Instruction Guide[1]

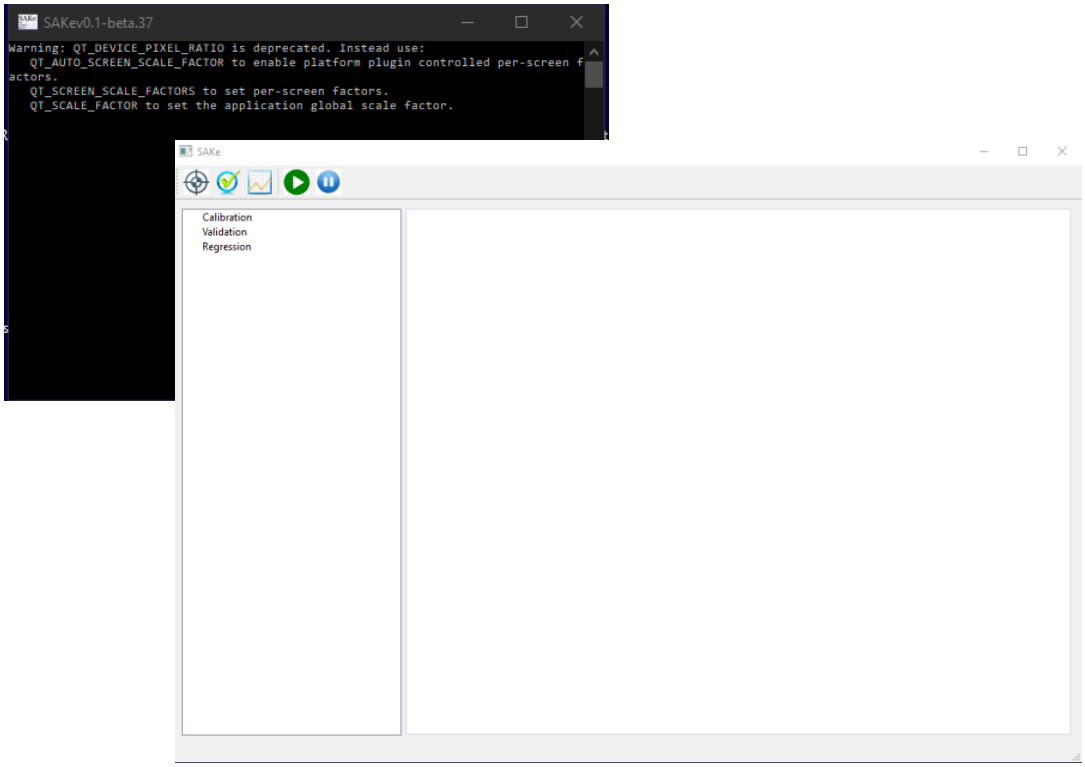
Examples and details on model application[2]

Start

To start the model, double click the executable file SAKev0.1-beta.39.exe

The following two windows will open:

- the first (in black) is the "terminal window", that may be useful for checking program messages during execution (note: do not close it, otherwise the application ends);
- the second (in white/grey) is the main application window.



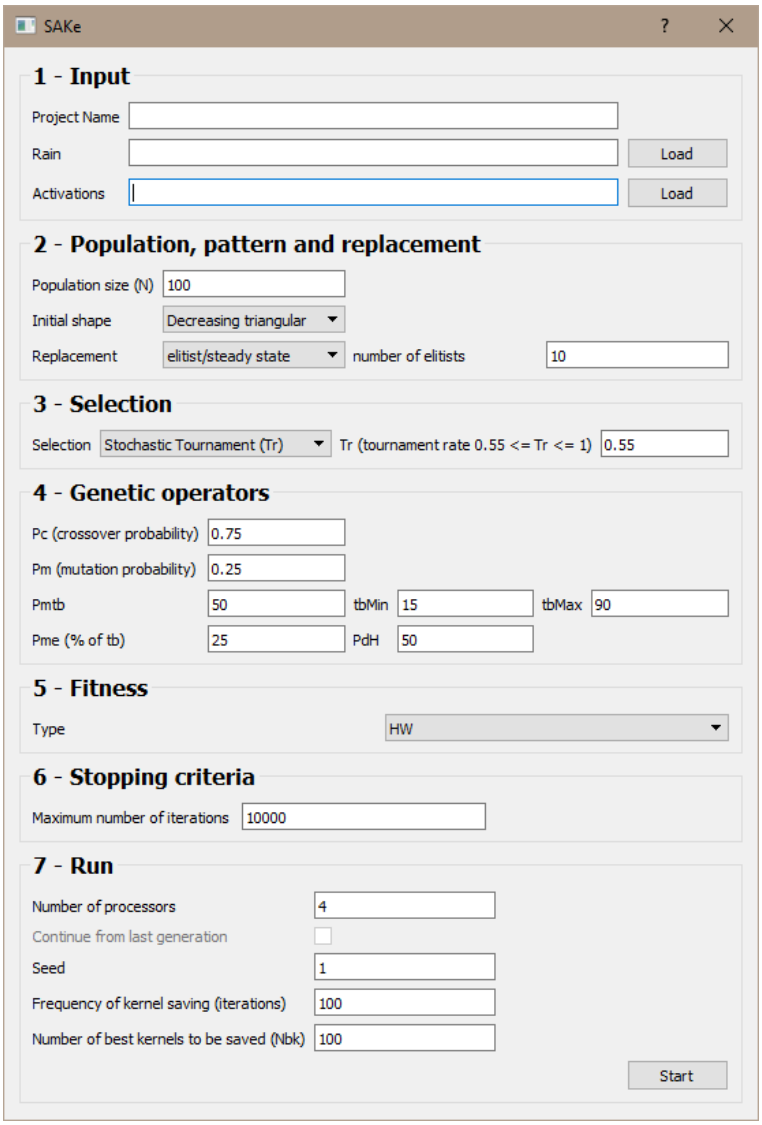
[1] The present Instruction Guide refers to the Microsoft Windows operating system.

[2] For more details, please refer to: De Rango A, Terranova A, D'Ambrosio D, Lupiano V, Mendicino G, Terranova OG, Iovine G (submitted). GA SAKe-2.0 – An advanced hydrological model to predict the activation of landslides. Computers & Geosciences.

Calibration

For calibrating the model, the following steps are required (for more details, cf. §3 - **Model calibration**[3]):

- select the button  , on the tool bar (top left). The following input mask will open:



- The three fields of section **1 - Input** must be initialized, by specifying a unique *Project Name*, and the complete paths (file names included, in csv format) for *Rain* and *Activations*. The remaining field of sections **2-7** are pre-compiled. In Figure A-1, an example of initialization of the mask for the "benchmark

[3] For details on mentioned sections, please refer to: De Rango A, Terranova A, D'Ambrosio D, Lupiano V, Mendicino G, Terranova OG, Iovine G (*submitted*). GA SAKe-2.0 – An advanced hydrological model to predict the activation of landslides. *Computers & Geosciences*.

experiment" (cf. Appendix B.1) is provided. Note that pre-compiled fields can be changed to allow for exploring different experimental setups (for details on fields and values, cf. Figure A-2, §3 and Appendix B.1).

- To start the calibration experiment, press the *Start* button on the bottom-right corner.

Note that, both calibration and regression experiments (see below) can be paused and re-started, by pressing the following buttons  on the tool bar.

Multiple experiments can be executed simultaneously. Per each experiment, the results are shown on a specific window (cf. Appendix B.1).

By default, the output files are stored in the following path:

C:\Users*name*\Documents\workspace\calibration*Project Name*.

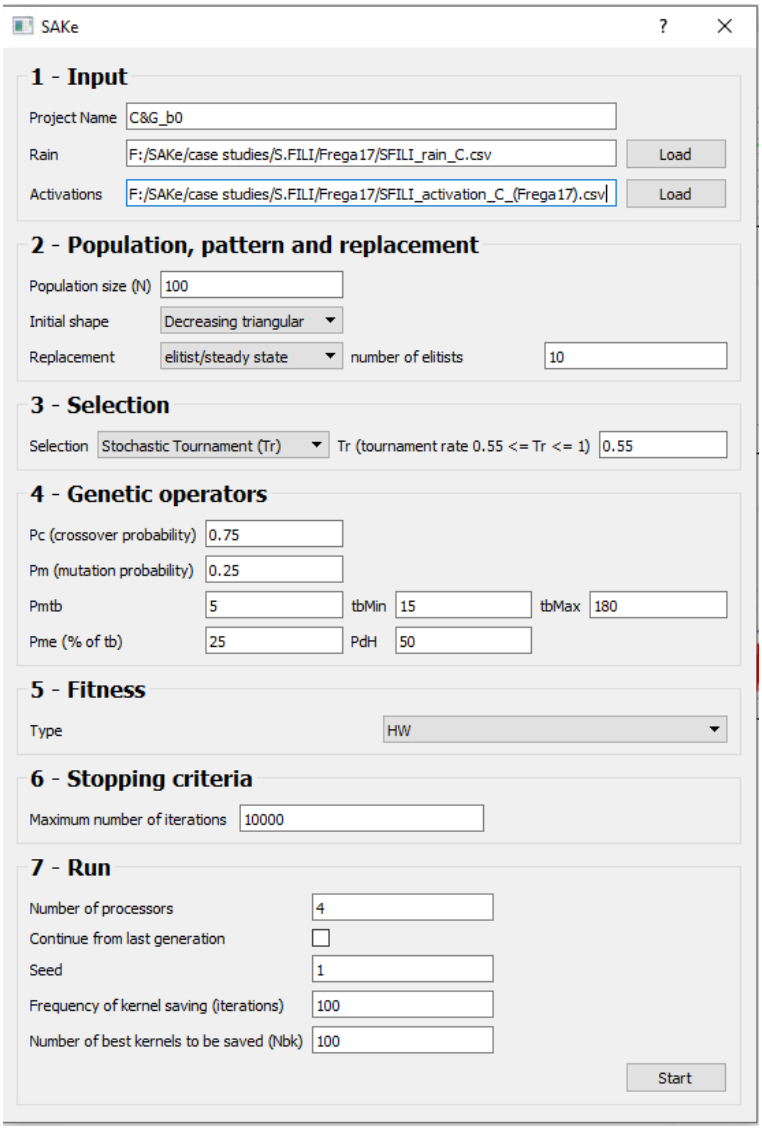
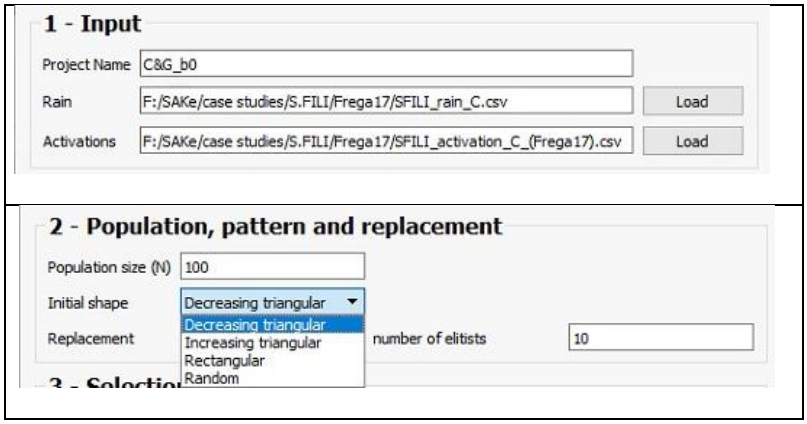


Figure A-1 – SAKe 2.0 – Example of calibration mask ("benchmark experiment" – cf. Appendix B.1).



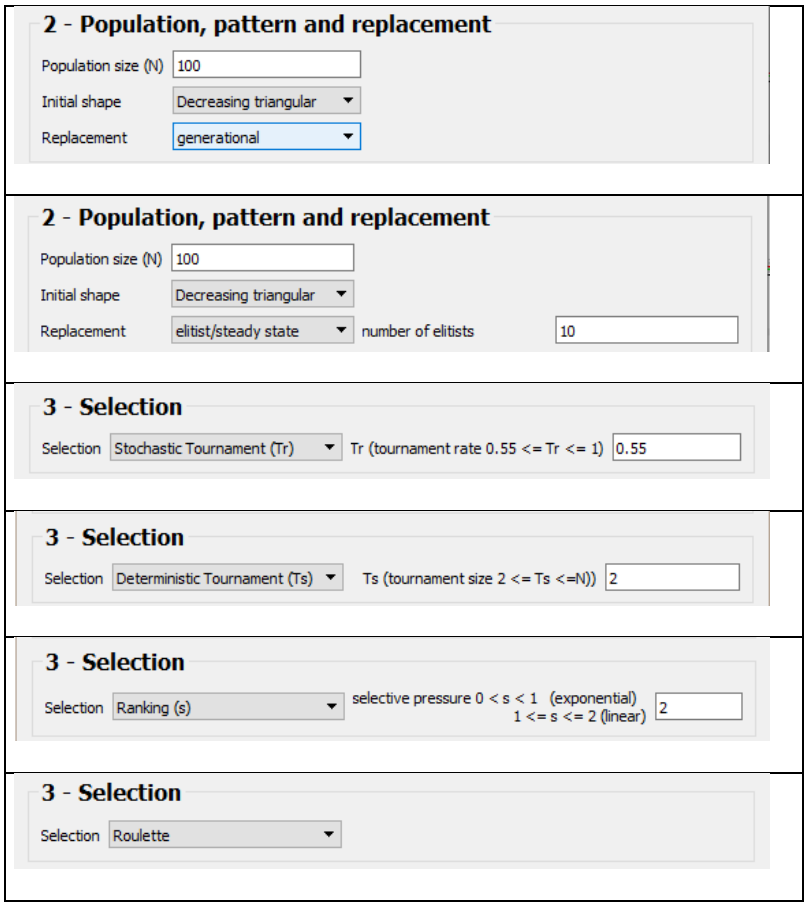


Figure A-2a – SAKe 2.0 – Details on sections of the calibration mask.

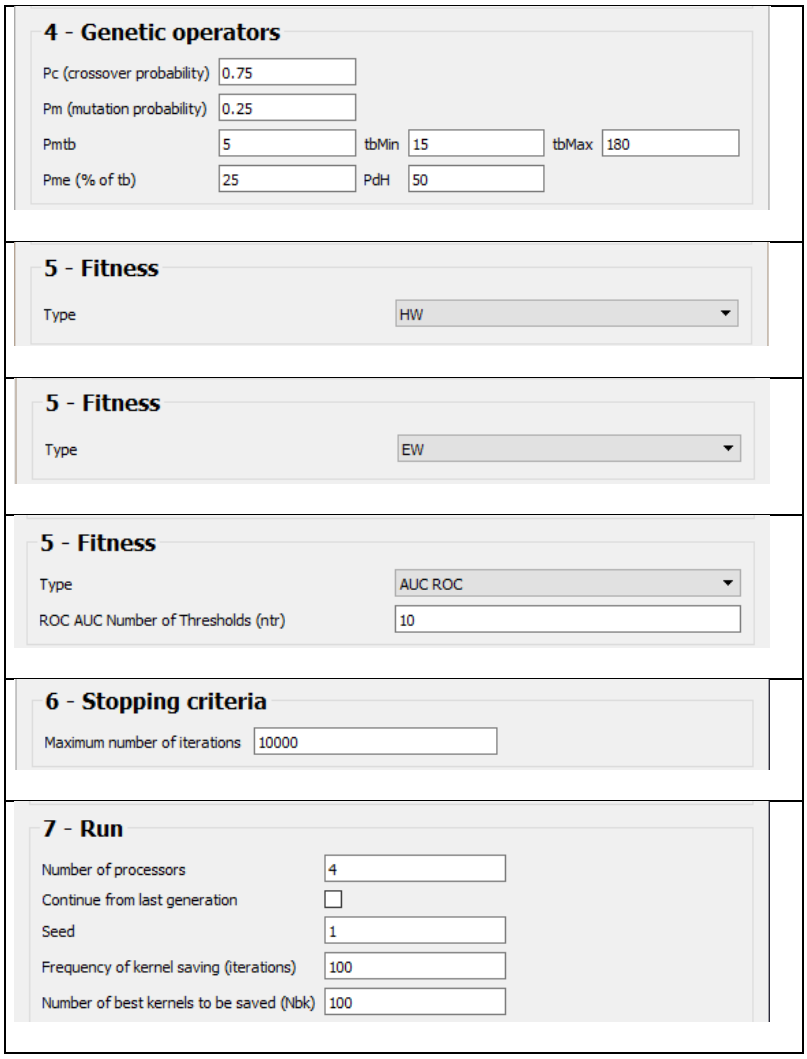


Figure A-2b – SAKe 2.0 – Details on sections of the calibration mask.

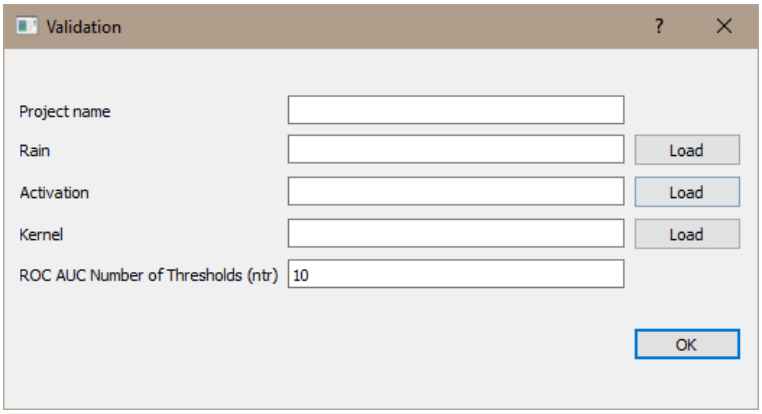
In Figure A-3, an example of output for the "benchmark experiment" (cf. Appendix B.1) is provided.

Figure A-3 – SAKe 2.0 – Example of output of calibration ("benchmark experiment" – cf. Appendix B.1).

Validation

For validating the model, the following steps are required (for more details, cf. **§4 - Model validation**):

- select the button  , on the tool bar. The following input mask will open:



- The fields must be initialized, by specifying a unique *Project Name*, the complete paths (file names included, in csv format) for *Rain*, *Activations*, and *Kernel*, and the number of thresholds to be employed for ROC evaluation. Note that this latter is pre-compiled, and can be changed to allow for exploring different

experimental setups (for details on fields and values, cf. §4 and Appendix B.2). In Figure A-4, an example of initialization of the mask for the "benchmark experiment" (cf. Appendix B.1) is provided.

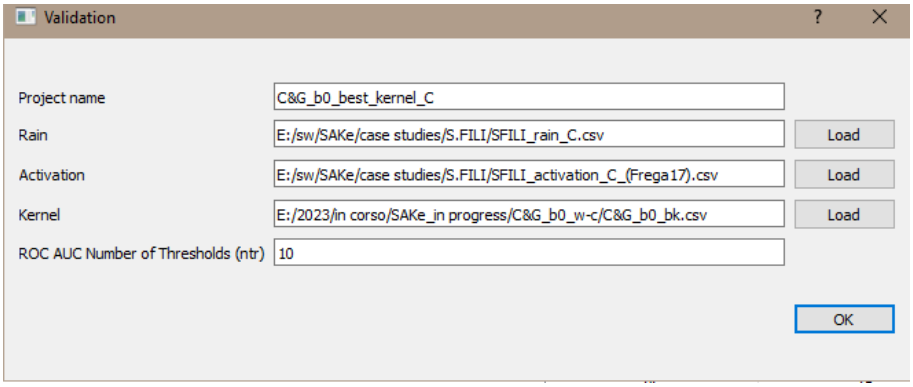


Figure A-4 – SAKe 2.0 – Example of validation mask (best kernel, "benchmark experiment" – cf. Appendix B.1).

- To start the validation experiment, press the *OK* button on the bottom-right corner.

The model will perform one single iteration, by applying the three fitness functions (HW, EW, ROC). The results are shown on a specific window (cf. Appendix B.2). By default, the output files are stored in the following path: C:\Users*name*\Documents\workspace\validation*Project Name*.

In Figure A-5, an example of output for the "benchmark experiment" (cf. Appendix B.1) is provided.

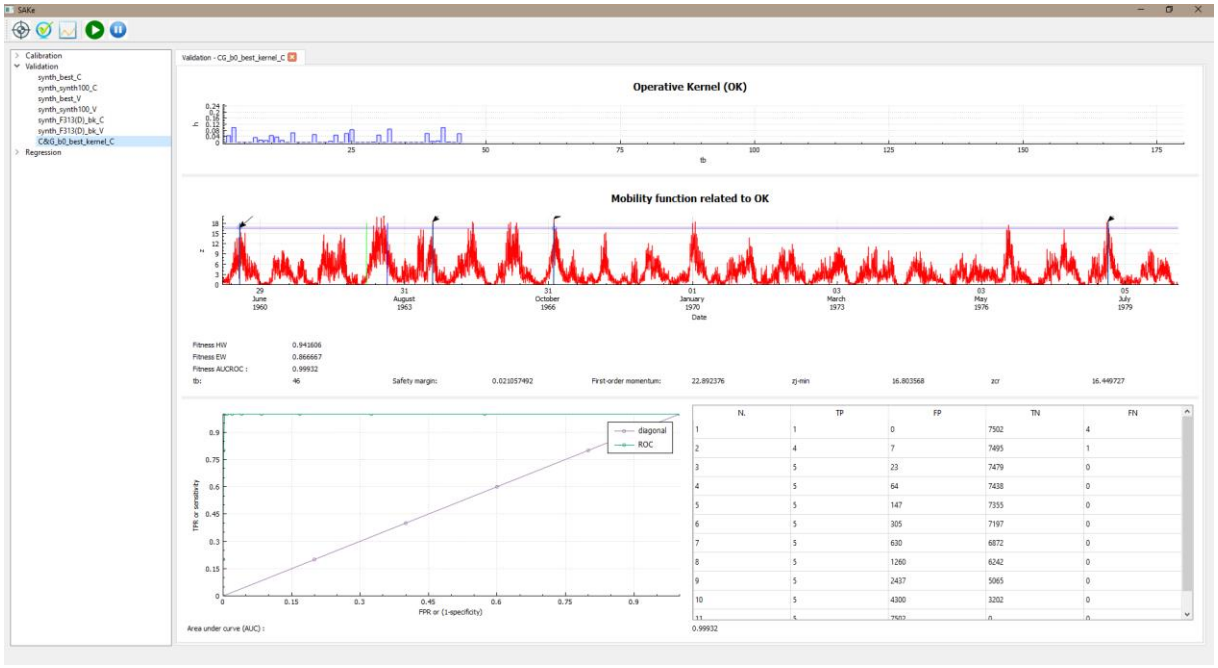
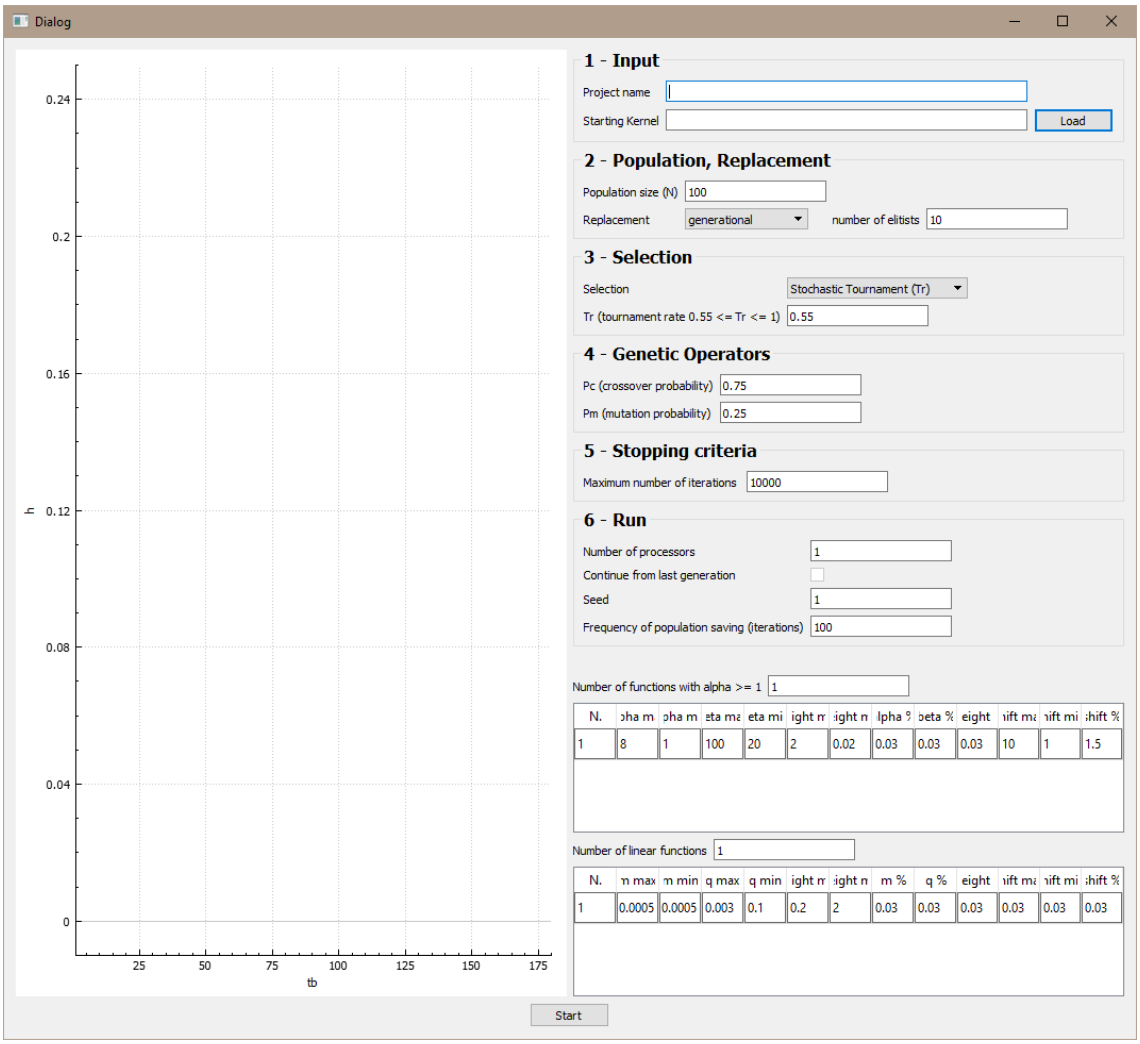


Figure A-5 – SAKe 2.0 – Example of output of validation (best kernel, "benchmark experiment" - cf. Appendix B.1).

Regression

For a regression experiment, the following steps are required **(**for more details, cf. **§5 - Regression (reduction of kernel variability for physical interpretation)**:

- select the button  , on the tool bar. The following input mask will open:



- The two fields of section **1 - Input** must be initialized, by specifying a unique *Project Name*, and the complete path (file name included, in csv format) of the *Starting Kernel*. The remaining field of sections **2-6** are pre-compiled. They can be changed to allow for exploring different experimental setups (for details on fields and values, cf. §4 and Appendix B.3). In Figure A-6a, an example of initialization of the mask is provided.
- To start the validation experiment, press the *Start* button on the bottom.

The model will perform the pre-fixed number of iterations. The results are shown on a specific window (cf. Appendix B.3). By default, the output files are stored in the following path:

C:\Users*name*\Documents\workspace\regression*Project Name*.

In Figure A-6b, an example of output is provided.

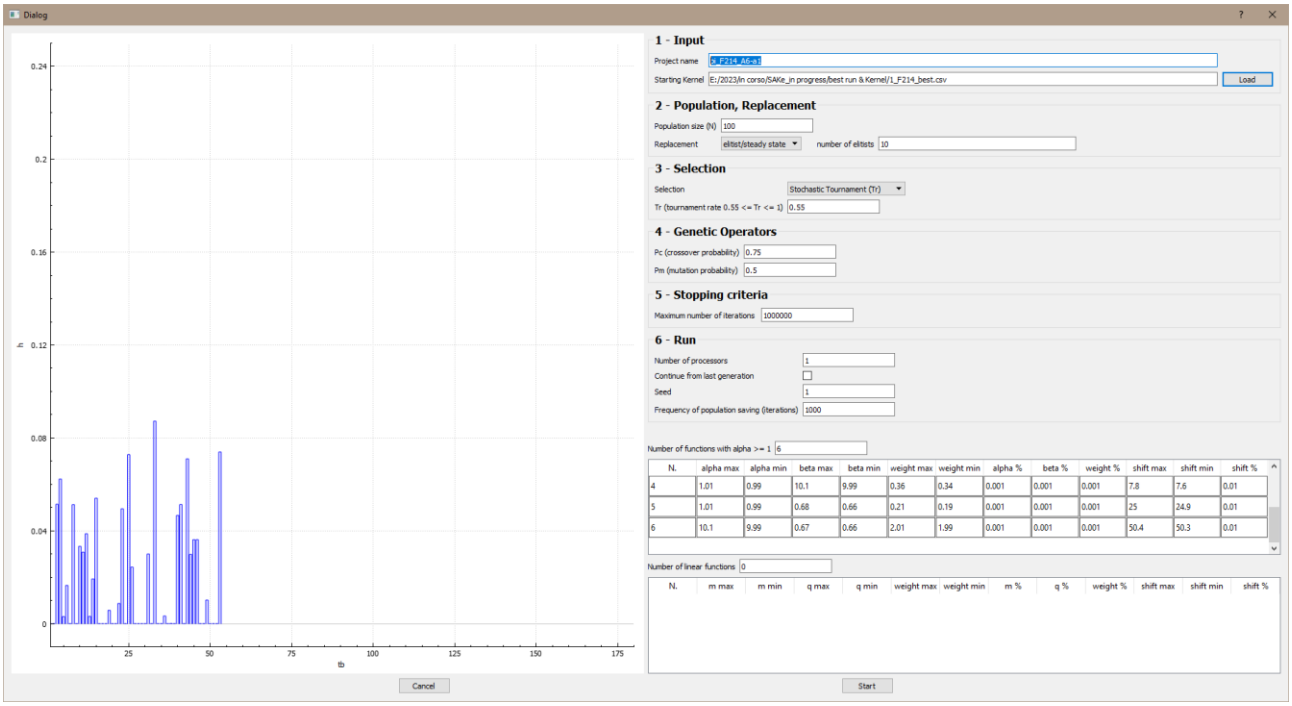


Figure A-6a – SAKe 2.0 Post-processing panel. Initialization of the regression.

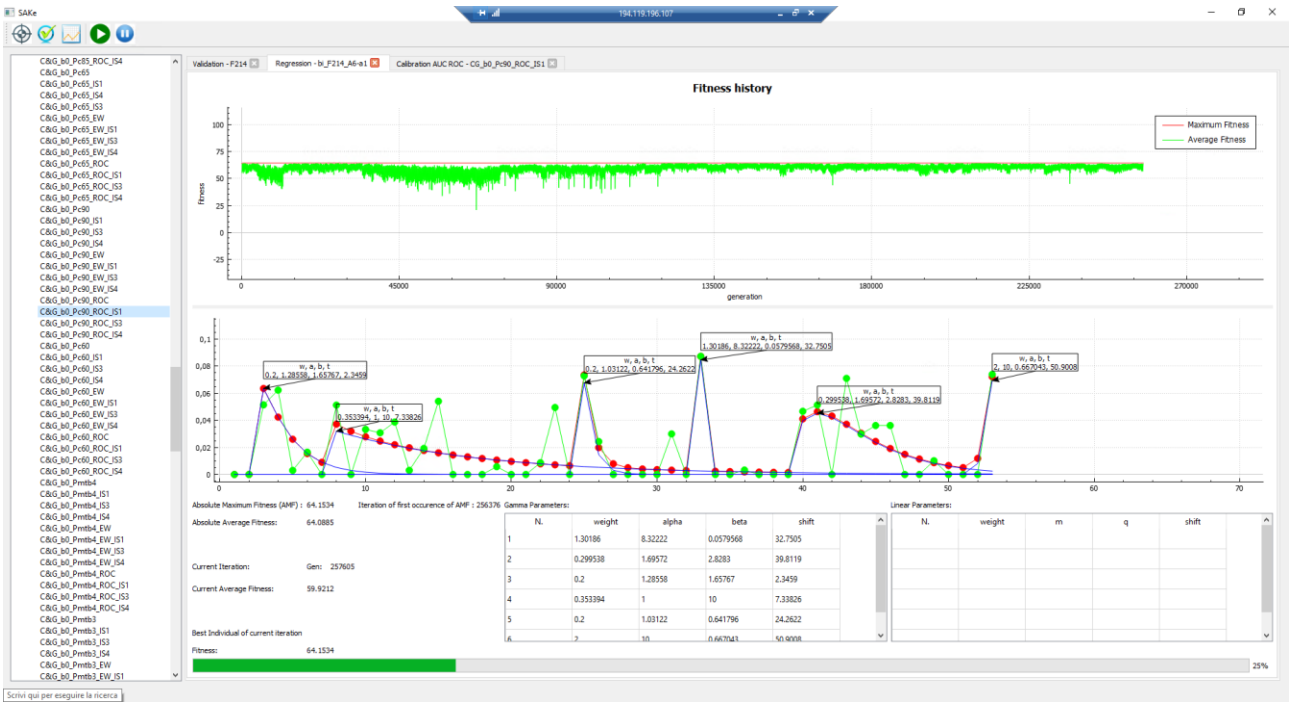


Figure A-6b – SAKe 2.0 Post-processing panel. Output of regression.

Please note: the model is in beta version, as checks are in progress to resolve an error that occurs in the Regression after several hundred thousand iterations. In any case, the tool already provides useful results for understanding the dynamics of the landslide phenomenon and the underground water circulation responsible for its activation.