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Source partitioning of H_2O and CO_2 fluxes based on high-frequency eddy covariance data: a comparison between study sites

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SUPPLEMENTARY MATERIAL

In the following, the partitioning results for all sites and all method versions (after Scanlon and Kustas (2010), Scanlon and Sahu (2008), and Thomas et al. (2008); see text for description) are shown including soil evaporation (E_{soil}) estimations based on Beer's law, chamber measurements of soil respiration (R_{soil}), and partitioning results after Reichstein et al. (2005).

Reichstein, M., Falge, E., Baldocchi, D., Papale, D., Aubinet, M., Berbigier, P., Bernhofer, C., Buchmann, N., Gilmanov, T., Granier, A., Grünwald, T., Havránková, K., Ilvesniemi, H., Janous, D., Knohl, A., Laurila, T., Lohila, A., Loustau, D., Matteucci, G., Meyers, T., Miglietta, F., Ourcival, J.-M., Pumpanen, J., Rambal, S., Rotenberg, E., Sanz, M., Tenhunen, J., Seufert, G., Vaccari, F., Vesala, T., Yakir, D., and Valentini, R.: On the separation of net ecosystem exchange into assimilation and ecosystem respiration: review and improved algorithm. Global Change Biol. 11 (9), 1424-1439, https://doi.org/10.1111/j.1365-2486.2005.001002.x, 2005.

Scanlon, T.M., and Kustas, W.P.: Partitioning carbon dioxide and water vapor fluxes using correlation analysis. Agric. For. Meteorol. 150 (1), 89-99, https://doi.org/10.1016/j.agrformet.2009.09.005, 2010.

Scanlon, T.M., and Sahu, P.: On the correlation structure of water vapor and carbon dioxide in the atmospheric surface layer: A basis for flux partitioning. Water Resour. Res. 44 (10), W10418, 15 pp, https://doi.org/10.1029/2008WR006932, 2008.

Thomas, C., Martin, J.G., Goeckede, M., Siqueira, M.B., Foken, T., Law, B.E., Loescher, H.W., and Katul, G.: Estimating daytime subcanopy respiration from conditional sampling methods applied to multi-scalar high frequency turbulence time series. Agric. For. Meteorol. 148 (8-9), 1210-1229, https://doi.org/10.1016/j.agrformet.2008.03.002, 2008.

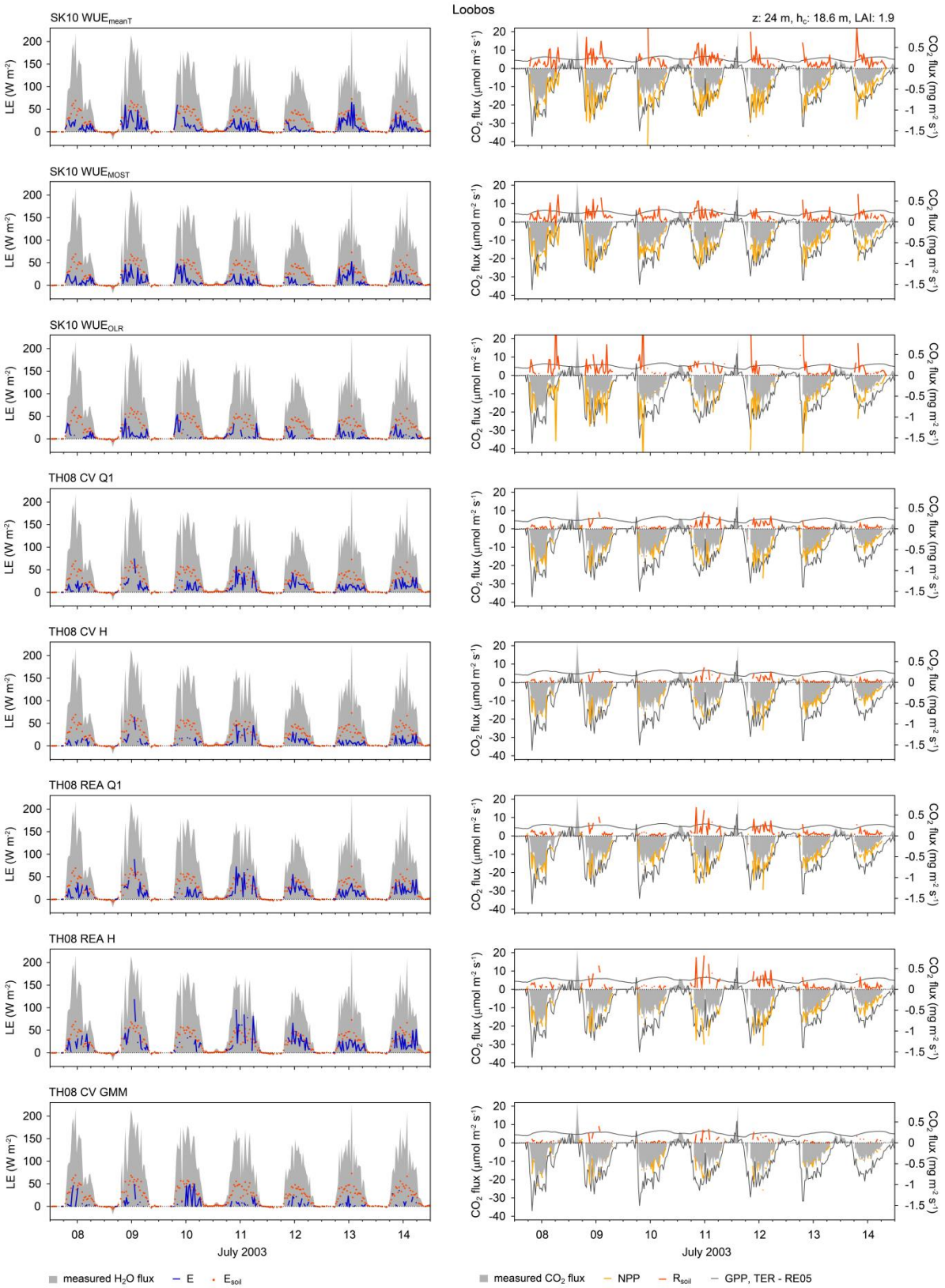

Figure S1: Source partitioning results of H_2O (left) and CO_2 (right) fluxes in half-hourly time steps for the Loobos study site (forest) in The Netherlands and for every method version (see text for description). CO_2 flux estimates by Reichstein et al. (2005; RE05) are also included (LE: latent heat flux; E: evaporation; E_{soil}: estimated evaporation based on Beer's law; GPP: gross primary production; NPP: net primary production; TER: total ecosystem respiration; R_{soil}: soil respiration; z: measurement height; h_c: canopy height; LAI: leaf area index).

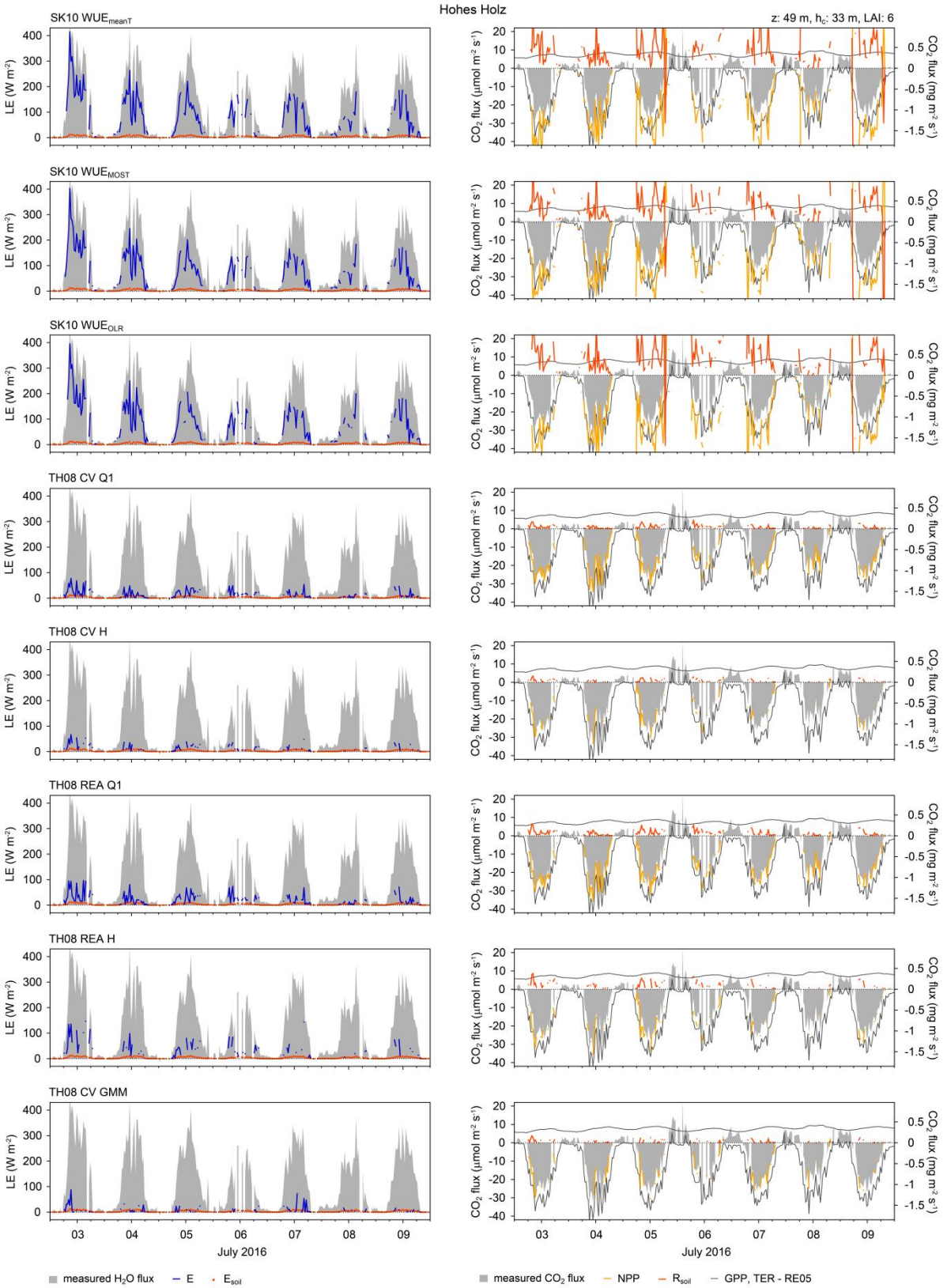

Figure S2: Source partitioning results of H_2O (left) and CO_2 (right) fluxes in half-hourly time steps for the Hohes Holz study site (forest) in Germany and for every method version (see text for description). CO_2 flux estimates by Reichstein et al. (2005; RE05) are also included (LE: latent heat flux; E: evaporation; E_{soil}: estimated evaporation based on Beer's law; GPP: gross primary production; NPP: net primary production; TER: total ecosystem respiration; R_{soil}: soil respiration; z: measurement height; h_c: canopy height; LAI: leaf area index).

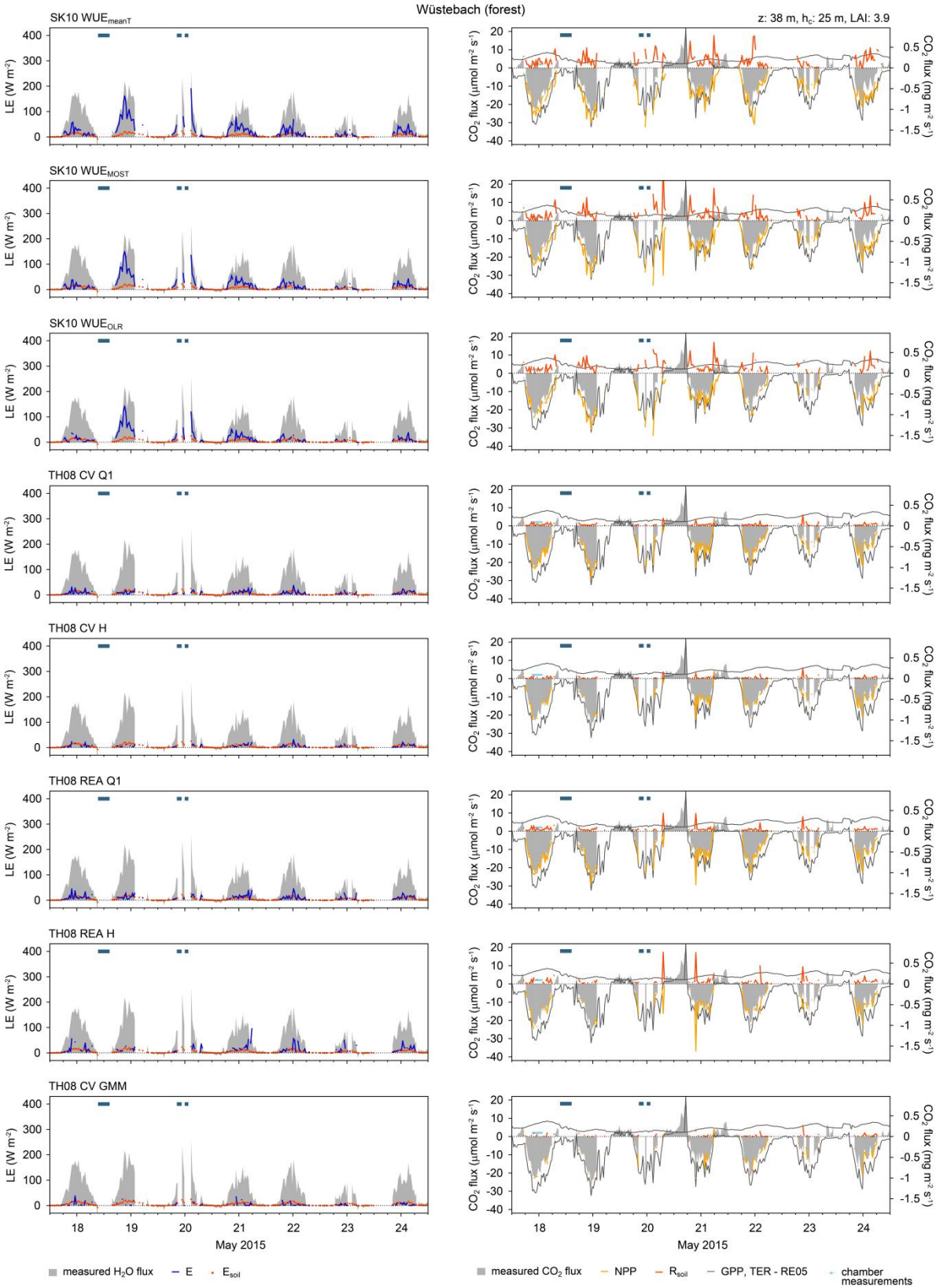

Figure S3: Source partitioning results of H_2O (left) and CO_2 (right) fluxes in half-hourly time steps for the Wüstebach study site (forest) in Germany and for every method version (see text for description). CO_2 flux estimates by Reichstein et al. (2005; RE05) and R_{soil} chamber measurements are also included (LE: latent heat flux; E: evaporation; E_{soil}: estimated evaporation based on Beer's law; GPP: gross primary production; NPP: net primary production; TER: total ecosystem respiration; R_{soil}: soil respiration; z: measurement height; h_c: canopy height; LAI: leaf area index; blue bars: precipitation events).

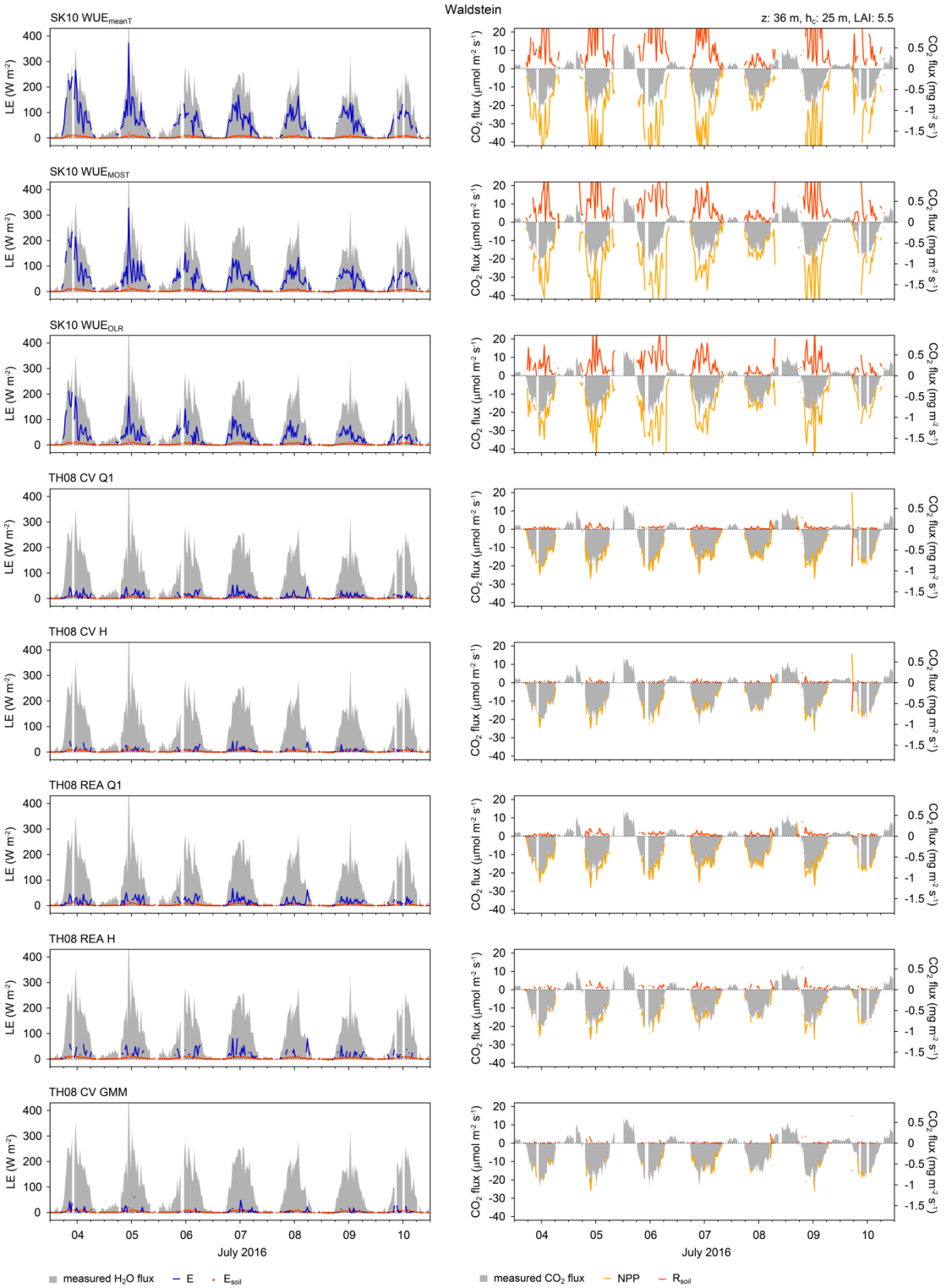

Figure S4: Source partitioning results of H_2O (left) and CO_2 (right) fluxes in half-hourly time steps for the Waldstein study site (forest) in Germany and for every method version (see text for description; LE: latent heat flux; E: evaporation; E_{soil}: estimated evaporation based on Beer's law; NPP: net primary production; R_{soil}: soil respiration; z: measurement height; h_c: canopy height; LAI: leaf area index).

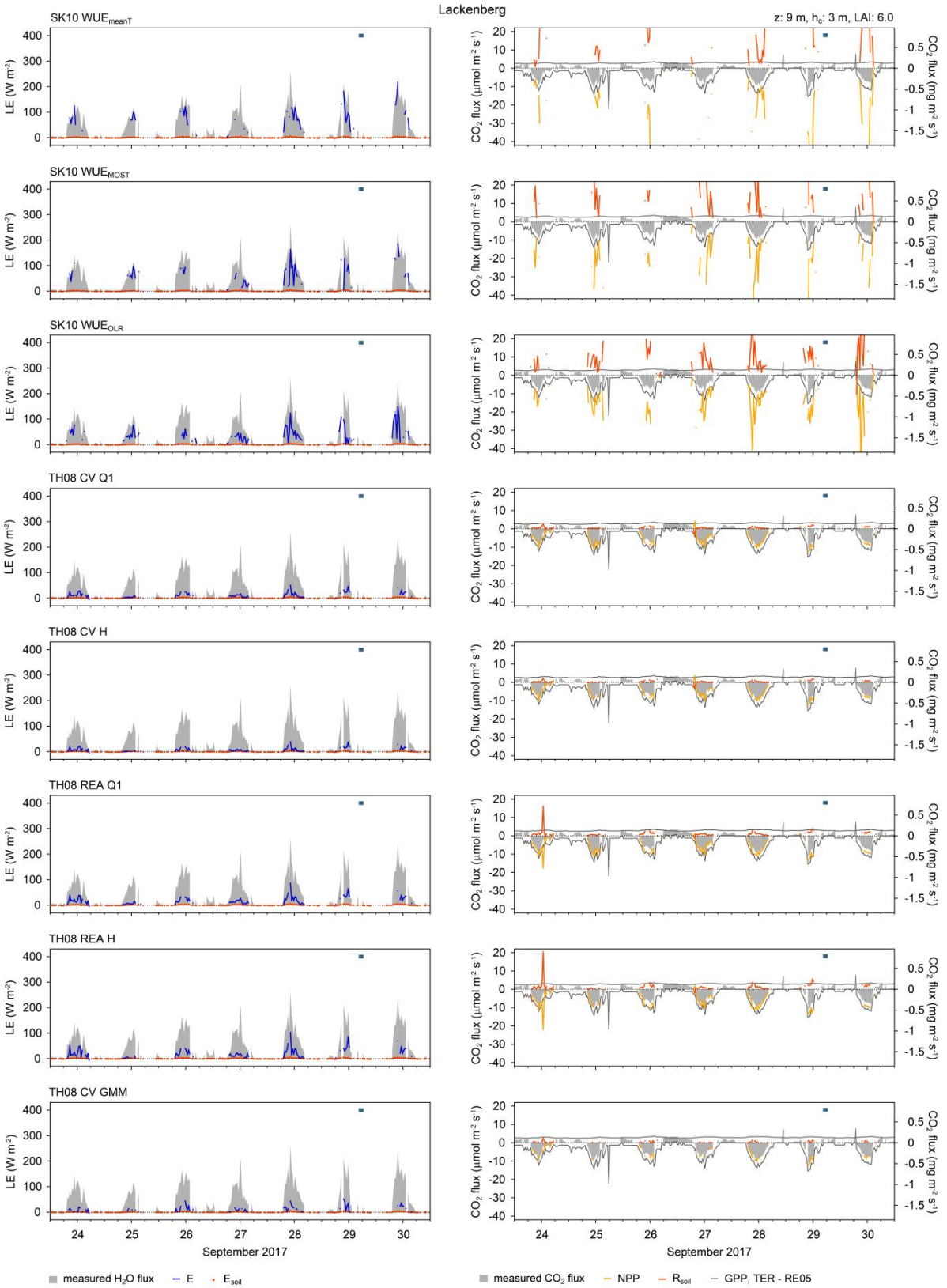

Figure S5: Source partitioning results of H_2O (left) and CO_2 (right) fluxes in half-hourly time steps for the Lackenberg study site (forest) in Germany and for every method version (see text for description). CO_2 flux estimates by Reichstein et al. (2005; RE05) are also included (LE: latent heat flux; E: evaporation; E_{soil}: estimated evaporation based on Beer's law; GPP: gross primary production; NPP: net primary production; TER: total ecosystem respiration; R_{soil}: soil respiration; z: measurement height; h_c: canopy height; LAI: leaf area index; blue bars: precipitation events).

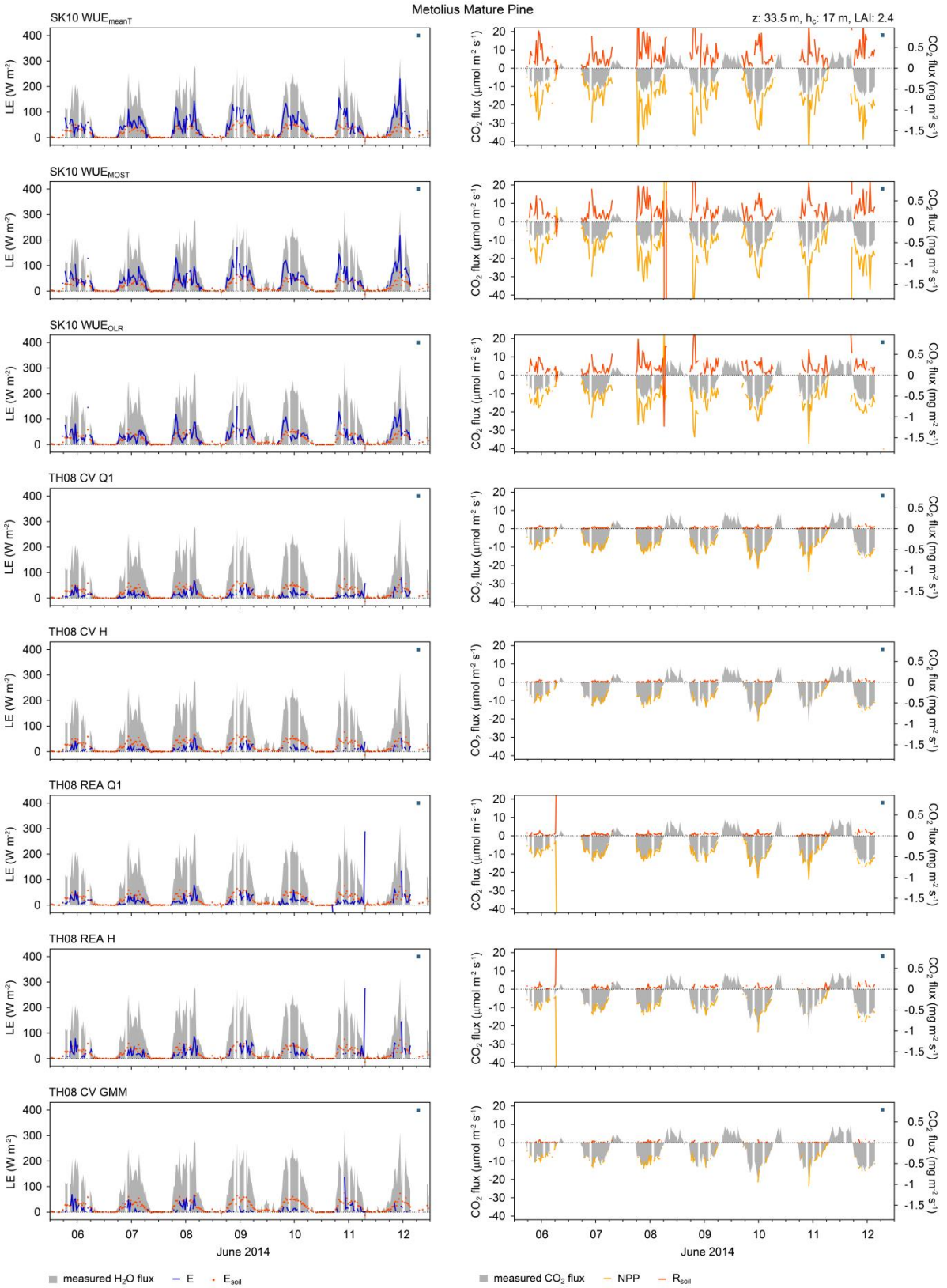

Figure S6: Source partitioning results of H_2O (left) and CO_2 (right) fluxes in half-hourly time steps for the Metolius Mature Pine study site (forest) in United States and for every method version (see text for description; LE: latent heat flux; E: evaporation; E_{soil}: estimated evaporation based on Beer's law; NPP: net primary production; R_{soil}: soil respiration; z: measurement height; h_c: canopy height; LAI: leaf area index; blue bars: precipitation events).

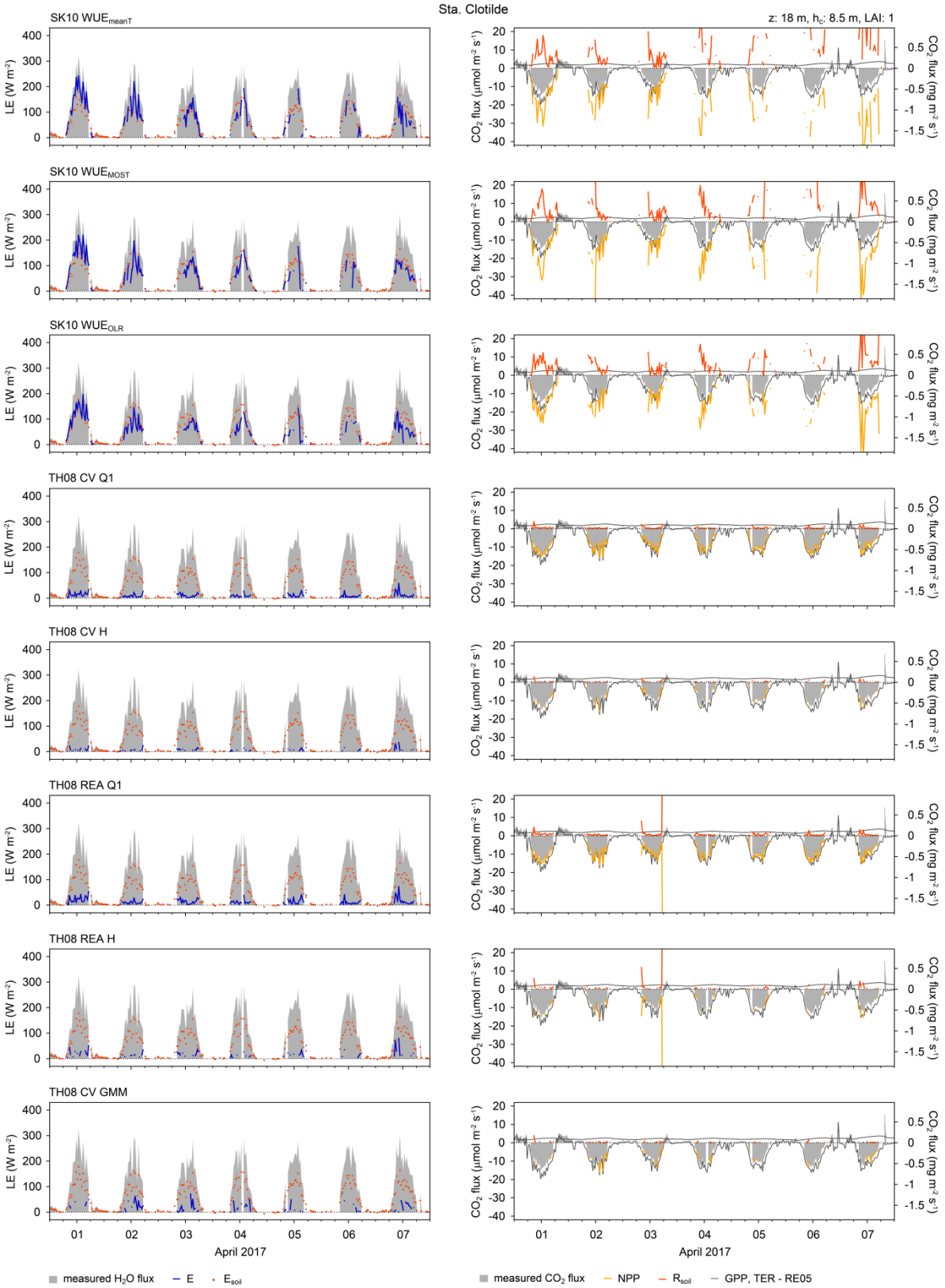

Figure S7: Source partitioning results of H_2O (left) and CO_2 (right) fluxes in half-hourly time steps for the Sta. Clotilde study site (forest) in Spain and for every method version (see text for description). CO_2 flux estimates by Reichstein et al. (2005; RE05) are also included (LE: latent heat flux; E: evaporation; E_{soil}: estimated evaporation based on Beer's law; GPP: gross primary production; NPP: net primary production; TER: total ecosystem respiration; R_{soil}: soil respiration; z: measurement height; h_c: canopy height; LAI: leaf area index).

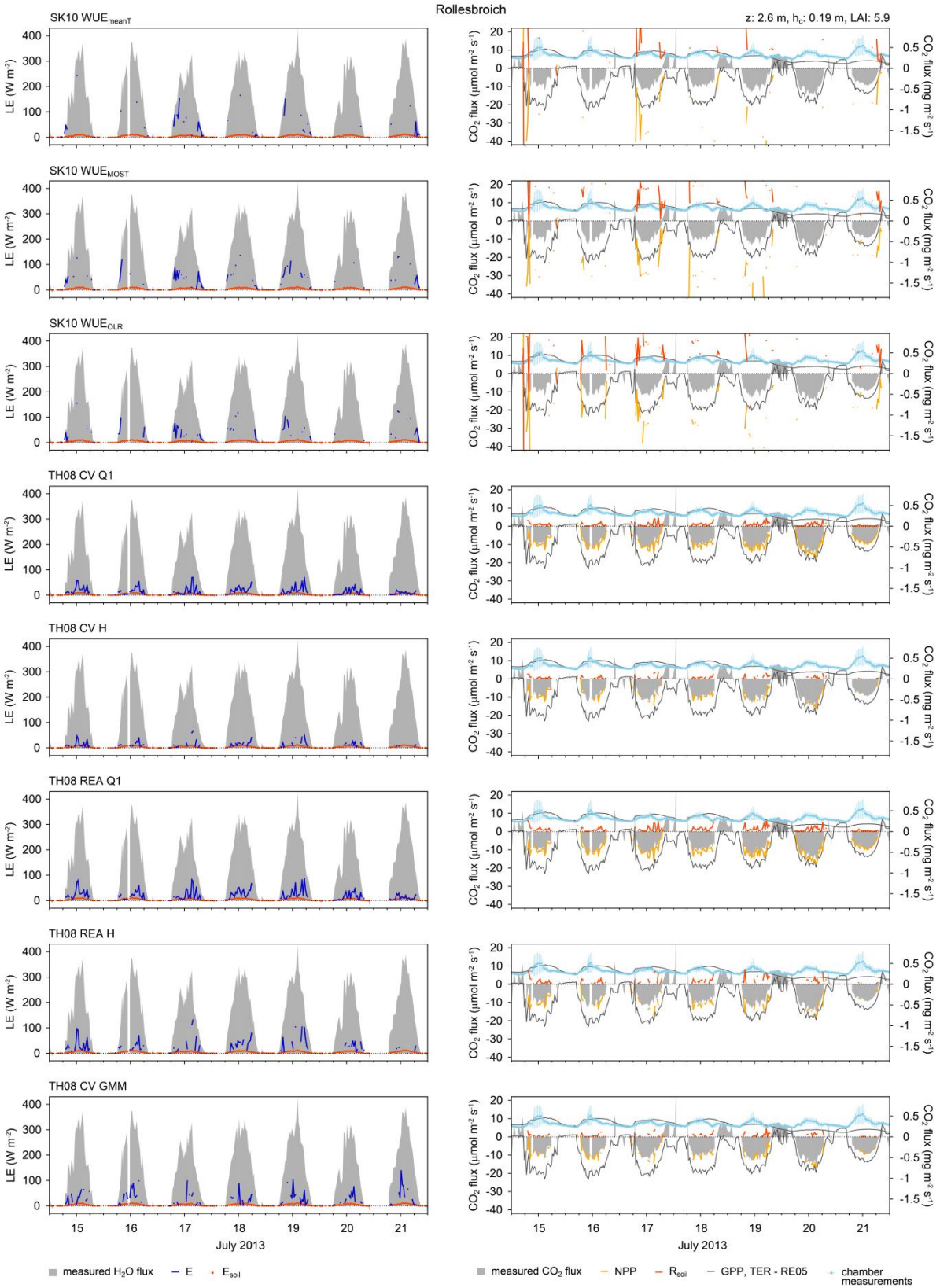

Figure S8: Source partitioning results of H_2O (left) and CO_2 (right) fluxes in half-hourly time steps for the Rollesbroich study site (grassland) in Germany and for every method version (see text for description). CO_2 flux estimates by Reichstein et al. (2005; RE05) and R_{soil} chamber measurements are also included (LE: latent heat flux; E: evaporation; E_{soil}: estimated evaporation based on Beer's law; GPP: gross primary production; NPP: net primary production; TER: total ecosystem respiration; R_{soil}: soil respiration; z: measurement height; h_c: canopy height; LAI: leaf area index).

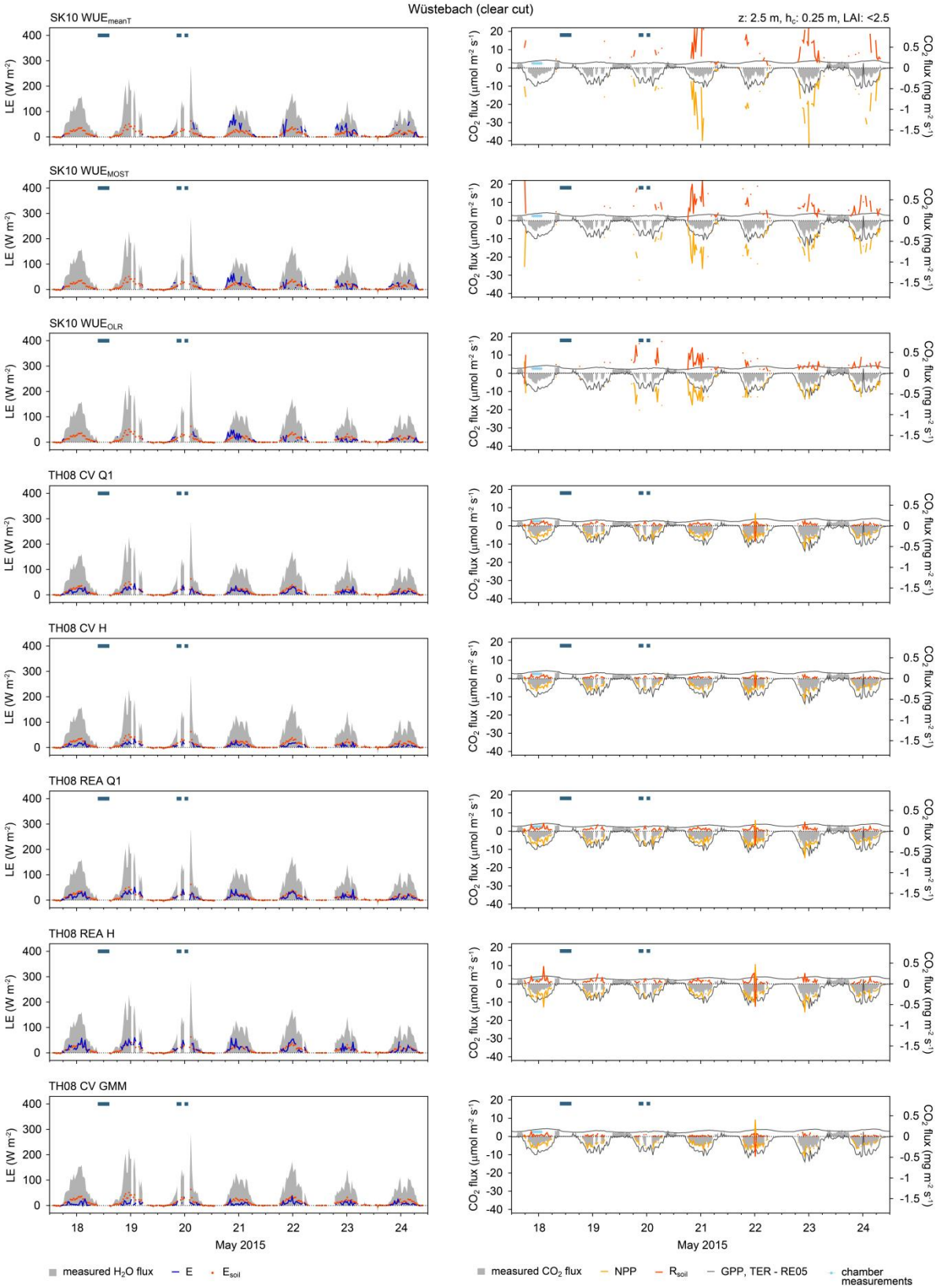

Figure S9: Source partitioning results of H_2O (left) and CO_2 (right) fluxes in half-hourly time steps for the Wüstebach study site (clear cut) in Germany and for every method version (see text for description). CO_2 flux estimates by Reichstein et al. (2005; RE05) and R_{soil} chamber measurements are also included (LE: latent heat flux; E: evaporation; E_{soil}: estimated evaporation based on Beer's law; GPP: gross primary production; NPP: net primary production; TER: total ecosystem respiration; R_{soil}: soil respiration; z: measurement height; h_c: canopy height; LAI: leaf area index; blue bars: precipitation events).

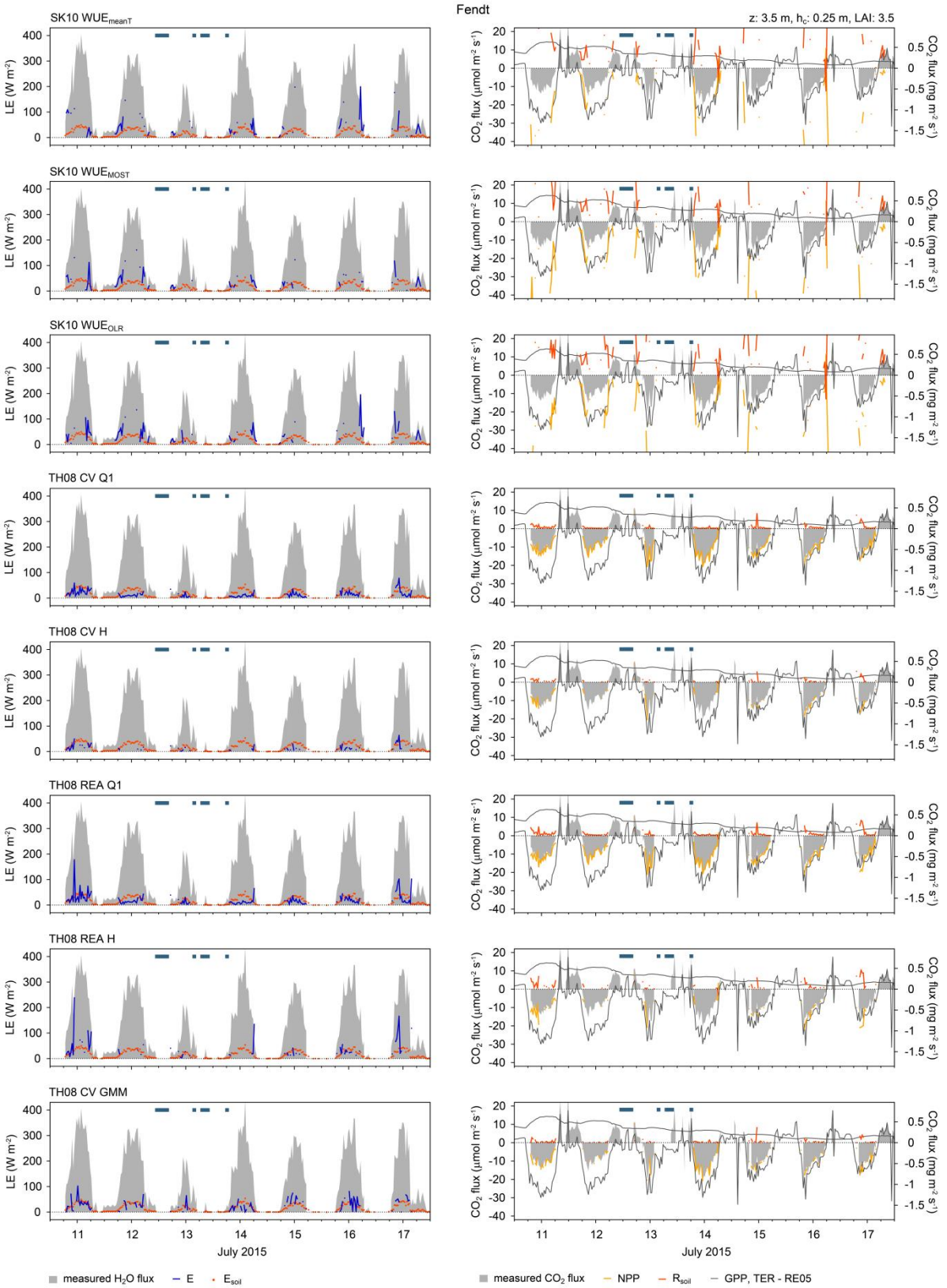

Figure S10: Source partitioning results of H_2O (left) and CO_2 (right) fluxes in half-hourly time steps for the Fendt study site (grassland) in Germany and for every method version (see text for description). CO_2 flux estimates by Reichstein et al. (2005; RE05) are also included (LE: latent heat flux; E: evaporation; E_{soil}: estimated evaporation based on Beer's law; GPP: gross primary production; NPP: net primary production; TER: total ecosystem respiration; R_{soil}: soil respiration; z: measurement height; h_c: canopy height; LAI: leaf area index; blue bars: precipitation events).

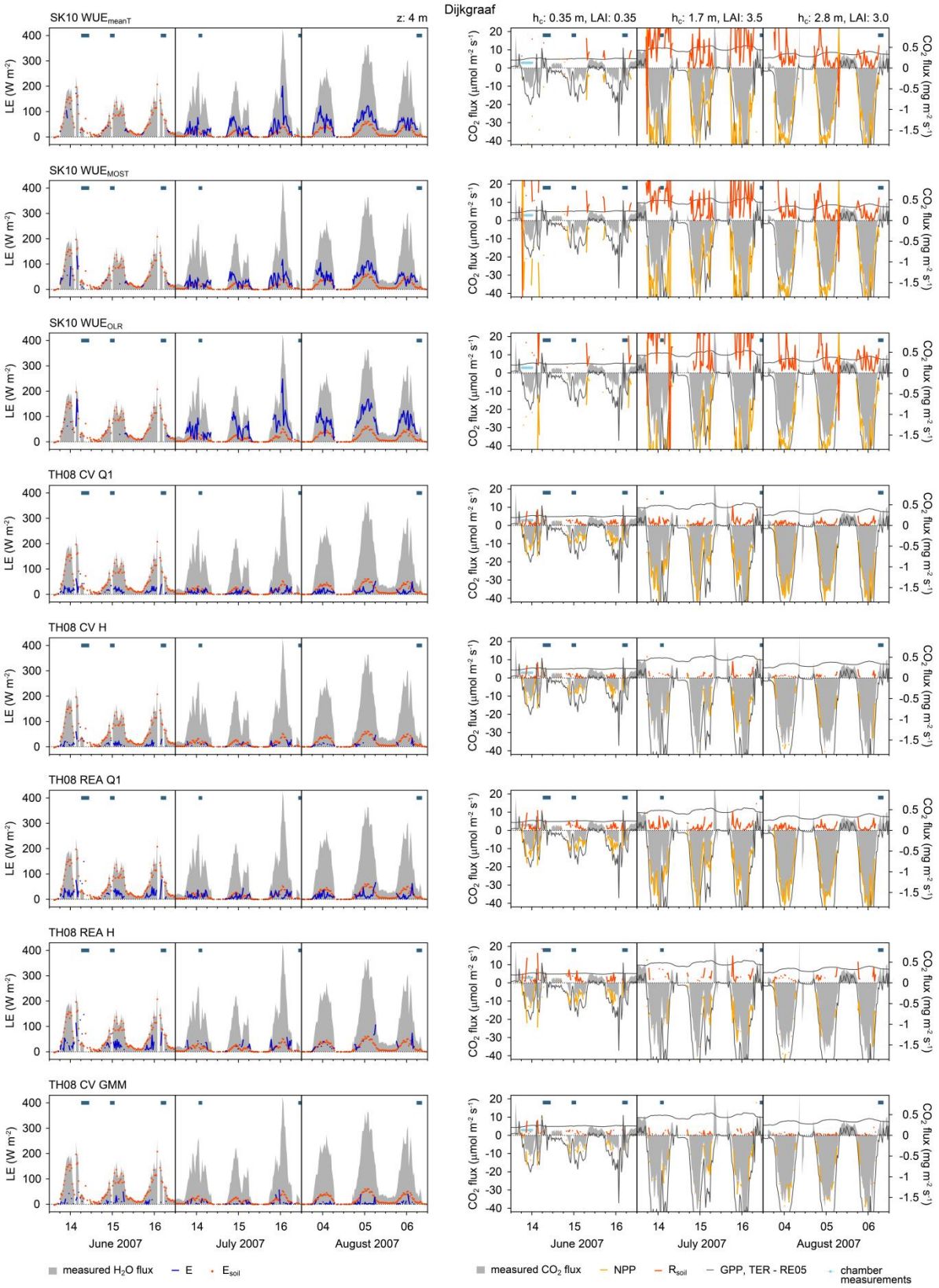

Figure S11: Source partitioning results of H_2O (left) and CO_2 (right) fluxes in half-hourly time steps for the Dijkgraaf study site (cropland, maize) in The Netherlands and for every method version (see text for description). CO_2 flux estimates by Reichstein et al. (2005; RE05) and R_{soil} chamber measurements are also included (LE: latent heat flux; E: evaporation; E_{soil}: estimated evaporation based on Beer's law; GPP: gross primary production; NPP: net primary production; TER: total ecosystem respiration; R_{soil}: soil respiration; z: measurement height; h_c: canopy height; LAI: leaf area index; blue bars: precipitation events).

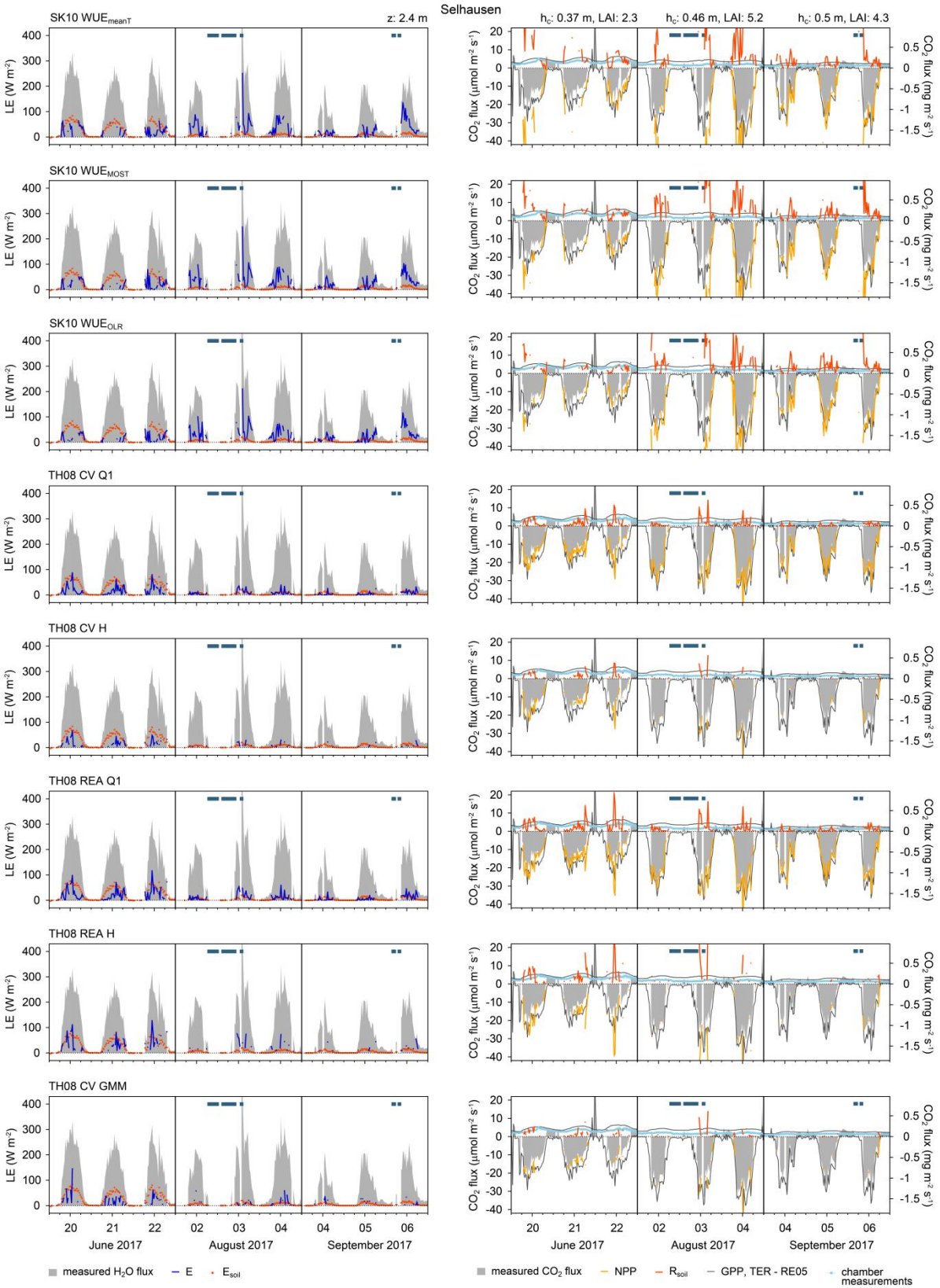

Figure S12: Source partitioning results of H_2O (left) and CO_2 (right) fluxes in half-hourly time steps for the Selhausen study site (cropland, sugar beet) in Germany and for every method version (see text for description). CO_2 flux estimates by Reichstein et al. (2005; RE05) and R_{soil} chamber measurements are also included (LE: latent heat flux; E: evaporation; E_{soil}: estimated evaporation based on Beer's law; GPP: gross primary production; NPP: net primary production; TER: total ecosystem respiration; R_{soil}: soil respiration; z: measurement height; h_c: canopy height; LAI: leaf area index; blue bars: precipitation events).

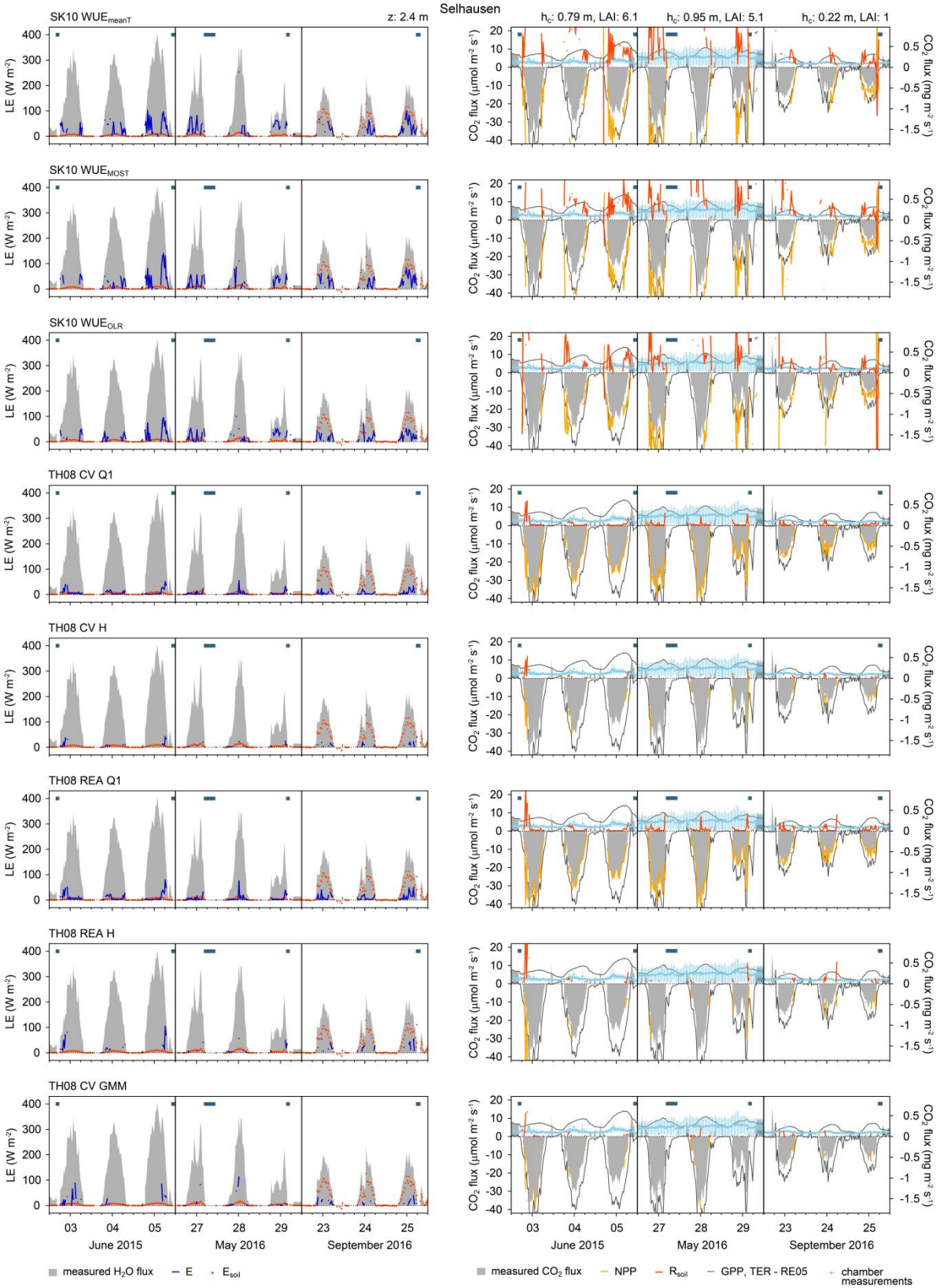

Figure S13: Source partitioning results of H_2O (left) and CO_2 (right) fluxes in half-hourly time steps for the Selhausen study site (cropland, 06/2015: winter wheat, 05/2016: barley, 09/2016: intercrop) in Germany and for every method version (see text for description). CO_2 flux estimates by Reichstein et al. (2005; RE05) and R_{soil} chamber measurements are also included (LE: latent heat flux; E: evaporation; E_{soil}: estimated evaporation based on Beer's law; GPP: gross primary production; NPP: net primary production; TER: total ecosystem respiration; R_{soil}: soil respiration; z: measurement height; h_c: canopy height; LAI: leaf area index; blue bars: precipitation events).