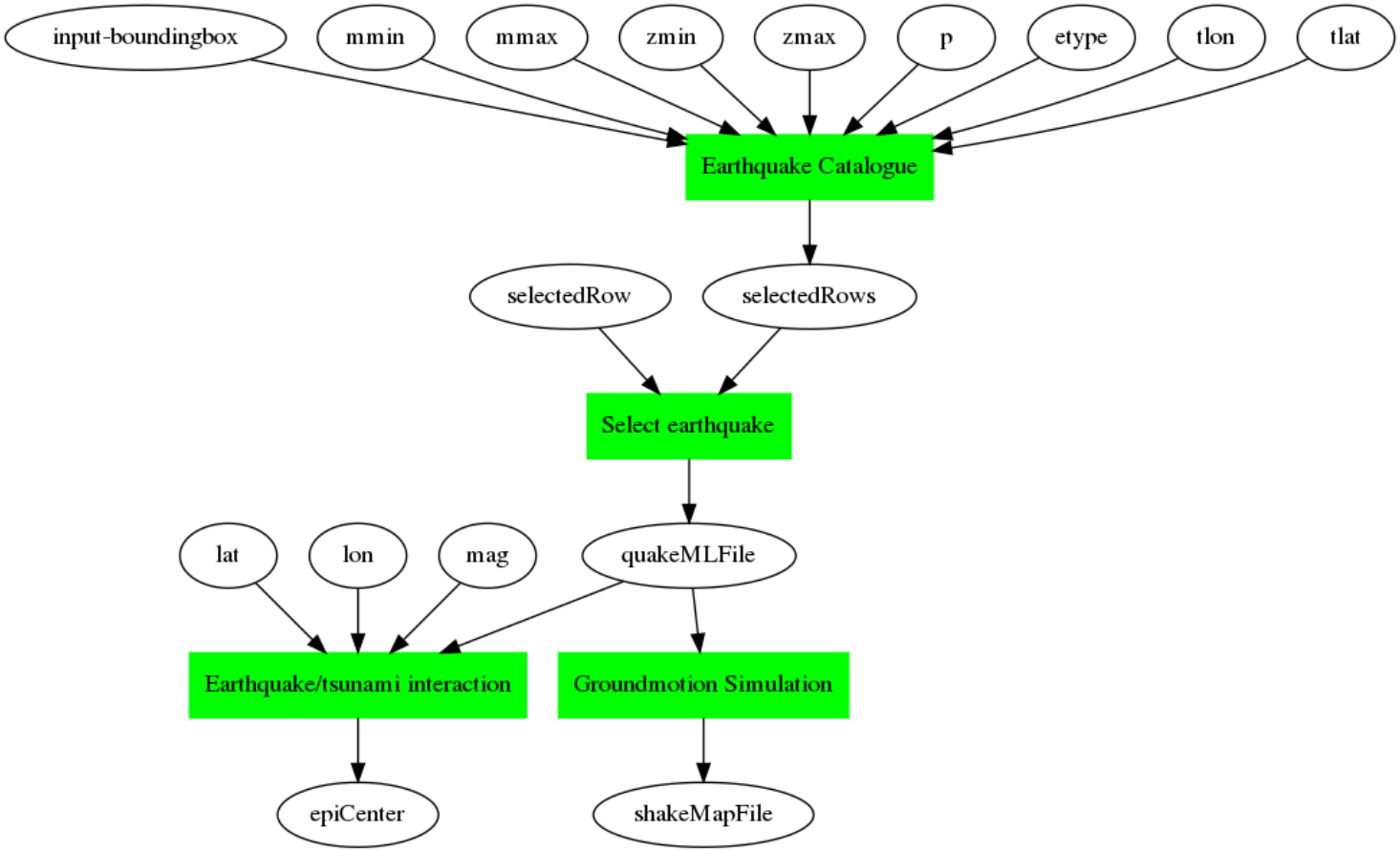
Workflow graph



Workflow graph



Workflow graph

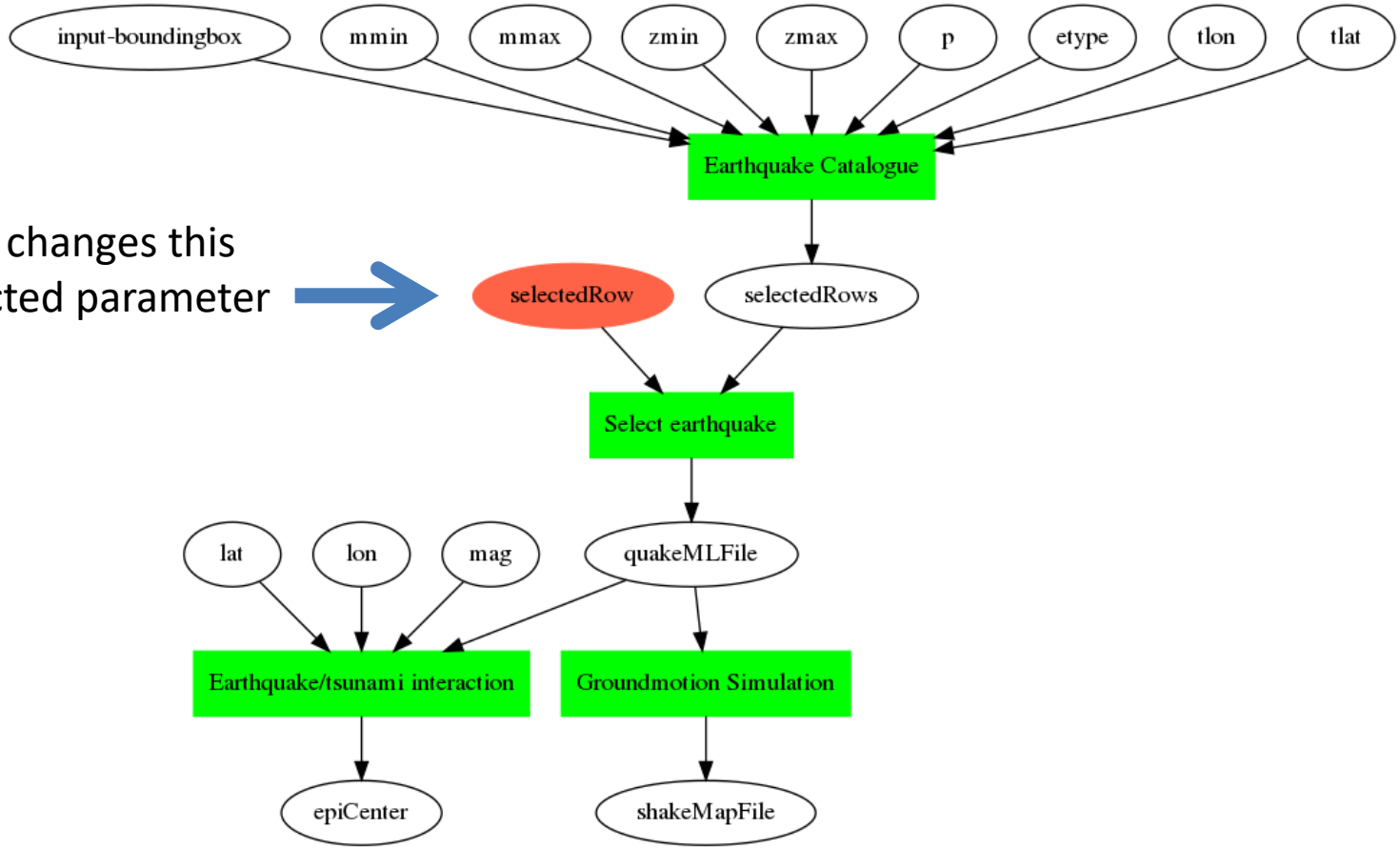


So far so good, but …

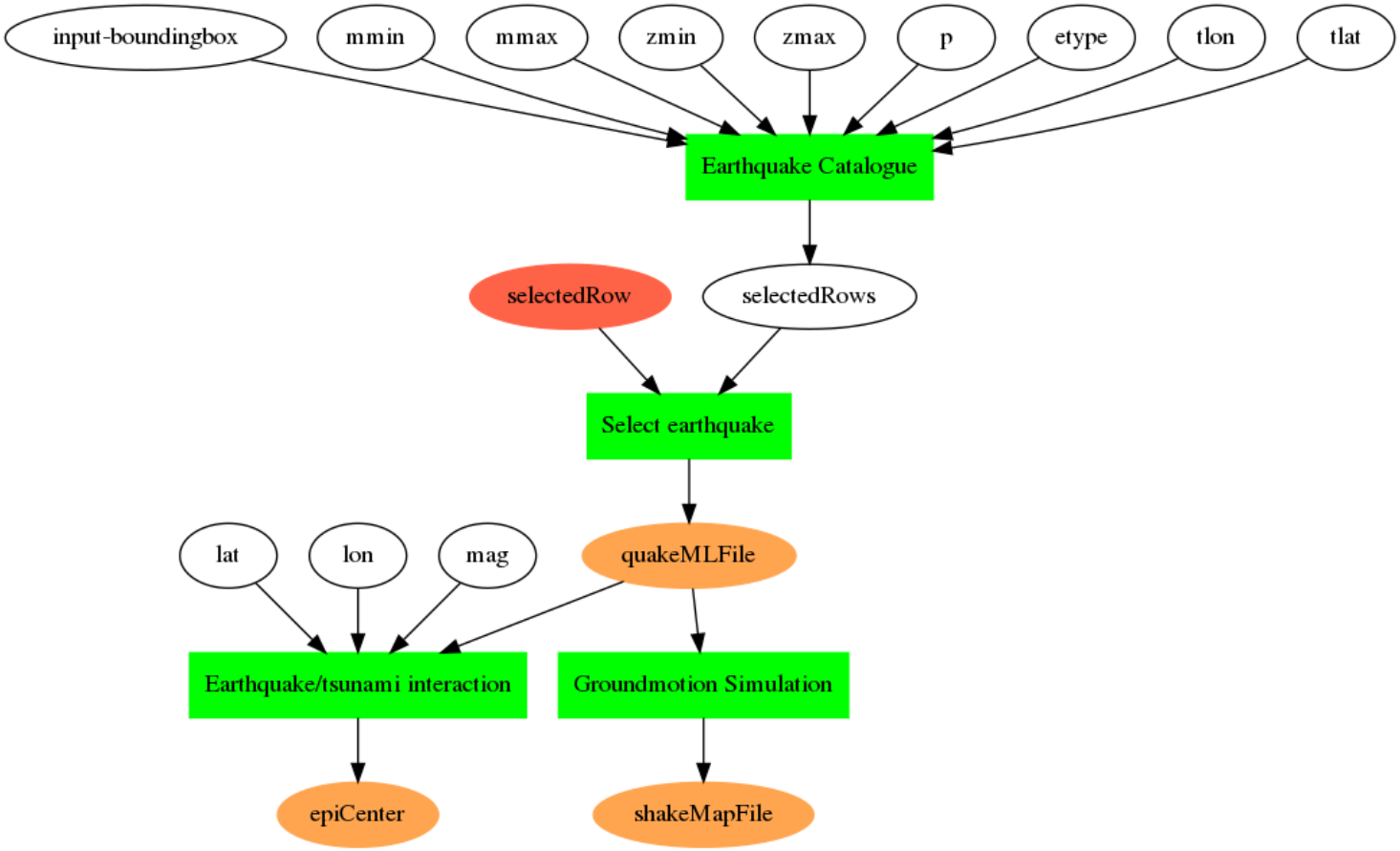
- What about flexibility?
  The user should be encouraged to play with the application, like
  - … changing parameters
  - … re-running processes to see how parameters change the outcome of a simulation.
  - … re-evaluating how changing simulations affect other simulations.

Workflow graph – tracking parameters

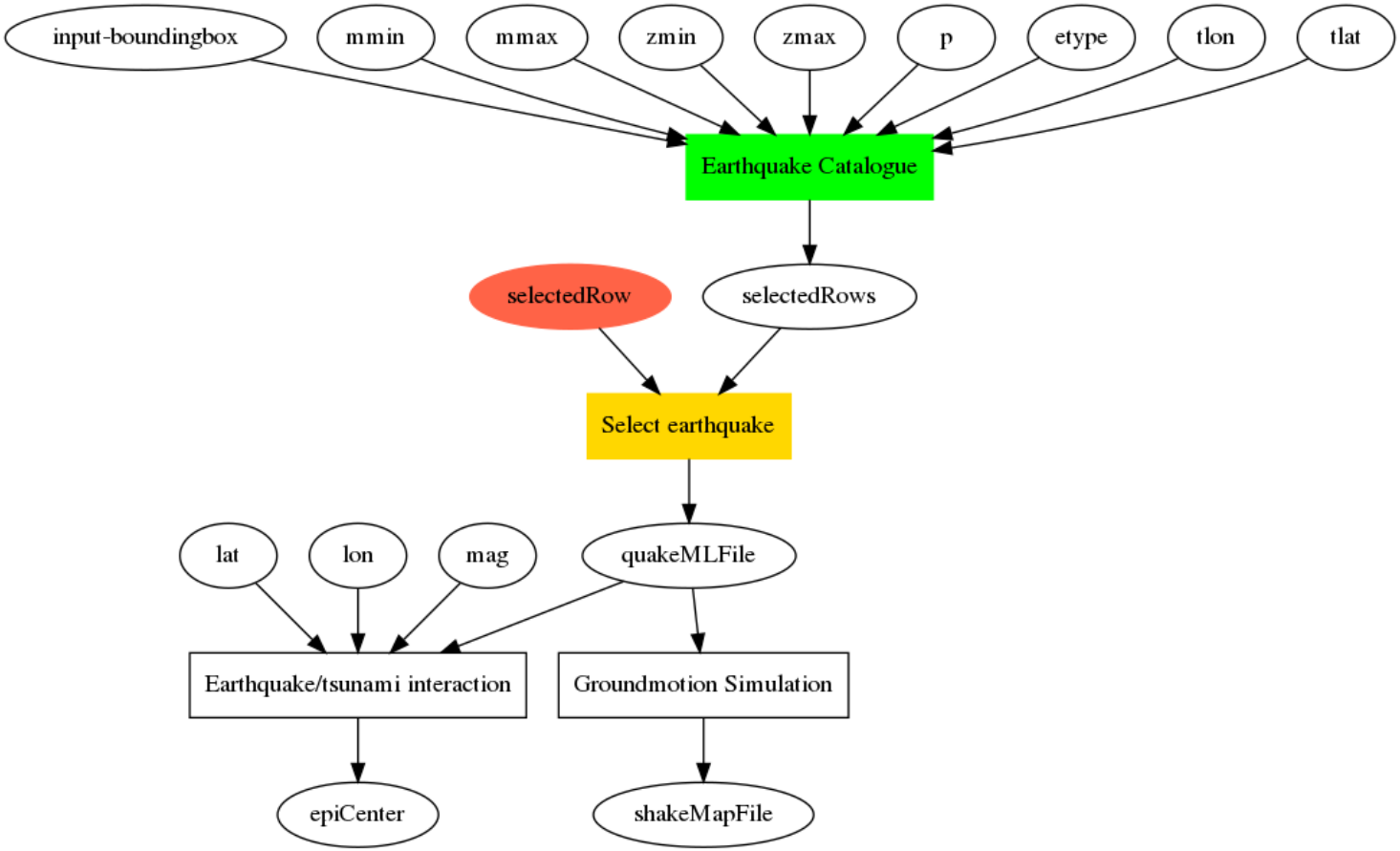
User changes this selected parameter here



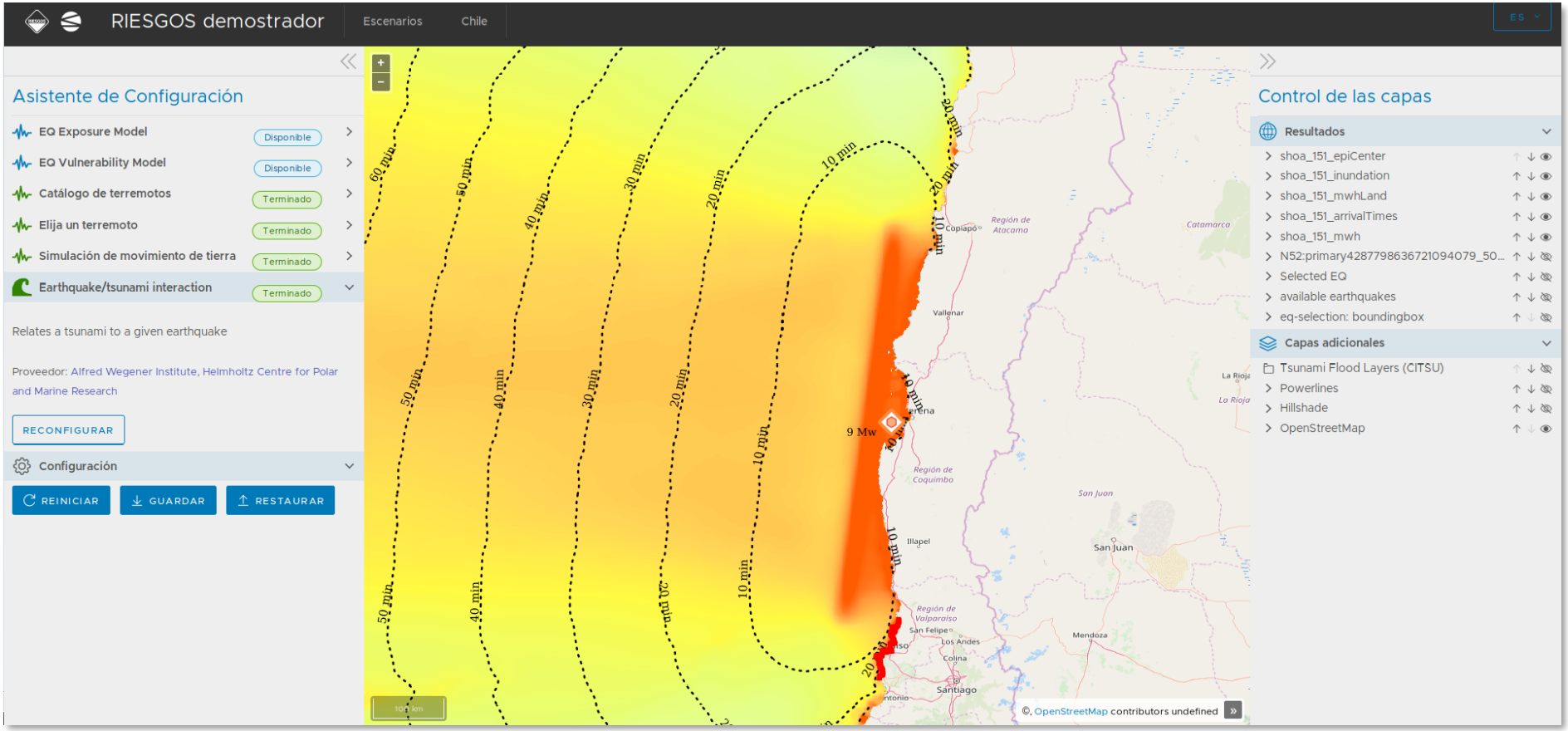
Workflow graph – tracking parameters



Workflow graph – tracking parameters



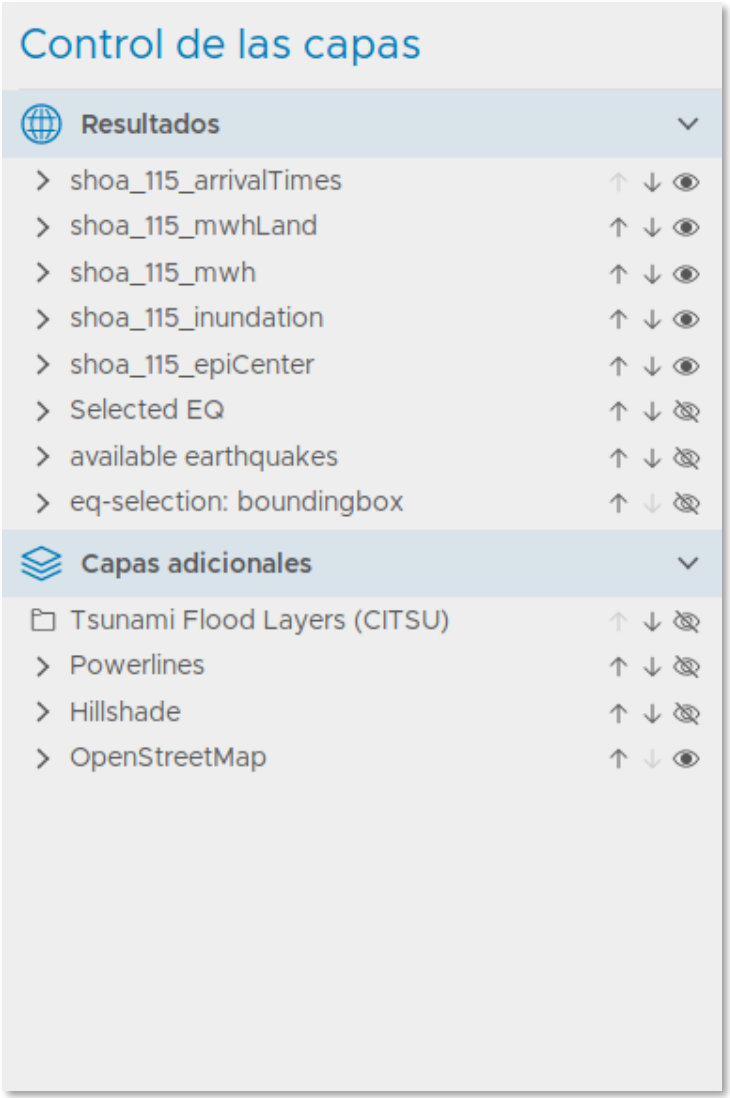
User interface



User interface

- Processing results are available as **OGC WMS/WFS services** and are downloadable for the user.

… the naming still needs some work.



LESSONS LEARNED

RIESGOS

Lessons learned

- WPS serves as a good framework for distributed geographical systems
- Multiple output formats for WPS processes are often required
  - Input for the following processes in the workflow
  - WMS/WFS services to visualize results in the web frontend
- Compute-intensive processes need to implement caching or pre-compute results to guarantee fast response times
  - The process the chooses the best-fitting results for the given input parameters

Lessons learned

- Limits for automatic workflow derivation from Process descriptions:
  - Highly specific input parameters can only be described to a certain degree in the ProcessDescription
    → Requires discussion between the different process providers
  - Using names of input and output-parameters for building the process graph would be more of a workaround as typing information would be lost
  - Customizations of the user-interface may require intermediate steps like the user selecting one of multiple process outputs.
  - Process implementations with internal data often have limits where they can be used
    … like geographical extent

Lessons learned

- Security related
  - Browser accesses WPS Servers directly
    → WPS Provider needs to allow access for javascript from other sites (CORS)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