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Gapfilling strategies in difficult situations: long gaps, discontinuities, switch and pulses

C. Trotta and D. Papale
University of Tuscia, Di.S.A.F.Ri., 01100 Viterbo, Italy (trottacarlo@unitus.it, darpap@unitus.it)

The eddy covariance technique measure the exchange rate of CO2 across the interface between the atmosphere and terrestrial ecosystems (Baldocchi 2003). Data from eddy covariance sites are usually reported half-hourly with the objective to collect data 24h a day and 365 days a year. However, the average data coverage during a year is often less than 70% due to system failures o data rejection. Therefore, gap filling procedures are needed to obtain complete data set and to calculate daily to annual sums (Moffat et al. 2007).

Current gap filling techniques are based on a wide range of approaches, including interpolation, probabilistic filling, look-up table, non-linear regression, artificial neural networks, and process-based models in a data-assimilation mode. In Moffat et al. (2007) has been demonstrated that a number of methods were able to fill NEE gaps with errors close to the random component in the data, with the artificial neural network based techniques (ANNs) performing slightly better than the other techniques. The methods have been tested with artificial gaps scenarios ranging from one half hour value to 10 days in European forest ecosystems

In this work we presented modified ANN gapfilling methods applied to difficult situations, like gaps longer than 30 days, sites where discontinuities are introduced by management or disturbances and ecosystems where the fluxes are governed by short term fast responses like switch and pulses (e.g. respiration pulses after rain events in arid or semiarid ecosystems). The performances of the new methods are evaluated using artificial gaps and compared with the other traditional “best methods”.

Baldocchi, D. D. 2003. Assessing the eddy covariance technique for evaluating carbon dioxide exchange rates of ecosystems: past, present and future. Global Change Biology 9:479-492.
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