`fluxible`: an R package to process ecosystem gas fluxes from closed-loop chambers in an automated and reproducible way

J Gaudard[1], R J Telford[1], J Chacon-Labella[2,3], H R Dawson[4,5], B J Enquist[6], J P Töpper[7], J Trepel[8], V Vandvik[1], M Baumane[9,10], K Birkeli[1], M J M Holle[11], J R Hupp[12], P E Santos-Andrade[13], T W Satriawan[14], A H Halbritter[1]

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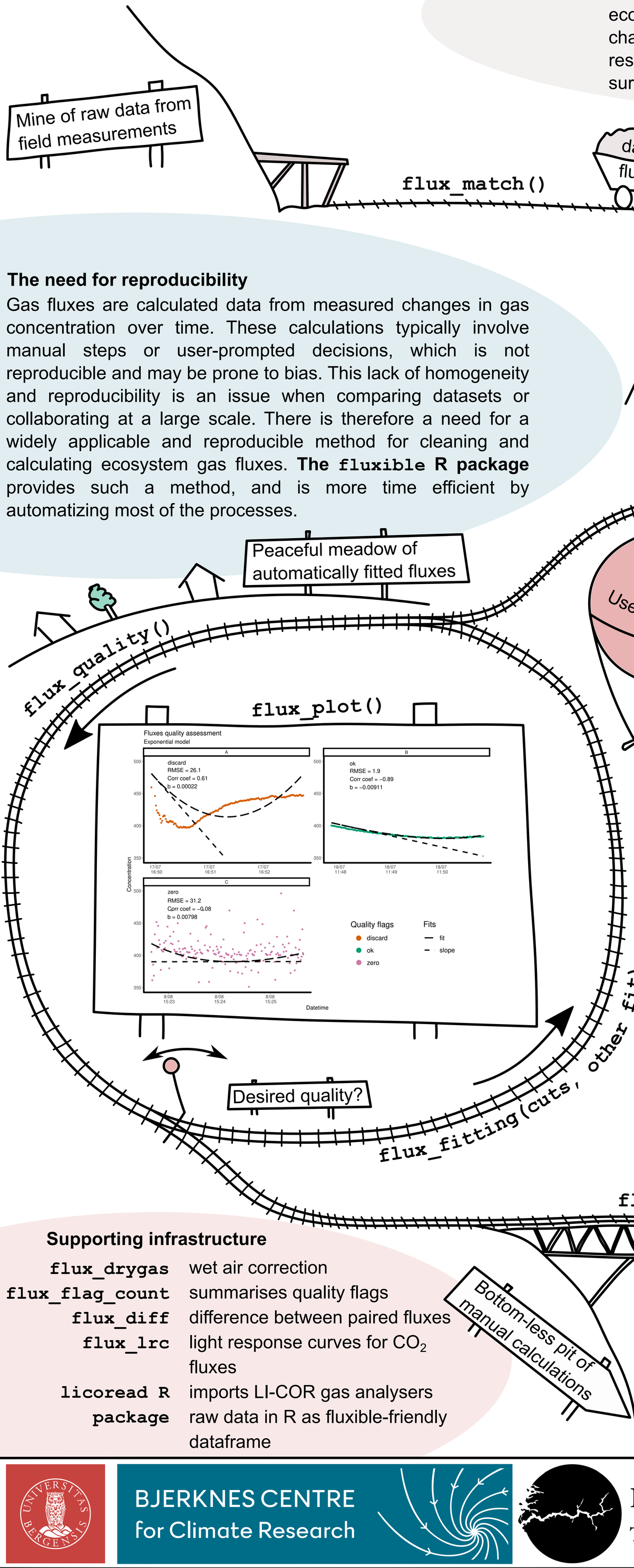
plant-functional-trait-course.github.io/fluxible
joseph.gaudard@pm.me
@jogaudard.bsky.social
0000-0002-6989-7624

A proxy for ecosystem balance

Ecosystem gas fluxes allow to measure the balance of an ecosystem in a non destructive way. In particular, carbon fluxes measurements are used to assess ecosystem carbon storage. They are widely used to study the effects of global changes on ecosystem functioning. These data are crucial to understand ecosystem responses to future climate, compare landscapes and biomes, and to train land surface models.

The need for reproducibility

Gas fluxes are calculated data from measured changes in gas concentration over time. These calculations typically involve manual steps or user-prompted decisions, which is not reproducible and may be prone to bias. This lack of homogeneity and reproducibility is an issue when comparing datasets or collaborating at a large scale. There is therefore a need for a widely applicable and reproducible method for cleaning and calculating ecosystem gas fluxes. **The `fluxible` R package** provides such a method, and is more time efficient by automatizing most of the processes.



From raw gas concentrations to fluxes in five steps

`flux_match`	attribute meta data and unique ID to each measurement
`flux_fitting`	fit a model (linear, exponential or quadratic) to the data and obtain the slope for each flux
`flux_quality`	obtain diagnostics on the fits quality
`flux_plot`	visually assess and check the fits
`flux_calc`	calculate the fluxes

Supporting infrastructure

`flux_drygas`	wet air correction
`flux_flag_count`	summarises quality flags
`flux_diff`	difference between paired fluxes
`flux_lrc`	light response curves for CO_2 fluxes
`licoread R package`	imports LI-COR gas analysers raw data in R as fluxible-friendly dataframe

The **`fluxible` R package** aims to:

- bridge the reproducibility gap in the cleaning method of raw field measured flux data
- increase compatibility between datasets
- provide an efficient, flexible and user-friendly workflow.

[1]Department of Biological Sciences and Bjerknes Centre for Climate Research, University of Bergen, Norway
[2]Departamento de Biología. Universidad Autónoma de Madrid, Spain
[3]Centro de Investigación en Biodiversidad y Cambio Global, CIBC-UAM, Universidad Autónoma de Madrid, Spain
[4]Department of Biology, University of Oregon, Eugene, Oregon, USA
[5]Research School of Biology, Australian National University, Canberra, Australia
[6]Ecology and Evolutionary Biology, University of Arizona, Tuscon, AZ, USA
[7]Norwegian Institute for Nature Research, Bergen, Norway
[8]Center for Ecological Dynamics in a Novel Biosphere (ECONOVO), Department of Biology, Aarhus University
[9]Department of Biology, Faculty of Science, University of Copenhagen, Denmark
[10]Department of Biology, Faculty of Natural Sciences, Aarhus University, Denmark
[11]Faculty of Biology, Gadjah Mada University, Sleman, Indonesia.
[12]LI-COR Biosciences, 4647 Superior St Lincoln, NE 68504, USA
[13]Universidad Nacional de San Antonio Abad del Cusco, Cusco, Perú
[14]Department of Geography, National University of Singapore, Singapore

References : Bastviken et al., "Critical method needs in measuring greenhouse gas fluxes." 2022; Zhao et al., "On the Calculation of Daytime CO_2 Fluxes Measured by Automated Closed Transparent Chambers." 2018; Kutzbach et al., "CO_2 flux determination by closed-chamber methods can be seriously biased by inappropriate application of linear regression." 2007. Acknowledgments: M Kerdoncuf (troll), J Knutson (avalanche), M Zwier (inkscape help), Between the Fjords lab (feedback and suggestions).