ESS-DIVE Standards: Leaf Physiology and Continuous Soil Respiration Data and Metadata

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Project Abstract: The aim of this work is to develop standardized formats, vocabulary, and metadata requirements for both leaf-level gas exchange data and automated, continuously-measured soil respiration measurements.

The first of these efforts targets data to be uploaded to ESS-DIVE; its scope covers measurements made with portable gas exchange systems, including survey measurements of photosynthesis, respiration and stomatal conductance; response curves e.g. CO_2 response curves commonly known as A-C_i curves; and derived parameters e.g. the stomatal slope parameter. The data standard will also include specifications for other derivations of key parameters e.g. derivation of $V_{c,max}$ from proxies such as "one-point" measurements. The standard considers data output from widely used, commercially available gas exchange systems from LI-COR, PP Systems, Walz, CID Bioscience and ADC Bioscientific.

The second effort targets the nascent COSORE database (https://github.com/bpbond/cosore/), but is anticipated to provide a foundational standard for both ESS-DIVE and Ameriflux as well. This data standard covers soil respiration broadly, although COSORE targets *continuous* data in particular, and includes a careful consideration of timestamps; measured flux rates at an arbitrary number of measurement chambers at a single site, along with diagnostics associated with each flux measurement; and a variety of chamber-, instrument-, and site-specific metadata. The standard considers data output from a wide range of commercial systems, in particular the commonly-used LI-8100A, and a broad diversity of data practices.

Development of these data standards recognizes the value to the community of making raw data available, in addition to the derived parameters that form the key results of many studies. As our understanding of soil, leaf, and plant processes evolves, access to complete, raw measurement data will enable future researchers to re-process data using the new approaches; it also, we hope, will make possible future syntheses and meta-analyses powered by measurements of these globally-important carbon fluxes.