On the development of benchmarking for eddy covariance data quality checking schemes

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With the development of a standardized eddy covariance (EC) data processing software it is now possible to create a high-throughput post-processing chain that allows to assess various statistics extracted from the datasets. The effect of changes in quality checking (QC) procedures can be thus effectively analysed. It is still difficult to establish what constitutes an effective QC test or filter, in other words, how exactly to define such filtering efficiency. One of the main obstacles is the design of such filters that can focus on issues that span from very specific problems to general tests of basic assumptions of the EC method. Here we propose a framework to benchmark different QC schemes based on a combination of three main measures extracted from the dataset – 1) difference in the aggregated EC fluxes, 2) change in the aggregated uncertainty and 3) data exclusion fraction. It is clear that relaxing of QC cannot be justified simply by the effort to retain data coverage in case of frequent spurious records. However, inclusion of a filter that increases exclusion fraction while the post-processed data do not differ in aggregated fluxes and uncertainties can be hardly accepted. In order to push this topic forward it would be also beneficial to provide easily available and reliable QC tools for the EC community and collect the feedback. This was already accomplished by publishing the R package openeddy (https://github.com/lsigut/openeddy) and related workflows. The feedback can help to make the codes more robust and also draw attention to new QC related issues not addressed before. The software could be therefore a platform for an exchange of experience from EC measurements across different ecosystem types and environmental conditions. Such an overview is otherwise difficult to obtain as the QC benchmarking requires supplemental information typically not included in tower network databases. Here we present the QC benchmarking results for sites from the Czech Carbon Observation System (CzeCOS) covering different ecosystems that represent different QC challenges. We show that, even though most of the QC procedures are generally applicable, site specific adaptation of filters is useful in some cases.