AmeriFlux Carbon Flux Data Processing and Management

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The AmeriFlux network gathers, curates, and publishes data collected by independently managed field sites, measuring concentrations and fluxes of carbon, water, and energy across the Americas. The data are processed into fluxes, quality controlled, and sent to the network for publication. After the initial data quality control, these data go through a series of post-processing steps to generate derived and value-added data products. To increase the network-wide data consistency, a new in-depth validity check approach has been developed and applied to identify different types of explicit and implicit errors and omissions in specific data flux measurements. This approach is based on detecting the explicit and implicit types of errors. Corrections are carried out in close collaboration with the tower teams. The flux processing pipeline involves two Ustar threshold calculation approaches, namely the Moving Point Test (MPT) and the Change Point Detection (CPD) approaches. An ensemble of Ustar thresholds are generated and used for Ustar filtering as well as uncertainty estimation. Gap-filling of micro-meteorological variables uses a combination of the Marginal Distribution Sampling (MDS) method for shorter gaps and, downscaled data based on the ERA Interim data products for longer gaps. Two methods are used to gap-fill the NEE and energy fluxes: the first based on the MDS method and the second based on Artificial Neural Networks (ANN). Partitioning of NEE into ecosystem respiration and gross primary production (GPP uses two methods: one based on nighttime data and another in daytime data.

In order to enhance data synthesis, land-model evaluation, and other multi-site data applications, efforts are underway to harmonize data and metadata formats within FLUXNET, in close collaboration among AmeriFlux, the European ICOS, and other regional networks. The formats are being implemented for AmeriFlux, ICOS, and FLUXNET, as well as their new releases of standardized sets of flux data products (featuring gap-filling, GPP/respiration partitioning, and uncertainty assessments products). One of the major revisions was to the BADM (Biological, Ancillary, and Disturbance Metadata) protocols. The updates include structure and variable changes to address new developments in data collection related to flux towers and facilitate two-way data sharing. New variables and an extensive addition to the vocabularies used to describe BADM templates allow for a more flexible and comprehensible coverage of field sites and the data collection methods and results.

This presentation will include typical examples of the AmeriFlux carbon data processing and management, illustrating how the developed approach can be used to: (a) combine different types of data into a consistent and reproducible processing pipeline, (b) create a new release of the AmeriFlux and FLUXNET data products, and (c) design the data sharing portal to support users.