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Interactive comment on "Short-term forecasting of regional biospheric CO_2 fluxes in Europe using a light-use-efficiency model" *by* Jinxuan Chen et al.

Anonymous Referee #1

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This study uses a data driven model, VPRM, to forecast biosphere CO2 fluxes in a few days (5 days) in the future. With the forecasting shortwave radiation and temperature from a meteorological model, and the processed MODIS NRT EVI and LSWI, they forecasted the biosphere CO2 fluxes over Europe in 2014 and try to assess both the "model uncertainty" and "forecast uncertainty". They concluded that the forecasting error is less than the VPRM model error. The largest forecast error source comes from the meteorological data rather than MODIS inputs. The study is interesting and important for understanding the contribution of model uncertainty, especially the forecast uncertainty, for such data driven model. The research questions are clearly stated, and the figures are of excellent quality. However, some of the analysis seem to be not robust enough to support the conclusions. I have several major comments on this study: (1)

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In this study, the “model error” of VPRM is estimated as the difference between the estimation from control simulation with perfect inputs and observed NEE flux in this study. However, this “model error” not only includes the error introduced by the VPRM model (input data, model parameters, and model structure), but also the error caused by the inconsistency of EC tower footprints (100-2000m, Baldocchi et al. 2001) and the spatial resolution of their simulation (10 x 10 km). Thus, the estimated result of “model error” in this study and their statement that “the error of the forecasting system is less than the VPRM model error” could be misleading. The authors at least need to show the landscape homogeneity in the 10 x 10 km surrounding of each EC tower sites used in this study, or to show the uncertainty caused by the GPP simulation at different spatial resolutions to the tower derived GPP. (2)When accounting for the error attribution from the meteorological variables, air temperature and downward shortwave radiation, they simply listed one site as an example and concluded that “it is the errors in shortwave radiation that mainly contribute to the meteorological data” (Figure 4). It would be more convincing if they can have a figure to show the distribution of GPPbias due to the bias of shortwave radiation (SWbias) and respiration (Rbias) accounting for all the sites. (3)There are already some studies to assess the uncertainty of the VPRM, for example, Lin et al. 2011, what are the similar or different conclusions between this study and Lin’s? I suggest more discussion should be added in this paper. Minor comments: Line 30-31 Do you mean “carbon exchange between the surface and the atmosphere”? Line 207 What are those experimental simulations a to f? You need to refer to “Table 2” here and describe those simulations. Line 244-245 How do you calculate the “bias-GPP” and “bias-R”? Line 275 “an” should be “a” Page 17 The caption should appear above the table, and all the separators for “Latitude” and “Longitude” should be full stops rather than commas. Baldocchi, D., E. Falge, L. Gu, R. Olson, D. Hollinger, S. Running, P. Anthoni, C. Bernhofer, K. Davis, R. Evans, J. Fuentes, A. Goldstein, G. Katul, B. Law, X. Lee, Y. Malhi, T. Meyers, W. Munger, W. Oechel, K.T. Paw U, K. Pilegaard, H.P. Schmid, R. Valentini, S. Verma, T. Vesala, K. Wilson, and S. Wofsy, 2001: FLUXNET: A New Tool to Study the Temporal and Spatial Variability of Ecosystem-Scale Carbon

Dioxide, Water Vapor, and Energy Flux Densities. Bull. Amer. Meteor. Soc., 82, 2415–2434,https://doi.org/10.1175/1520-0477(2001)082<2415:FANTTS>2.3.CO;2 Lin, J.C., Pejam, M.R., Chan, E., Wofsy, S.C., Gottlieb, E.W., Margolis, H.A. and McCaughey, J.H., 2011. Attributing uncertainties in simulated biospheric carbon fluxes to different error sources. Global Biogeochemical Cycles, 25(2).

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