Geophysical Research Abstracts
Vol. 19, EGU2017-16089, 2017
EGU General Assembly 2017

Towards an integrated quality control procedure for eddy-covariance data

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The eddy-covariance technique is nowadays the most reliable and direct way, allowing to calculate the main fluxes of Sensible and Latent Heat and of Net Ecosystem Exchange, this last being the result of the difference between the CO_2 assimilated by photosynthetic activities and those released to the atmosphere through the ecosystem respiration processes.
Despite the improvements in accuracy of measurement instruments and software development, the eddy-covariance technique is not suitable under non-ideal conditions respect to the instruments characteristics and the physical assumption behind the technique mainly related to the well-developed and stationary turbulence conditions. Under these conditions the calculated fluxes are not reliable and need to be flagged and discarded.
In order to discover these unavoidable "bad" fluxes and build dataset with the highest quality, several tests applied both on high-frequency (10-20 Hz) raw data and on half-hourly times series have been developed in the past years. Nevertheless, there is an increasing need to develop a standardized quality control procedure suitable not only for the analysis of long-term data, but also for the near-real time data processing.
In this paper, we review established quality assessment procedures and present an innovative quality control strategy with the purpose of integrating the existing consolidated procedures with robust and advanced statistical tests more suitable for the analysis of time series data.
The performance of the proposed quality control strategy is evaluated both on simulated and EC data distributed by the ICOS research infrastructure. It is concluded that the proposed strategy is able to flag and exclude unrealistic fluxes while being reproducible and retaining the largest possible amount of high quality data.