MOSAIC

modeling and statistical tools for ecotoxicology

http://mosaic.univ-lyon1.fr

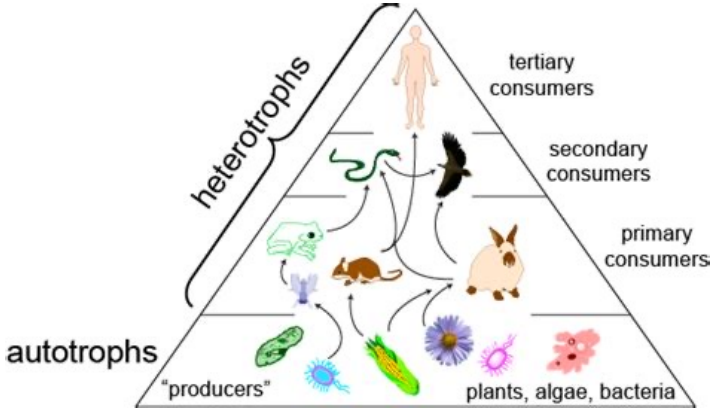
Supports

financial

institutions

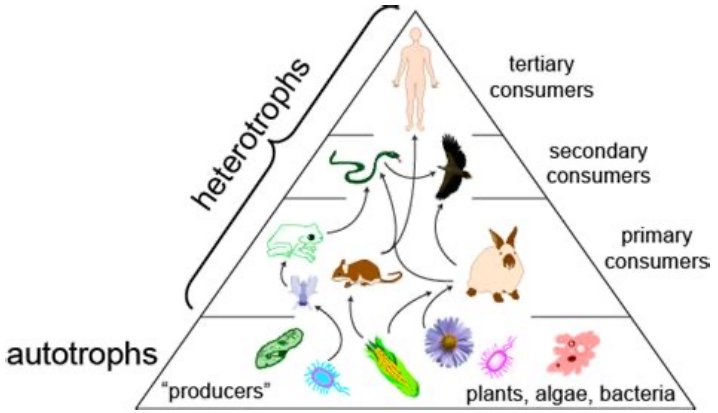
Environmental risk assesment

An evidence



Environmental risk assesment

An evidence



A priority

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

MINISTÈRE
DE LA TRANSITION
ÉCOLOGIQUE
ET SOLIDAIRE

EUR-Lex

Environmental risk assessment

All concerned

One substance
=
One registration

ECHA
EUROPEAN CHEMICALS AGENCY

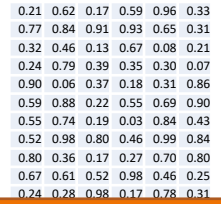
Environmental risk assessment

All concerned

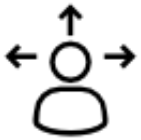
One substance
=
One registration

ECHA
EUROPEAN CHEMICALS AGENCY

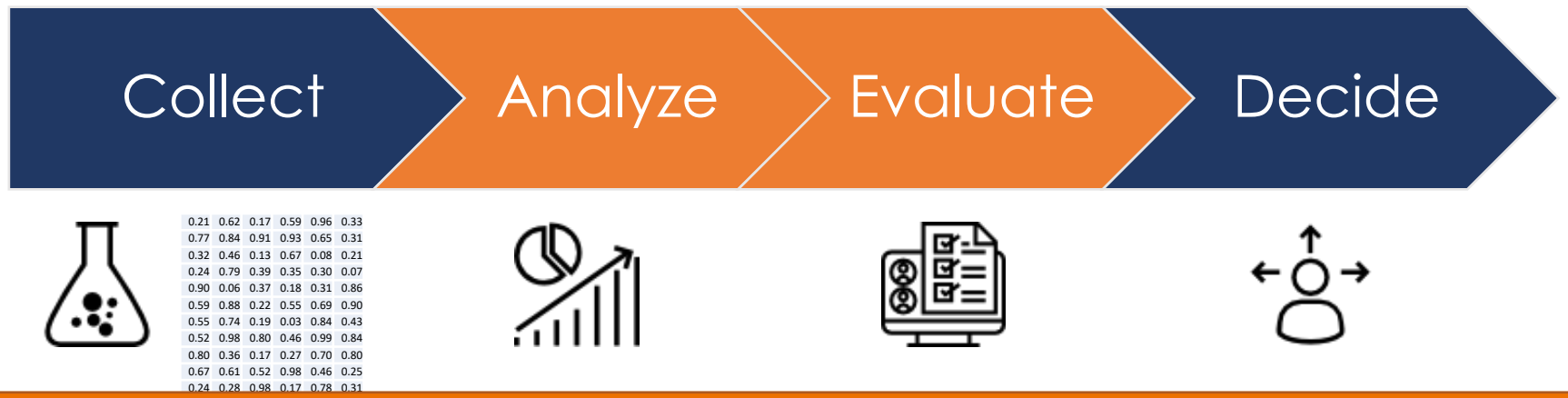
Collect → Analyze → Evaluate → Decide



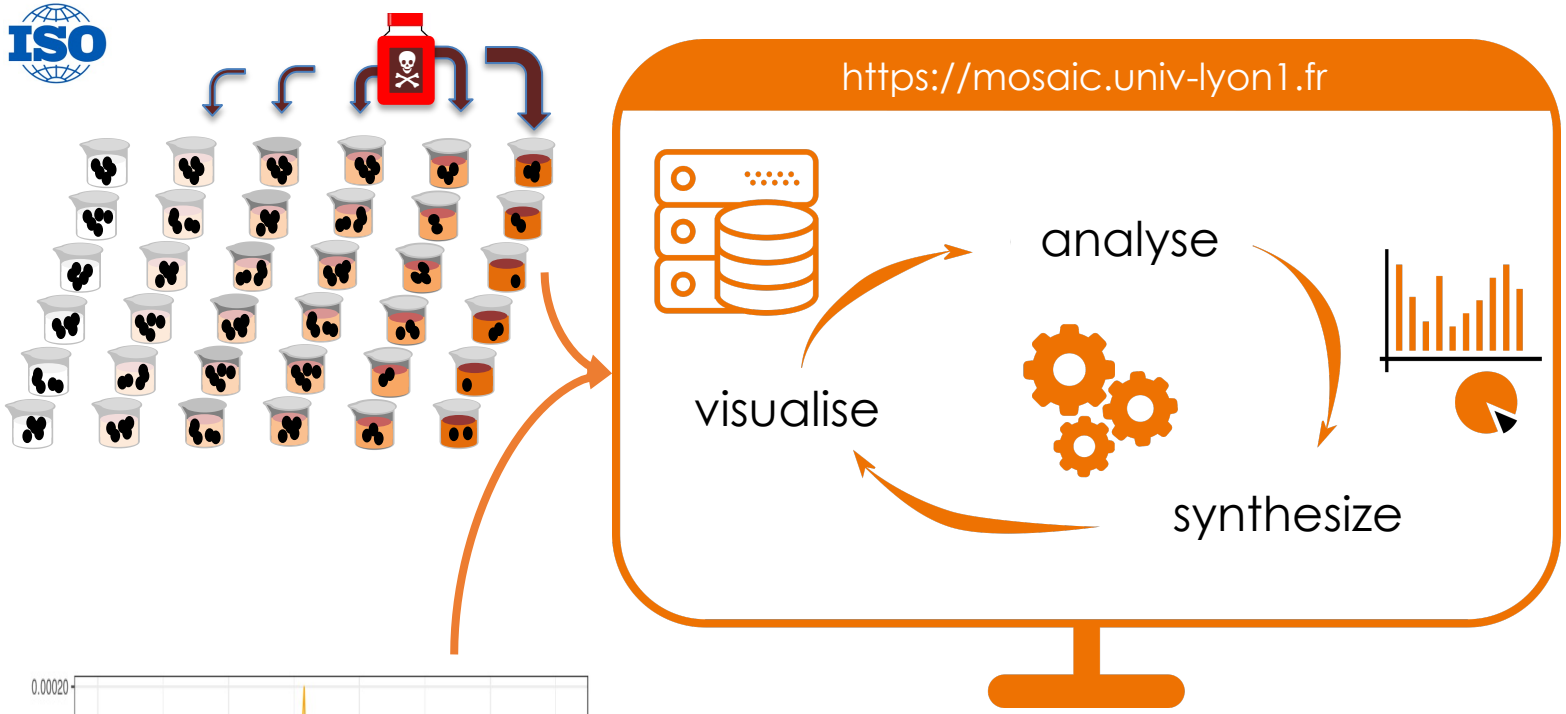
0.21	0.62	0.17	0.59	0.96	0.33
0.77	0.84	0.91	0.93	0.65	0.31
0.32	0.46	0.13	0.67	0.08	0.21
0.24	0.79	0.39	0.35	0.30	0.07
0.90	0.06	0.37	0.18	0.31	0.86
0.59	0.88	0.22	0.55	0.69	0.90
0.55	0.74	0.19	0.03	0.84	0.43
0.52	0.98	0.80	0.46	0.99	0.84
0.80	0.36	0.17	0.27	0.70	0.80
0.67	0.61	0.52	0.98	0.46	0.25
0.24	0.28	0.98	0.17	0.78	0.31

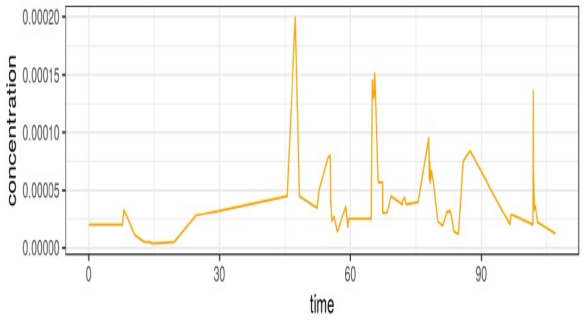


Environmental risk assessment

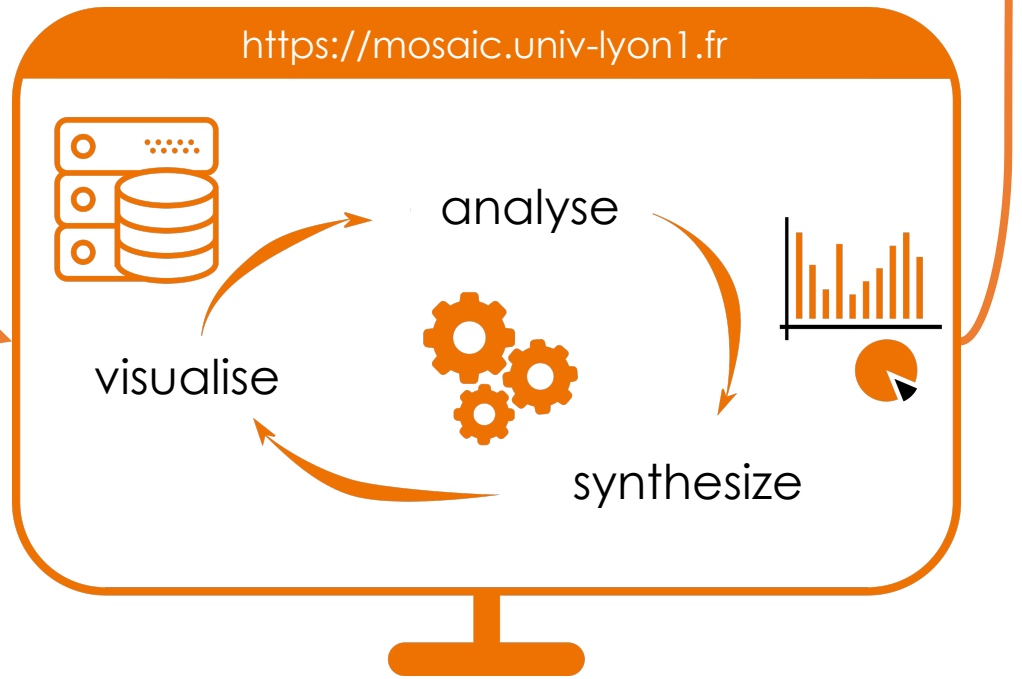


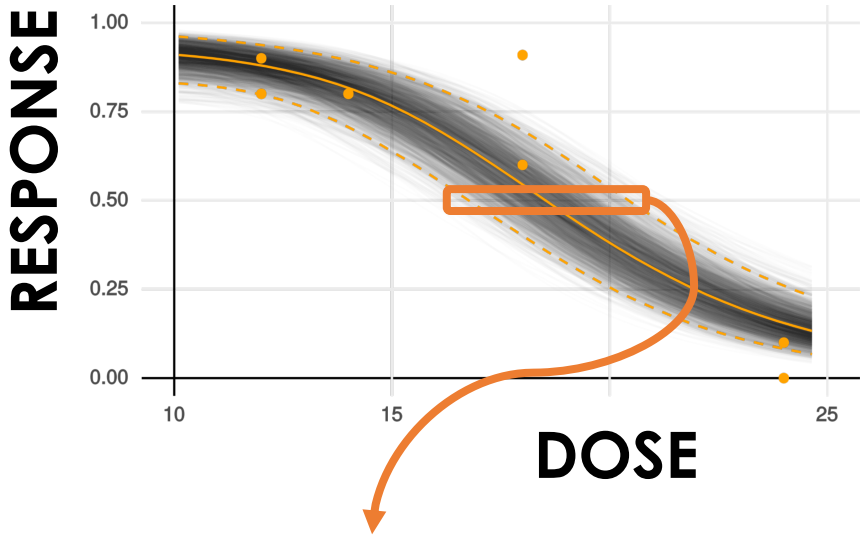
MOSAIC, the solution

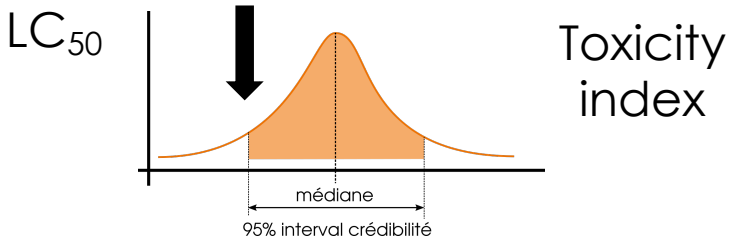




MOSAIC, the solution







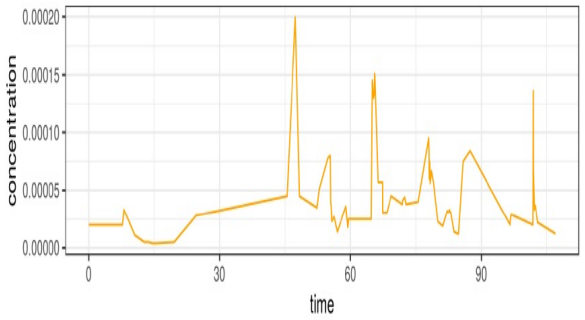
MOSAIC, the solution

https://mosaic.univ-lyon1.fr

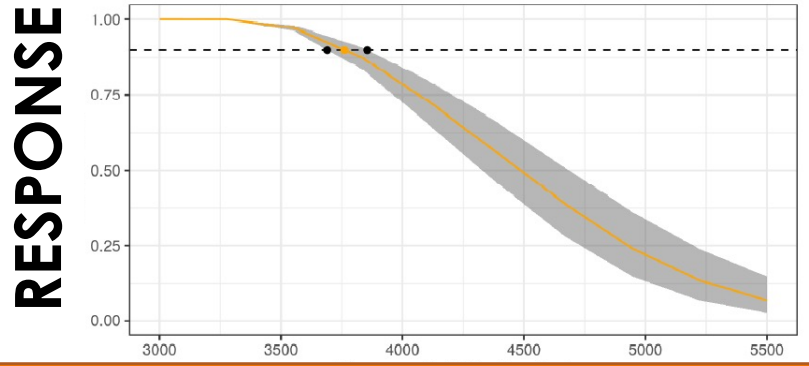
analyse

visualise

synthesize

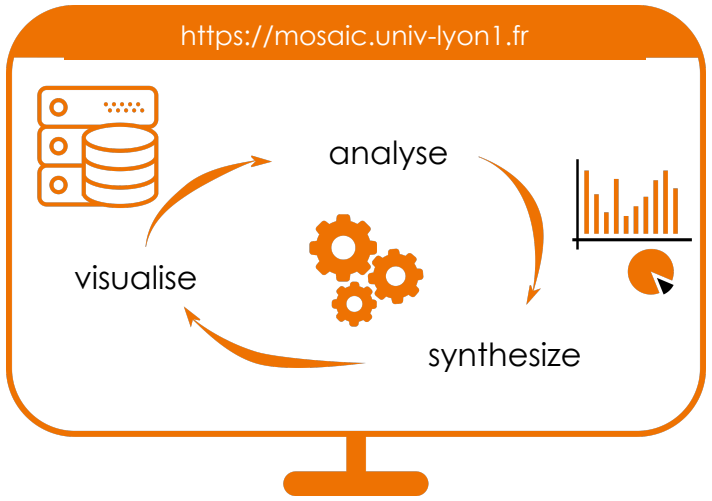


TKTD modeling



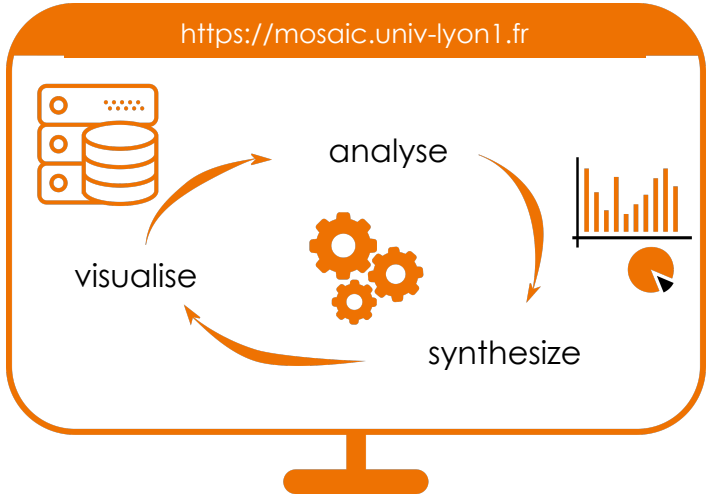
MOSAIC, its strengths

- Transparency and reproducibility



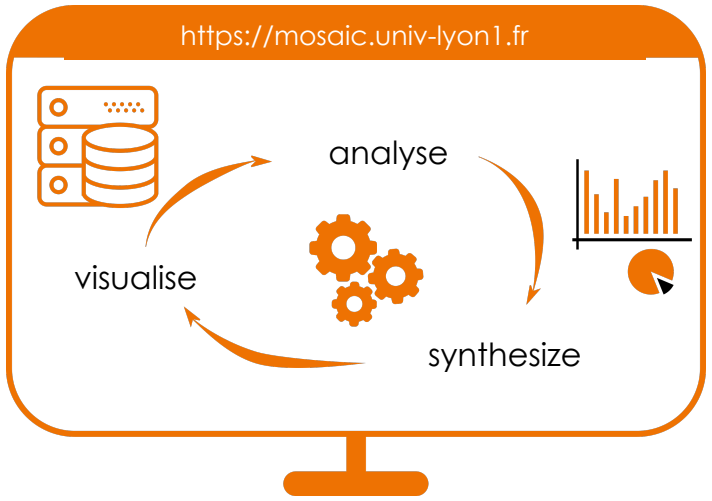
MOSAIC, its strengths

- Transparency and reproducibility



- Bayesian statistics

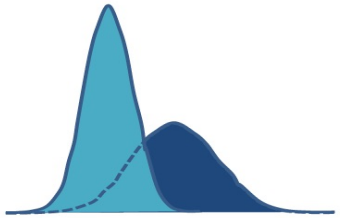
MOSAIC, its strengths



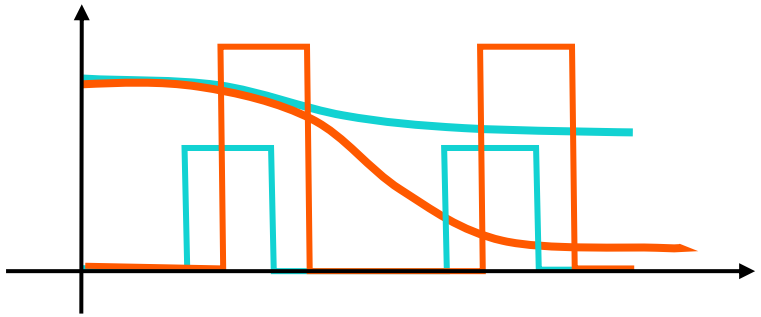
- Transparency and reproducibility

GLP

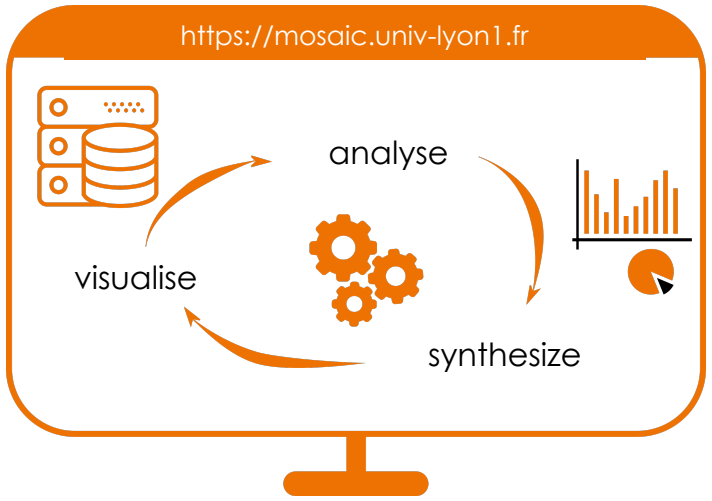
- Mechanistic modeling approach
- Bayesian statistics



- Predict to better prevent



MOSAIC, a first prescriber



OECD
BETTER POLICIES FOR BETTER LIVES

243
Adopted:
29 July 2016

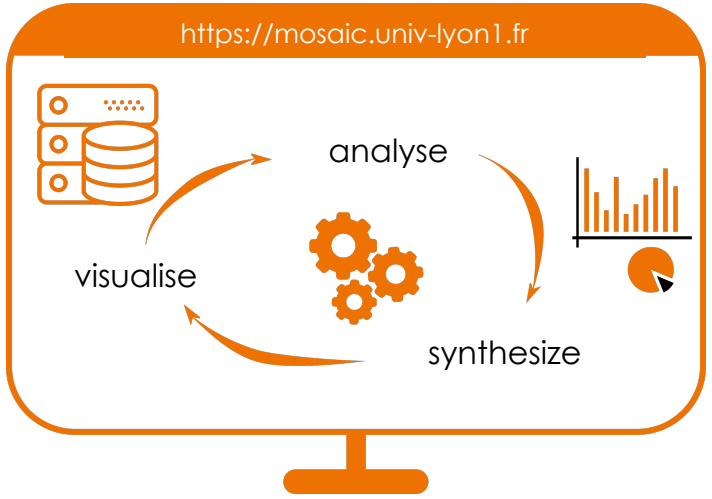
OECD GUIDELINE FOR THE TESTING OF CHEMICALS

EC_x

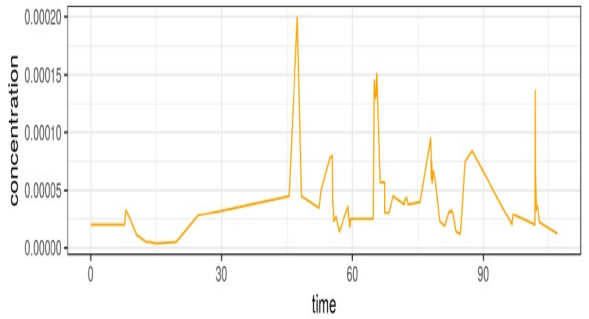
***Lymnaea stagnalis* Reproduction Test**

52. EC_x values, including their associated lower and upper credible/confidence limits, are estimated using any appropriate statistical method based on a regression analysis of the number of clutches (or eggs) per individual-day. Even if any statistical software can be used for regression analysis (3), the user-friendly web-platform MOSAIC_repro, freely available at http://pbil.univ-lyon1.fr/software/mosaic/reproduction/, is recommended because the procedures implemented within this software were developed during the validation process of the *L. stagnalis* Reproduction Test (see details in ANNEX 7).

MOSAIC, in support of regulation



efsa
European Food Safety Authority



→ TKTD modeling

MOSAIC

For who? For what?

MOSAIC is a turnkey decision-making tool for ecotoxicologists, regulators and industrials.

Without the need to immerse into extensive mathematical and statistical technicalities, users are given advanced and **innovative methods** for a valuable quantitative environmental risk assessment.

Contact

http://pbil.univ-lyon1.fr/software/mosaic/
mosaic@univ-lyon1.fr

http://goo.gl/Y2UOMp

MOSAIC

Features

- Free usage
- User-friendly interface
- Data privacy
- Reproducible results
- Open methods

Contact

http://pbil.univ-lyon1.fr/software/mosaic/
mosaic@univ-lyon1.fr

http://goo.gl/Y2UOMp

Usage statistics (overview)

Showing 3351 entries

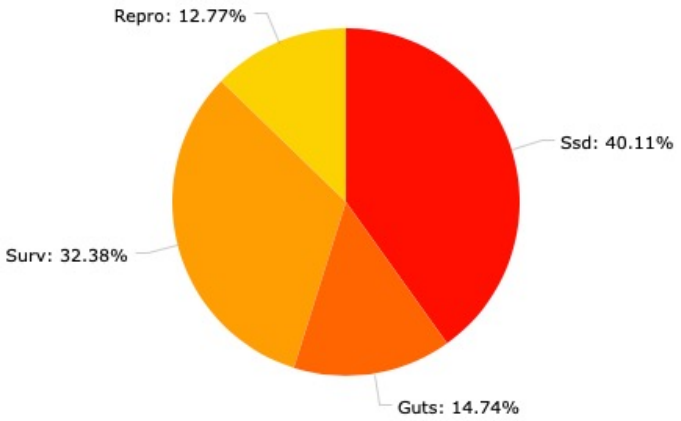
Unique users

553

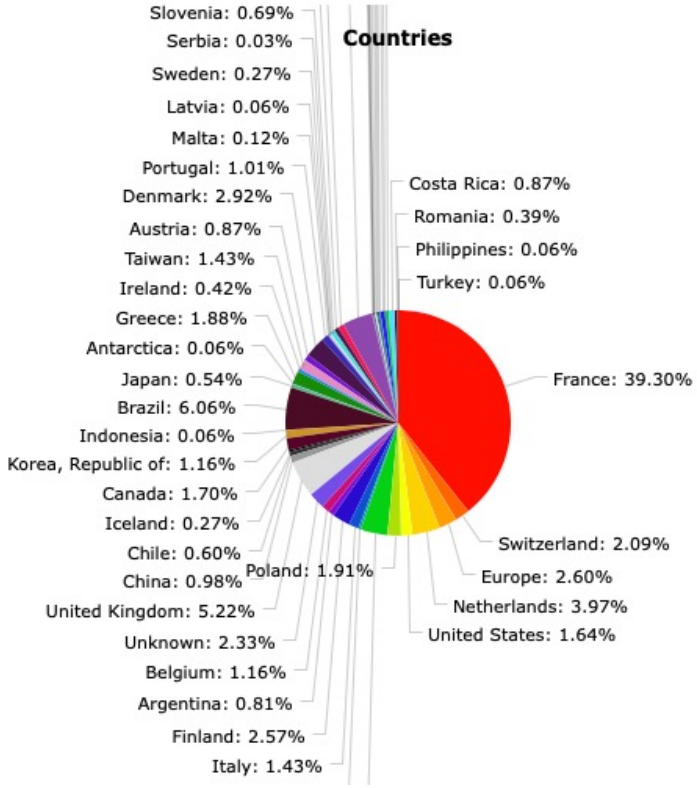
New users

553

Modules



Countries



Usage statistics (last month)

Showing 271 entries

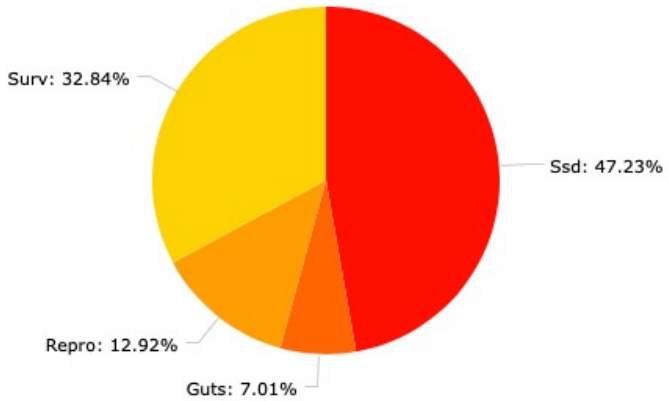
Unique users

78

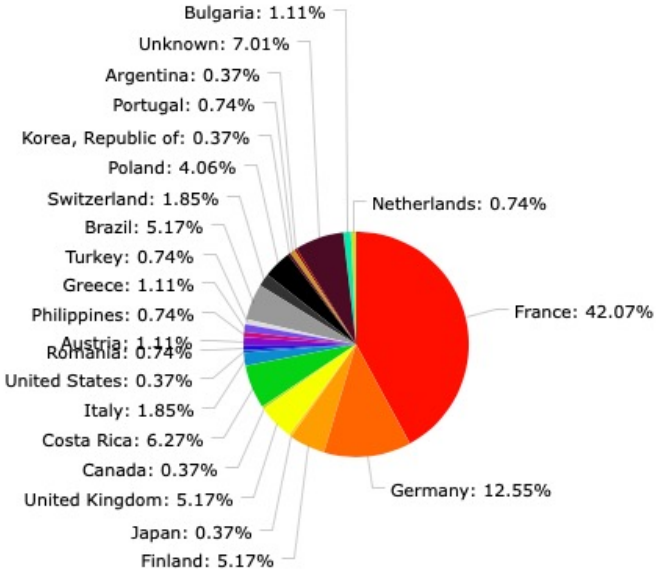
New users

78

Modules

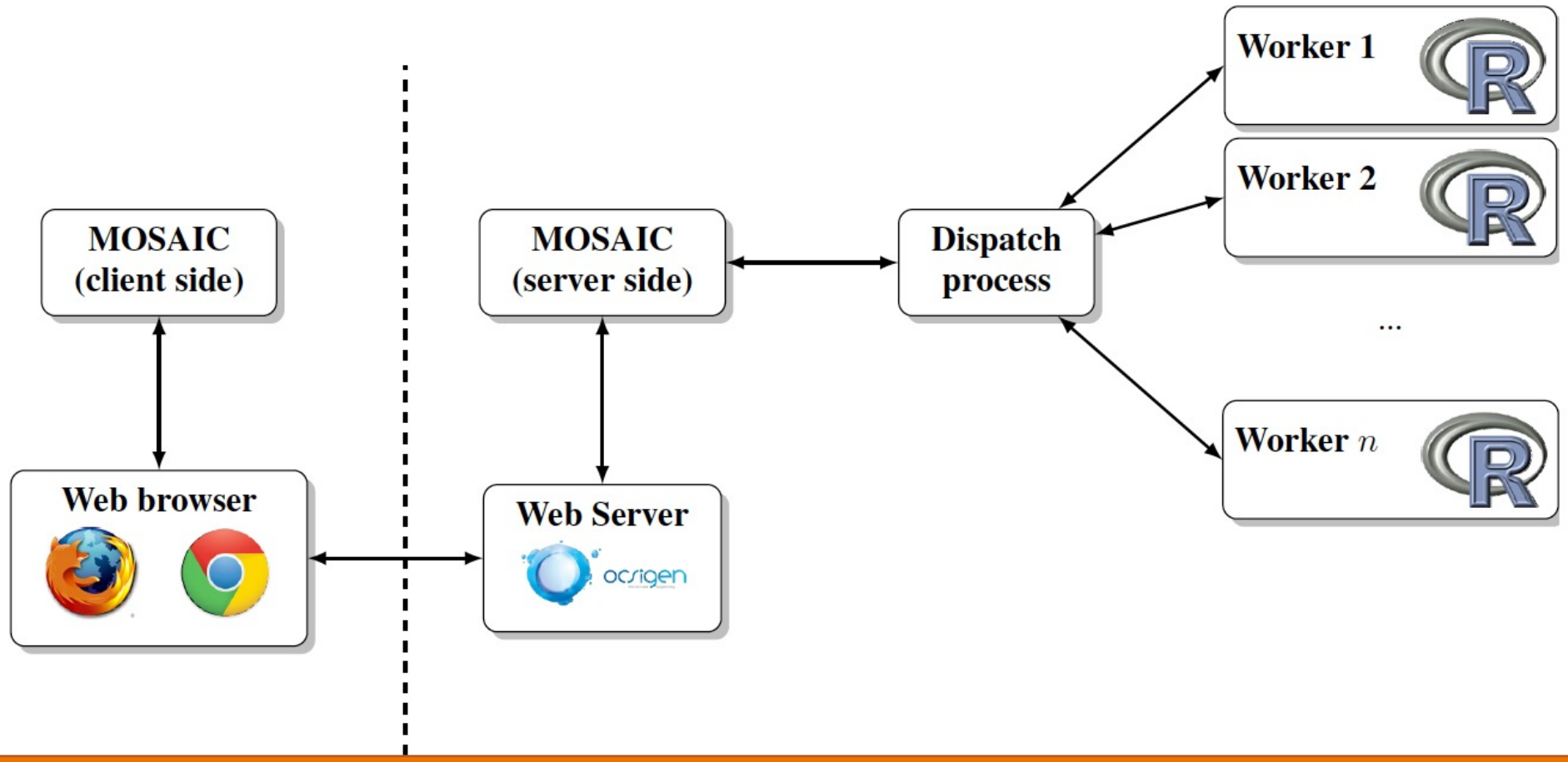


Countries



MOSAIC

The dark side



Contact

http://pbil.univ-lyon1.fr/software/mosaic/
mosaic@univ-lyon1.fr

http://goo.gl/Y2UOMp

MOSAIC

Two modules for survival

MOSAIC surv

Classical dose-response analysis of bioassay **survival** data, with descriptive summaries of the data and **x% lethal concentrations** (LCx) estimates under a **Bayesian framework**.

MOSAIC GUTS

Toxicokinetic-toxicodynamic (TKTD) analysis of survival data, fitted with a General Unified Threshold model of Survival (GUTS) model to estimate **threshold concentrations and x% lethal concentrations** (LCx) under a **Bayesian framework**.

MOSAIC

Two modules
for reproduction and SSD

MOSAIC repro

Classical dose-response analysis of bioassay **reproduction** data, in addition with descriptive summaries of the data and estimates of **x% effective concentrations** (ECx) under a **Bayesian framework**.

MOSAIC SSD

Species Sensitivity Distribution fitted to estimate **hazardous concentration for p%** (HCp) of the species.

Parameters of the probability distribution are estimated from toxicity thresholds under a **frequentist framework**.

MOSAIC REPRO

OECD GUIDELINE FOR THE TESTING OF CHEMICALS

EC_x

52. EC_x values, including their associated lower and upper credible/confidence limits, are estimated using any appropriate statistical method based on a regression analysis of the number of clutches (or eggs) per individual-day. Even if any statistical software can be used for regression analysis (3), the user-friendly web-platform MOSAIC_repro, freely available at http://pbil.univ-lyon1.fr/software/mosaic/reproduction/, is recommended because the procedures implemented within this software were developed during the validation process of the *L. stagnalis* Reproduction Test (see details in ANNEX 7).

MOSAIC GUTS-fit

efsa
European Food Safety Authority

SCIENTIFIC OPINION

EFSA Journal

ADOPTED: 27 June 2018

doi: 10.2903/j.efsa.2018.5377

Scientific Opinion on the state of the art of Toxicokinetic/Toxicodynamic (TKTD) effect models for regulatory risk assessment of pesticides for aquatic organisms

EFSA Panel on Plant Protection Products and their Residues (PPR), Colin Ockleford, Paulien Adriaanse, Philippe Berny, Theodorus Brock, Sabine Duquesne, Sandro Grilli, Antonio F Hernandez-Jerez, Susanne Hougaard Bennekou, Michael Klein, Thomas Kuhl, Ryszard Laskowski, Kyriaki Machera, Olavi Pelkonen, Silvia Pieper, Robert H Smith, Michael Stemmer, Ingvar Sundh, Aaldrik Tiktak, Christopher J. Topping, Gerrit Wolterink, Nina Cedergreen, Sandrine Charles, Andreas Focks, Melissa Reed, Maria Arena, Alessio Ippolito, Harry Byers and Ivana Teodorovic

It is acknowledged that standard software suitable for general (non-expert) use is not yet at hand, although for GUTS there are some options available. MOSAIC (MOdeling and StAtistical tools for ecotoxicology) developed at the University of Lyon contains a GUTS tool (http://pbil.univ-lyon1.fr/software/mosaic/guts) which can be used for calibration. Moreover, GUTS-ShinyApp (http://lbbe-shiny.univ-lyon1.fr/guts-shinyapp/) can be used to simulate predictions of survival for different exposure profiles with different TKTD parameter values for both GUTS-RED-SD and GUTS-RED-IT models.

MOSAIC

Two new modules
2020

MOSAIC growth

Classical dose-response analysis of bioassay data of **growth-type**, in addition with descriptive summaries of the data and estimates of **x% effective concentrations** (ECx) under a **Bayesian framework**.

MOSAIC bioacc

Provides **bioaccumulation factors** (BCF/BMF/BAF) from the fitting of a toxicokinetic (TK) model on accumulation-depuration data under a **Bayesian framework**. Fulfils all requirements of regulators when examining applications for market authorization of active substances.

MOSAIC

How to cite MOSAIC?

- Ratier A, Lopes C, Multari G, et al (2020) Brief communication: new perspectives on the calculation of bioaccumulation factors for active substances in living organisms. *bioRxiv*. https://doi.org/10.1101/2020.07.07.185835
- Charles S, Wu D, Ducrot V (2021) How to account for the uncertainty from standard toxicity tests in species sensitivity distributions: an example in non-target plants. *PLOS ONE* 16:e0245071.
- Charles S, Veber P, Delignette-Muller ML. 2018. MOSAIC: a web-interface for statistical analyses in ecotoxicology. *Environ. Sci. Pollut. Res*. 25:11295–11302.
- Kon Kam King G, Veber P, Charles S, Delignette-Muller ML. 2014. MOSAIC_SSD: a new web tool for species sensitivity distribution to include censored data by maximum likelihood. *Environ. Toxicol. Chem.* 33:2133–9.
- Baudrot V, Veber P, Gence G, Charles S. 2018. Fit GUTS reduced models online: from theory to practice. *Integr. Environ. Assess. Manag.* 14:625–630.

Contact

http://pbil.univ-lyon1.fr/software/mosaic/

mosaic@univ-lyon1.fr

http://goo.gl/Y2UOMp

MOSAIC

Two new modules
2020

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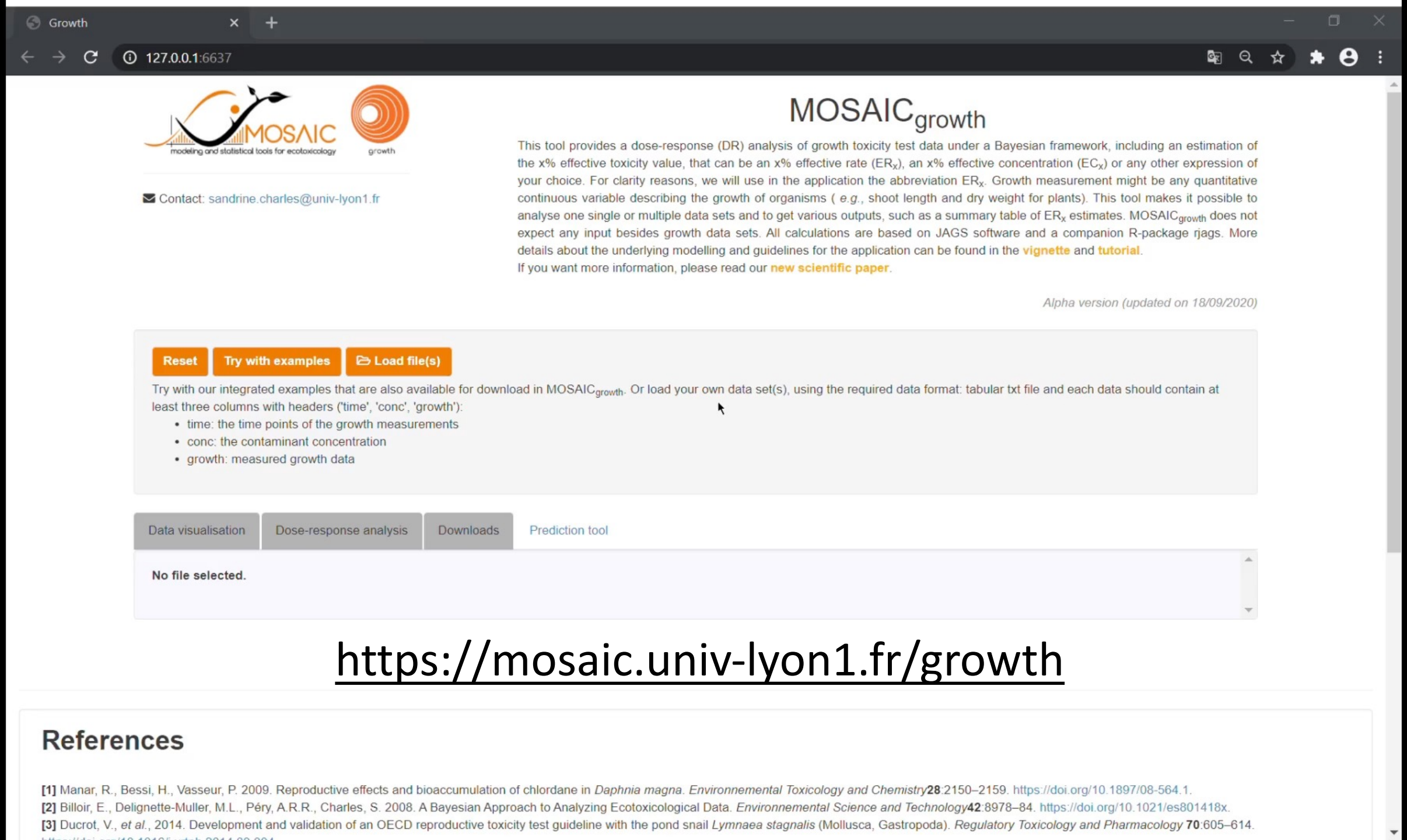

https://mosaic.univ-lyon1.fr/growth

References

[1] Manar, R., Bessi, H., Vasseur, P. 2009. Reproductive effects and bioaccumulation of chlordane in *Daphnia magna*. *Environnemental Toxicology and Chemistry* **28**:2150–2159. https://doi.org/10.1897/08-564.1.
[2] Billoir, E., Delignette-Muller, M.L., Péry, A.R.R., Charles, S. 2008. A Bayesian Approach to Analyzing Ecotoxicological Data. *Environnemental Science and Technology* **42**:8978–84. https://doi.org/10.1021/es801418x.
[3] Ducrot, V., *et al.*, 2014. Development and validation of an OECD reproductive toxicity test guideline with the pond snail *Lymnaea stagnalis* (Mollusca, Gastropoda). *Regulatory Toxicology and Pharmacology* **70**:605–614.

Growth

127.0.0.1:6637

MOSAIC$_{growth}$

This tool provides a dose-response (DR) analysis of growth toxicity test data under a Bayesian framework, including an estimation of the x% effective toxicity value, that can be an x% effective rate (ER_x), an x% effective concentration (EC_x) or any other expression of your choice. For clarity reasons, we will use in the application the abbreviation ER_x. Growth measurement might be any quantitative continuous variable describing the growth of organisms (*e.g.*, shoot length and dry weight for plants). This tool makes it possible to analyse one single or multiple data sets and to get various outputs, such as a summary table of ER_x estimates. MOSAIC$_{growth}$ does not expect any input besides growth data sets. All calculations are based on JAGS software and a companion R-package rjags. More details about the underlying modelling and guidelines for the application can be found in the **vignette** and **tutorial**.
If you want more information, please read our **new scientific paper**.

Contact: sandrine.charles@univ-lyon1.fr

Alpha version (updated on 18/09/2020)

Reset **Try with examples** **Load file(s)**

Try with our integrated examples that are also available for download in MOSAIC$_{growth}$. Or load your own data set(s), using the required data format: tabular txt file and each data should contain at least three columns with headers ('time', 'conc', 'growth'):

- time: the time points of the growth measurements
- conc: the contaminant concentration
- growth: measured growth data

Data visualisation | Dose-response analysis | Downloads | Prediction tool

No file selected.

References

[1] Manar, R., Bessi, H., Vasseur, P. 2009. Reproductive effects and bioaccumulation of chlordane in *Daphnia magna*. *Environnemental Toxicology and Chemistry***28**:2150–2159. https://doi.org/10.1897/08-564.1.
[2] Billoir, E., Delignette-Muller, M.L., Péry, A.R.R., Charles, S. 2008. A Bayesian Approach to Analyzing Ecotoxicological Data. *Environnemental Science and Technology***42**:8978–84. https://doi.org/10.1021/es801418x.
[3] Ducrot, V., *et al.*, 2014. Development and validation of an OECD reproductive toxicity test guideline with the pond snail *Lymnaea stagnalis* (Mollusca, Gastropoda). *Regulatory Toxicology and Pharmacology* **70**:605–614.