

Fluxible: an R package to calculate ecosystem gas fluxes in a reproducible and automated workflow.

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Find the package here:
jogaudard.github.io/fluxible



Ecosystem gas fluxes

Carbon fluxes measurements are widely used to study the effects of global changes on ecosystem functioning. This is a non destructive method to assess ecosystems carbon balance. These data are crucial to understand ecosystem responses to future climate, compare landscapes and biomes, and to train land surface models.

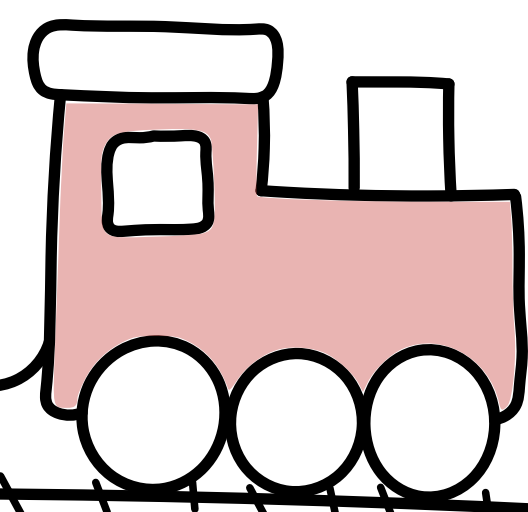
Mine of raw data from field measurements

`flux_match()`

data
fluxID

data
fluxID

data
fluxID



`flux_fitting()`

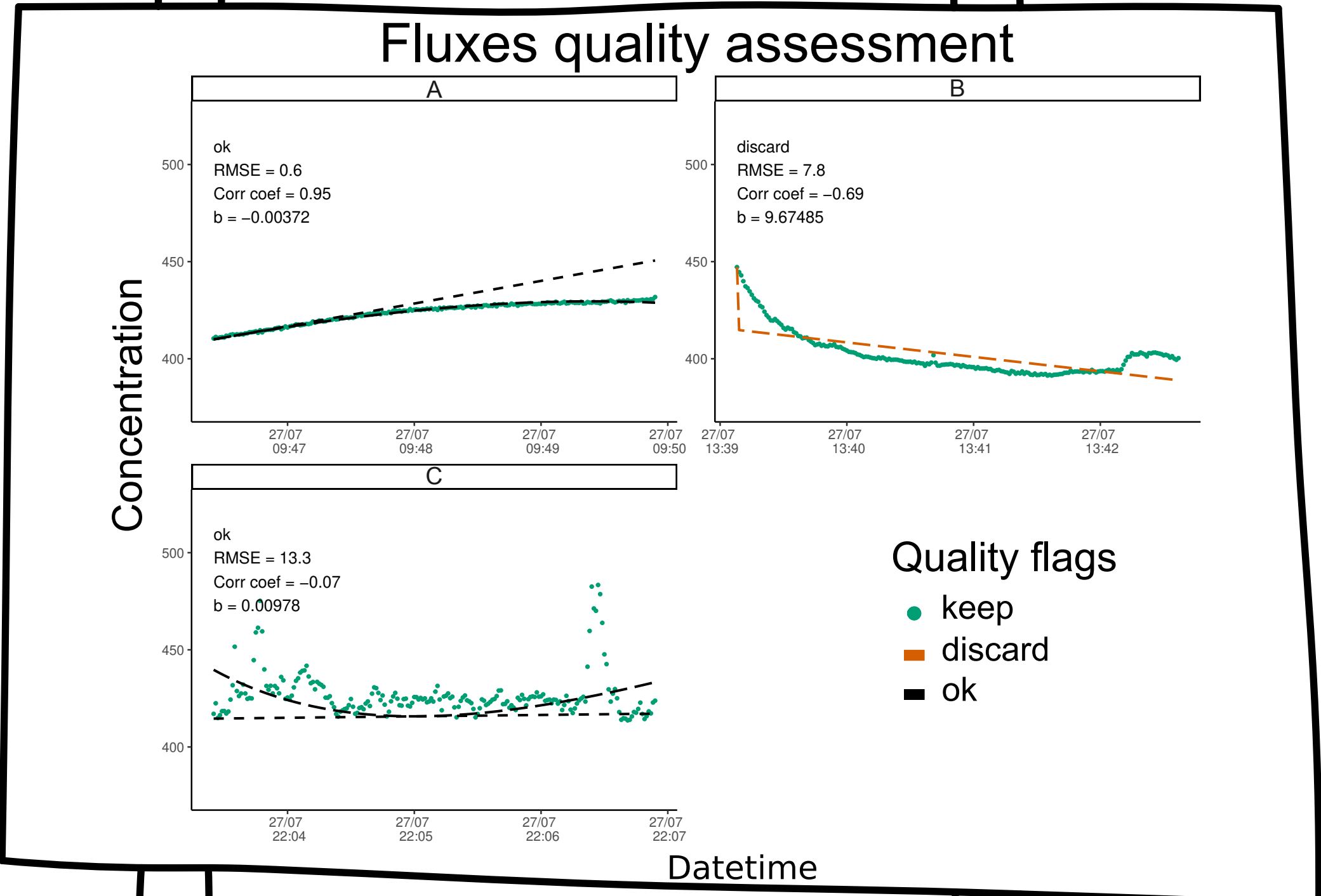
The need for reproducibility

Gas fluxes are calculated data from measured changes in gas concentration over time. Currently a wide variety of methods are used. Most of them include steps that are not reproducible and prone to bias. This lack of homogeneity and reproducibility is an issue when comparing datasets and 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.

Peaceful meadow of automatically fitted fluxes

`flux_quality()`

`flux_plot()`



Desired quality?

`flux_fitting(cuts, other fit)`

User's assessment

Workflow

- Slice datasets and attribute metadata with `flux_match`
- Fit a model (linear or exponential) to the data and obtain the slope for each flux with `flux_fitting`
- Obtain quality information for each fit with `flux_quality`
- Plot each flux for visual check with `flux_plot`
- Re-run `flux_fitting`, `flux_quality` and `flux_plot` with different arguments until you obtain the desired quality
 - the cuts, type of fit and quality thresholds are applied homogeneously to the entire dataset
- Calculate fluxes from the slope provided by `flux_fitting` using `flux_calc`

Clean fluxes

`flux_calc()`

Analysis

Further developments

The current calculations are suited for an airtight flux chamber. However, for experiments using non airtight chambers or tents, an extra step will be included in the modelling of fluxes to account for gas leakage. As we want Fluxible to suit the needs of different experiments and projects, more choices of fit expression in `flux_fitting` will be available in the future.

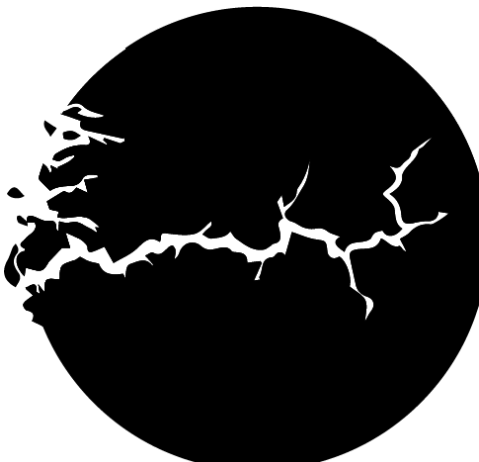
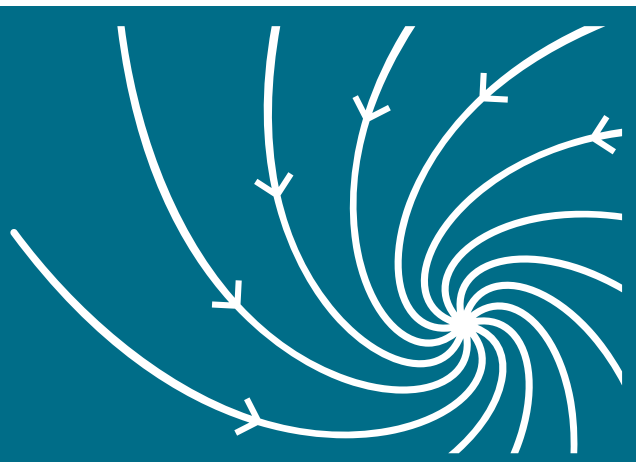
Bottom-less pit of manual calculations

The Fluxible R package aims at:

- bridging the reproducibility gap in the cleaning method of raw field measured flux data;
- increasing compatibility between datasets;
- providing a fast and user friendly workflow.



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References : Zhao et al., "On the Calculation of Daytime CO₂ Fluxes Measured by Automated Closed Transparent Chambers," 2018; Speißer, Wilschut, and van Kleunen, "Number of Simultaneously Acting Global Change Factors Affects Composition, Diversity and Productivity of Grassland Plant Communities," 2022
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