

Latest developments in advanced network management and cross-sharing of next-generation flux stations

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In recent years, spatial and temporal flux data coverage improved significantly and on multiple scales, from a single station to continental networks, due to standardization, automation, and management of the data collection, and better handling of the extensive amounts of generated data. However, operating budgets for flux research items, such as labor, travel, and hardware, are becoming more difficult to acquire and sustain.

With more stations and networks, larger data flows from each station, and smaller operating budgets, modern tools are required to effectively and efficiently handle the entire process, including sharing data among collaborative groups.

On one hand, such tools can maximize time dedicated to publications answering research questions, and minimize time and expenses spent on data acquisition, processing, quality control and overall station management. On the other hand, cross-sharing the stations with external collaborators may help leverage available funding, and promote data analyses and publications.

A new low-cost, advanced system, FluxSuite, utilizes a combination of hardware, software and web-services to address these specific demands. It automates key stages of flux workflow, minimizes day-to-day site management, and modernizes the handling of data flows:

- (i) The system can be easily incorporated into a new flux station, or as an upgrade to many presently operating flux stations, via weatherized remotely-accessible microcomputer, SmartFlux 2, with fully digital inputs
- (ii) Each next-generation station will measure all parameters needed for flux computations in a digital and PTP time-synchronized mode, accepting digital signals from a number of anemometers and data loggers
- (iii) The field microcomputer will calculate final fully-processed flux rates in real time, including computation-intensive Fourier transforms, spectra, co-spectra, multiple rotations, stationarity, footprint, etc.
- (iv) Final fluxes, radiation, weather and soil data will be merged into a single quality-control file
- (v) Multiple flux stations can be linked into an automated time-synchronized network
- (vi) Flux network managers, or PI's, can see all stations in real-time, including fluxes, supporting data, automated reports, and email alerts
- (vii) PI's can assign rights, allow or restrict access to stations and data: selected stations can be shared via rights-managed access internally or with external institutions
- (viii) Researchers without stations could form “virtual networks” for specific projects by collaborating with PIs from different actual networks

This presentation provides detailed examples of FluxSuite currently utilized to manage two large flux networks in China (National Academy of Sciences and Agricultural Academy of Sciences), and smaller networks with stations in the USA, Germany, Ireland, Malaysia and other locations around the globe. Very latest 2016 developments and expanded functionality are also discussed.