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

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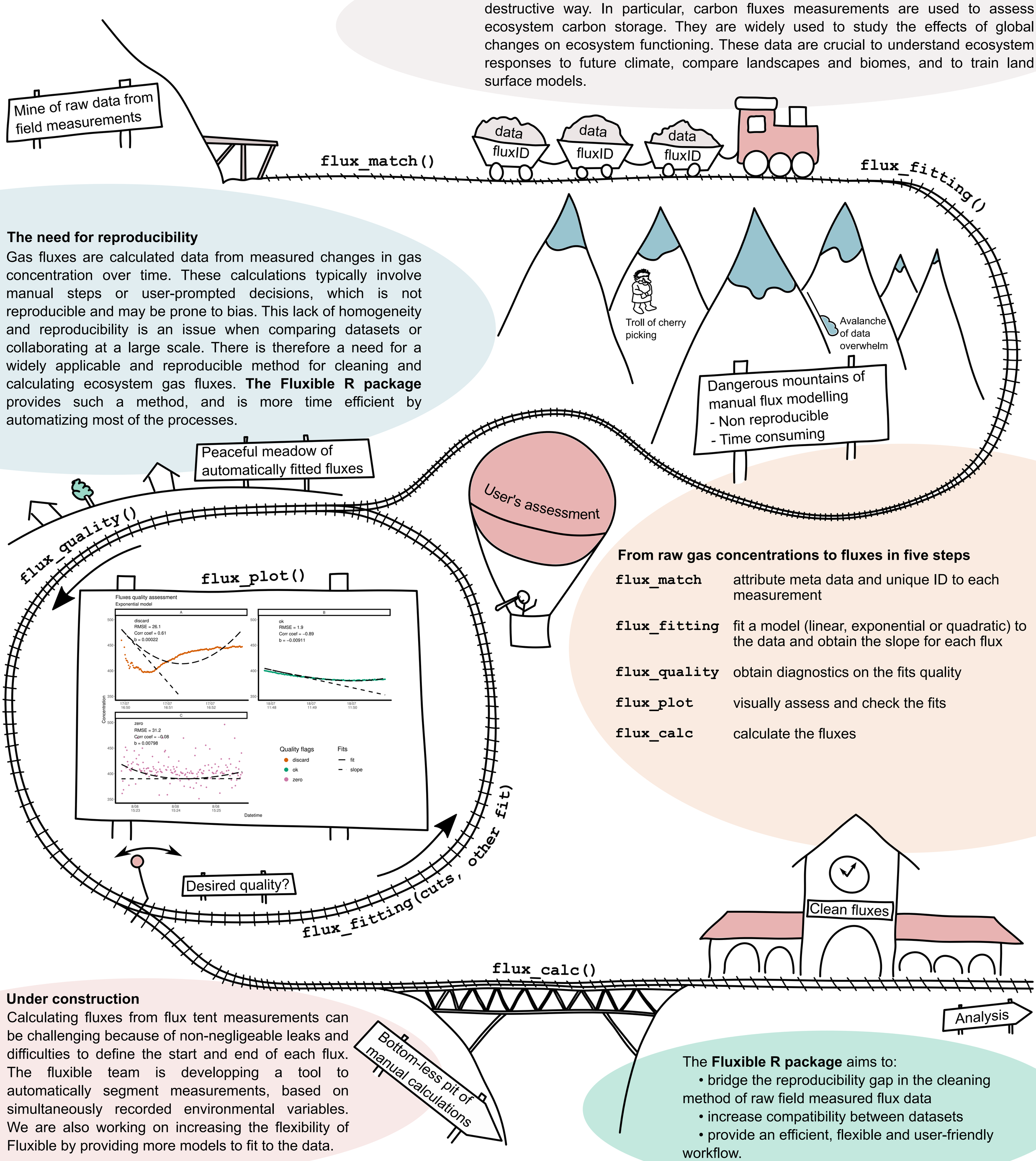
A proxy for ecosystem balance

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

Under construction

Calculating fluxes from flux tent measurements can be challenging because of non-negligeable leaks and difficulties to define the start and end of each flux. The fluxible team is developping a tool to automatically segment measurements, based on simultaneously recorded environmental variables. We are also working on increasing the flexibility of Fluxible by providing more models to fit to the data.

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.

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References: Zhao et al., On the Calculation of Daytime CO2 Fluxes Measured by Automated Closed Transparent Chambers. (2018); Hüppi, R. et al. Restricting the nonlinearity parameter in soil greenhouse gas flux calculation for more reliable flux estimates (2018); Kutzbach, L. et al. CO2 flux determination by closed-chamber methods can be seriously biased by inappropriate application of linear regression. (2007).
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