



## **On the evaluation of a terrestrial biosphere model on different time scales using eddy covariance observations**

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The objective of this study is to evaluate the process-based ORCHIDEE for CO<sub>2</sub>, water vapour and heat fluxes, on multiple time scales using eddy covariance observations. Prior to model-data comparison on different time scales, observed and modeled time series were decomposed into subsignals of characteristic temporal variability (diurnal, annual and inter annual). Two different techniques are used SSA (Singular System Analysis) and HRA (Harmonic Regression Analysis).

The evaluation of model using a harmonic method for extracting annual cycle and conventional method for extracting diurnal cycle is comparable to SSA method based on individual site study. Our results show that ORCHIDEE invariantly performs best in diurnal cycle, independent of PFT and sub-signal separation method used. Visualization of model-data mismatch across PFT on different time scales enables us to identify some structural deficiencies and bias inherent to the model. For example in tropical evergreen broadleaf forests, the annual cycle of the Net Ecosystem Exchange CO<sub>2</sub> flux and of the latent heat flux is opposite in phase with multi-site observations, as shown by the negative biweight midcorrelation. This highlights a problem in the representation of soil hydrological processes and soil respiration moisture dependency in the model for this type of ecosystems.