

Interactive comment on “Filling the gaps in meteorological continuous data measured at FLUXNET sites with ERA-interim reanalysis” by N. Vuichard and D. Papale

N. Vuichard and D. Papale

vuichard@lsce.ipsl.fr

Received and published: 5 June 2015

Comment from Referee #1: A question I would like the Authors to consider is related to budget closure that is a notorious issue of flux tower measurements and not an issue present in short-term forecast as produced by reanalysis (in which budget closure is numerically imposed). Is there a positive effect on a better closure of the energy budget as results of the gap filling and downscaling method? I realise that to answer this question there are other measured FLUXNET quantities involved (e.g. turbulent fluxes) that are not part of the forcing. However this could allow to qualify the proposed methodology also with respect to the energy closure.

C112

Author's response: We thank Referee #1 for this interesting remark, which relates on the manuscript section 'Checking for data quality'. The energy balance closure at site level is indeed a research question, which has been studied and discussed in several publications (Charuchittipan et al., 2014; Foken, 2008; Stoy et al., 2013; Twine et al., 2000; Wilson, 2002) but not fully solved yet. As mentioned by the reviewer, to address this question, there are variables needed, mostly surface heat fluxes (ground, sensible and latent heat flux) but also upward longwave and shortwave radiation that are not considered in our dataset. However, the downscaling approach proposed in this paper is designed to detect and remove biases between ERA-interim and site level data for the downward longwave and shortwave radiations. Do large differences between ERA-interim and Fluxnet data for these two variables may indicate that the Fluxnet data is biased, which could impact on the energy balance closure? We don't think so and for two reasons: first, there are several good reasons for not expecting that ERA-interim and Fluxnet dataset match well for the downward radiation. For instance, the aspect of the terrain that cannot be accounted for in the ERA-interim reanalysis, impacts on the downward radiation received at the surface. Second, at most Fluxnet stations, the net radiation term that is needed when calculating the energy balance closure, is directly measured by a net radiometer and not inferred from its four components. Consequently, at Fluxnet stations, measurement error on the downward radiation will not propagate on the net radiation measurement. For the reasons explained above, we think that it is rather impossible to connect the bias between ERA-interim and Fluxnet to problems related to the energy balance closure. Consequently, we prefer to not mention this issue in the Discussion section.

All the other minor comments addressed by Reviewer #1 will be accounted for in the revised manuscript.

References: Charuchittipan, D., Babel, W., Mauder, M., Leps, J. P. and Foken, T.: Extension of the Averaging Time in Eddy-Covariance Measurements and Its Effect on the Energy Balance Closure, *Boundary-Layer Meteorol.*, 152(3), 303–327,

C113

doi:10.1007/s10546-014-9922-6, 2014. Foken, T.: The energy balance closure problem: An overview, *Ecol. Appl.*, 18(6), 1351–1367, doi:10.1890/06-0922.1, 2008. Stoy, P. C., Mauder, M., Foken, T., Marcolla, B., Boegh, E., Ibrom, A., Arain, M. A., Arneeth, A., Aurela, M., Bernhofer, C., Cescatti, A., Dellwik, E., Duce, P., Gianelle, D., van Gorsel, E., Kiely, G., Knohl, A., Margolis, H., Mccaughey, H., Merbold, L., Montagnani, L., Papale, D., Reichstein, M., Saunders, M., Serrano-Ortiz, P., Sottocornola, M., Spano, D., Vaccari, F. and Varlagin, A.: A data-driven analysis of energy balance closure across FLUXNET research sites: The role of landscape scale heterogeneity, *Agric. For. Meteorol.*, 171-172, 137–152, doi:10.1016/j.agrformet.2012.11.004, 2013. Twine, T. E., Kustas, W. P., Norman, J. M., Cook, D. R., Houser, P. R., Meyers, T. P., Prueger, J. H. and Wesley, M. L.: Correcting eddy covariance flux underestimates over grassland, *Agric. For. Meteorol.*, 103, 279–300, 2000. Wilson, K.: Energy balance closure at FLUXNET sites, *Agric. For. Meteorol.*, 113, 223–243, doi:10.1016/S0168-1923(02)00109-0, 2002.

Interactive comment on Earth Syst. Sci. Data Discuss., 8, 23, 2015.