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The FLUXNET (r)evolution: a coordinated, global effort for longer, more representative and more accessible flux tower datasets

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The FLUXNET2015 release of flux tower data represents a milestone in the global landscape of eddy covariance based monitoring of CO2 and other greenhouse gas (GHG) land-atmosphere exchanges. For the first time more than 200 stations across the globe joined forces towards a standardized product, facilitated by a centralized processing and a unique software (OneFLUX, Pastorello et al. 2020). This paved the way for a deeper understanding of ecosystem responses to climate change and other stressors, as well as for improved performances of satellite products via better calibration and validation data, together with better upscaling and mapping efforts. However, the complexity of such an effort made it impossible to replicate it in a short timeframe for a fully comprehensive new release. Still in 2015, the “birth” of the ICOS ERIC, the European monitoring network of GHG land-atmosphere exchanges, represented another game-changer. The collaboration between ICOS and its American and Australian counterparts, AmeriFlux and OzFlux, led to the launch in December 2025 of the FLUXNET Data System Initiative, characterized by a new, continuously updated approach. With the present contribution we intend to describe the main features of the new system and the benefits we expect it will deliver to the flux, satellite and modeling communities and other stakeholders. By decentralizing the processing and the communication with the smaller regional networks to the three data hubs (ICOS, AmeriFlux and OZFlux), we were able to: (i) extend the data coverage in time and space, including historically under-represented areas and biomes; (ii) building a new API-based tool for the accessibility of the datasets, the FLUXNET Shuttle (Papale et al., 2020), allowing a quasi-continuous update of the datasets, thus suppressing the need for “static” new releases in the future; (iii) increasing the efficiency of the OneFLUX software, in particular in the case of long gaps and for ecosystems in special conditions. This effort constituted also an occasion to define a strategy for handling the legacy of long-term timeseries, and an opportunity for the study and construction of new solutions

for peculiar cases, like the synthetic ustar threshold for urban flux towers.