Recent progress and future development in terrestrial GHG flux observations – Ecosystem research towards an essential climate variable

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FLUXNET data network

FLUXNET is the global data network of eddy-covariance stations that, created in 1996, includes now more than 2000 station globally, federating national and continental networks. The data provided by FLUXNET are widely used by the scientific community for applications going from ecological responses, to climate change impact on ecosystems, to GHG exchange mapping and balances at global scale (Figure 1). A novel FLUXNET coordination project just started will support training and exchange opportunities, develop strong international collaboration, and support the building of tools and protocols that ensure continued collaboration and growth. The FLUXNET coordination project will build the next generation of FLUXNET to be a flagship of networked global scientific cooperation."

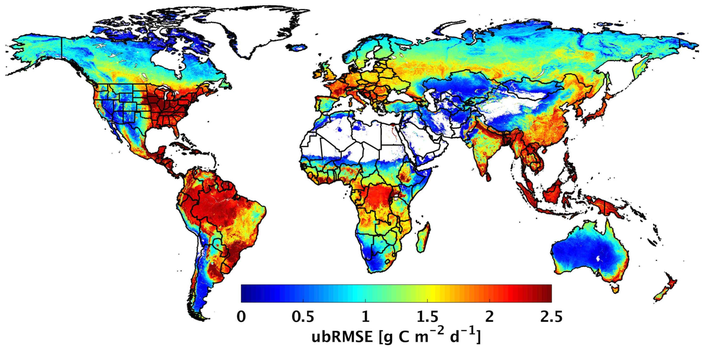

Fig. 1. Global map of ecosystem daily net carbon uptake ($g \cdot C \cdot m^{-2} \cdot y^{-1}$) (from Jones et al. 2017)

Fig. 3. Loobos Ecosystem station in the Netherlands ©ICOS & KPunkka

Systematic observation of greenhouse gas fluxes between terrestrial ecosystems and the atmosphere are an elementary part of the global carbon cycle research. Data from observations have increasing importance for evaluating climate neutrality at country and global levels and enable ecosystem researchers to understand climate change impact on ecosystem function.

The 6th IPCC Assessment Report recognises that provision of long-term eddy covariance data by FLUXNET is important for improving knowledge of fluxes between the atmosphere and land surface and as a data supply towards IPCC simulations.
Continental and national scale research infrastructures such as Ameriflux, the Chinese Ecosystem Research Network (CERN), the Expanded Freshwater and Terrestrial Environmental Observation Network (EFTEON, South Africa), the European Long Term Ecosystem Reseach Research Infrastructure (eLTER RI), the Integrated Carbon Observation System (ICOS, Europe), the National Ecological Observatory Network (NEON, US), the Terrestrial Ecosystem Research Network (TERN, Australia) and independent stations supply researchers with the critical data for advancing process understanding, simulating and predicting ecosystem fluxes, functions and vulnerabilities.
This poster introduces two major initiatives for further improvements: the further development of FLUXNET and the initiative for a Global Ecosystem Research Infrastructure (GERI) that connects currently six of the major research infrastructures towards a coordinated global effort.

C-fluxes as essential climate variable

The two initiatives aim collaboratively to establish land fluxes as an essential climate variable in the next implementation plan Global Climate Observing System (GCOS).
GCOS works towards a world where climate observations are accurate and sustained, and access to climate data is free and open. This will support multiple scientific and societal impact of the observations and provide timely information on the state of the global carbon cycle to the parties to the Paris Agreement.

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Global Ecosystem Research Infrastructure, GERI

GERI is a global RI initiative and partnership of six analogous, but independent, site-based research infrastructures (CERN, EFTEON eLTER, ICOS, NEON and TERN) dedicated to better understanding the function and change of indicator ecosystems across global biomes. GERI aims to support excellent science that informs political and managerial decision-making addressing grand societal challenges. It is envisioned that a fully functioning GERI will deliver harmonised data, international partnerships and enable new understandings of global ecological processes – stretching across continents, decades, and ecological disciplines – in ways that were not previously possible.

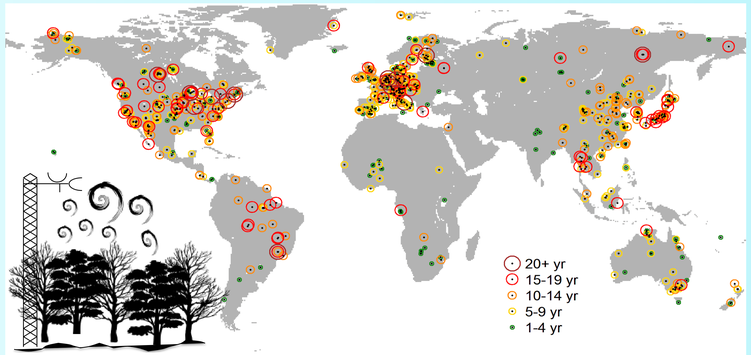

Fig. 2. A global map of CO_2 flux stations

Fig. 4. Ecosystem tower in Wisconsin, USA, photo Jeff Miller, Univ Wisconsin