

Interactive comment on “Ideas and perspectives: enhancing the impact of the FLUXNET network of eddy covariance sites” by Dario Papale

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Thank you Bruno Marino for the comment to the paper. Here below my replay and view (in blue italic)

Papale summarizes the history of FLUXNET and related networks resulting in intermittent data products and the current status of mixed interoperability. Papale notes that fluxnet community operations are not standardized, or available in near real-time, or effectively shared creating a mixed-mosaic of data formats and user requirements that are difficult to navigate (see review by JB Fisher). Solutions are proposed to realign flux community/individual efforts and standardization of data format and access, however, few details as to engineering structure and how these solutions could be

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implemented are provided. While flux data for CO₂ is produced and consumed primarily by research communities, it is of high importance to commercial applications for GHG mitigation and verification of emission reduction claims now emerging in the private sector. Without direct measurement of CO₂ flux (e.g., forests, soil, agriculture) at appropriate scales, commercial applications cannot contribute to solutions based on the net removal of GHG's.

Thanks for the comment. Yes, the private sector is also an important player and although right now the examples of commercial use of FLUXNET data are limited (it is mainly in the sensors production and maintenance), I hope that this will change in the near future, because this would also help FLUXNET to be sustained. The technical and engineering implementation details are not provided, it is true, but I don't think the limit is on that side: there is a lot of experience and development (see for example the ENVRIFAIR activities <https://envri.eu/home-envri-fair/>) in tools and solutions.

Adoption and commercialization of typical research instrumentation for eddy covariance will catalyze innovation and cost reduction as well as manufacture of turn-key eddy covariance systems that can be readily deployed anywhere on the planet. Regional networks of up to 1,000 nodes should be readily achievable at reasonable cost. In addition, interoperability should be seamless and draw on a standardized System of Systems architecture design accommodating high data volume, data security, third party verification, and related concept of operations typical of the banking and related industries.

This is a possibility, and for sure it would be interesting for FLUXNET. The last 25 years shown a development of new sensors and an increase of the networks size, but we need to admit that the technique is still not as accessible as reported in the comment.

The vision proposed may seem bold and unachievable, however, we live in a time where real-time dynamic data characterizing the biosphere and anthropogenic impacts

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on the biosphere are crucial to the management of climate change now and for future generations. Off-the-shelf GHG analyzers, simple steel construction and fabrication of easily deployed single and multiple pole-based towers, and the ubiquitous presence of the internet and satellite telemetry are available and mature industries, poised for application-specific innovation such as proposed by Papale.

Let's hope this is the near future. . .

Importantly, private sector involvement may offer new sources of funding for vast eddy covariance observation nodes with the condition that all data remain freely available to the research community.

This is a crucial point but I think we are still not there. I think it is also our role (FLUXNET) to demonstrate the potential of our measurements also in commercial applications (not only for carbon sequestration but also as service in agriculture, monitoring anthropogenic emissions in cities, linked to satellite validation etc.) to stimulate and investment.

In summary, Papale proposes that a new "FLUXNET" emerges from a reorganization of existing fluxnet communities. This is a critical transition for FLUXNET, or a likely successor entity, to ensure continued growth and relevance to research and private sectors. The private sector should be actively involved in this transformation benefitting all stakeholders.

Thank you, I also hope this will be the future direction.

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