Investigating the responses of sun-induced chlorophyll fluorescence, gross primary production and their inter-relationship to abiotic factors changes in a temperate deciduous forest

Figure S1. Figure S1a depicts SIF-ENV-SA model performance between observed and predicted SIF-760, Figure S1b represents predictor importance estimates for SIF-ENV-SA model, Figure S1c depicts GPP-ENV-SA model performance between observed and predicted GPP, Figure S1d represents predictor importance estimates for GPP-ENV-SA model. N denotes the number of data points used for the RF model evaluation, adj. R^2 represents the adjusted coefficient of determination of the relationship between testing data and predicted SIF or GPP, OOB R^2 is the model accuracy on the validation data, and the RMSE is the root mean square error between observed SIF or GPP and RF model predicted SIF or GPP. The dashed diagonal line depicts the 1:1 line. Data under only sunny days at half-hourly timescale were used.

The RF regression of SIF on variables exhibited in Figure S1b explains approximately 94% of the total variance of far-red SIF (Figure S1a). SWC appears to be the most important variable, followed by PAR and SAA, and the contribution of VPD plays an insignificant role for SIF prediction (Figure S1b). For GPP, the RF model on variables represented in Figure S1d captures 71% of the variability in GPP (Figure S1c). VPD and SWC appear to be the most determinant variables, followed by SAA and the contribution of PAR was insignificant for GPP prediction.
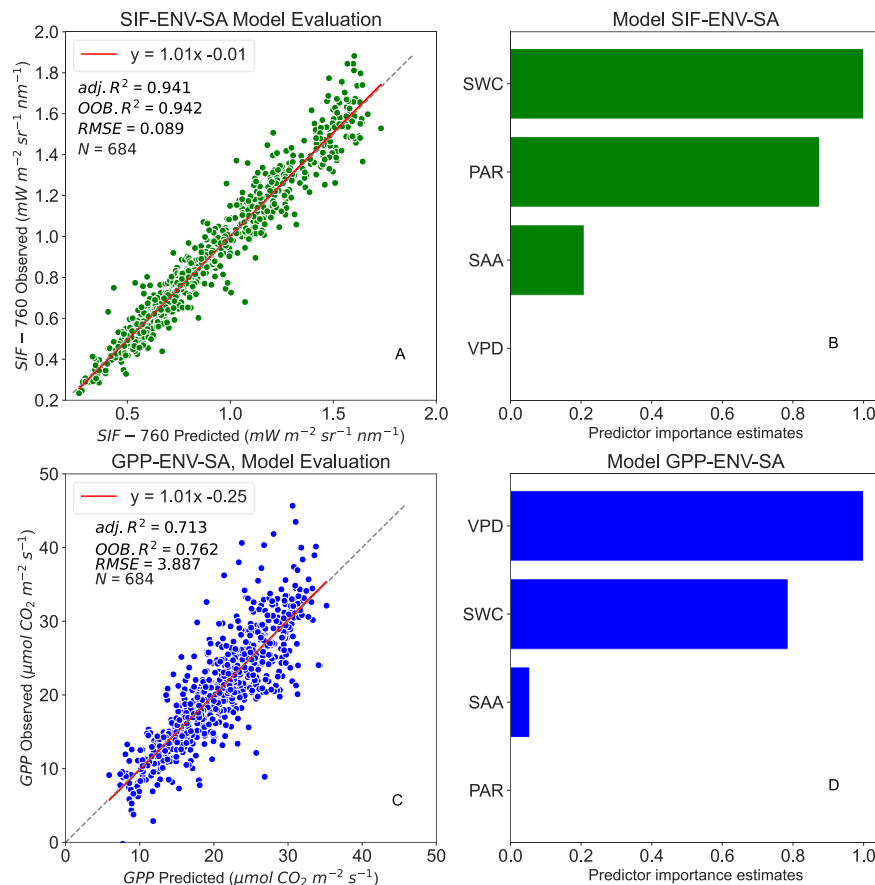
Figure S2. Partial dependence describing the effect of each variable on far-red SIF variations under clear sky days at half-hourly timescale for the SIF-ENV-SA model.

The results in Figure S2 reveal a monotonic positive relationship between SIF and lower values of SWC (SWC < 3 cm³ cm⁻³) and a saturation pattern is observed at high SWC values (SWC > 3 cm³ cm⁻³). The relationship between

SIF and SAA is also positive for values of SAA < 200 degrees, however, for values of SAA between 200 and 250 degrees, their relations become negative. VPD is overall negatively related to SIF, while SIF increases with PAR.
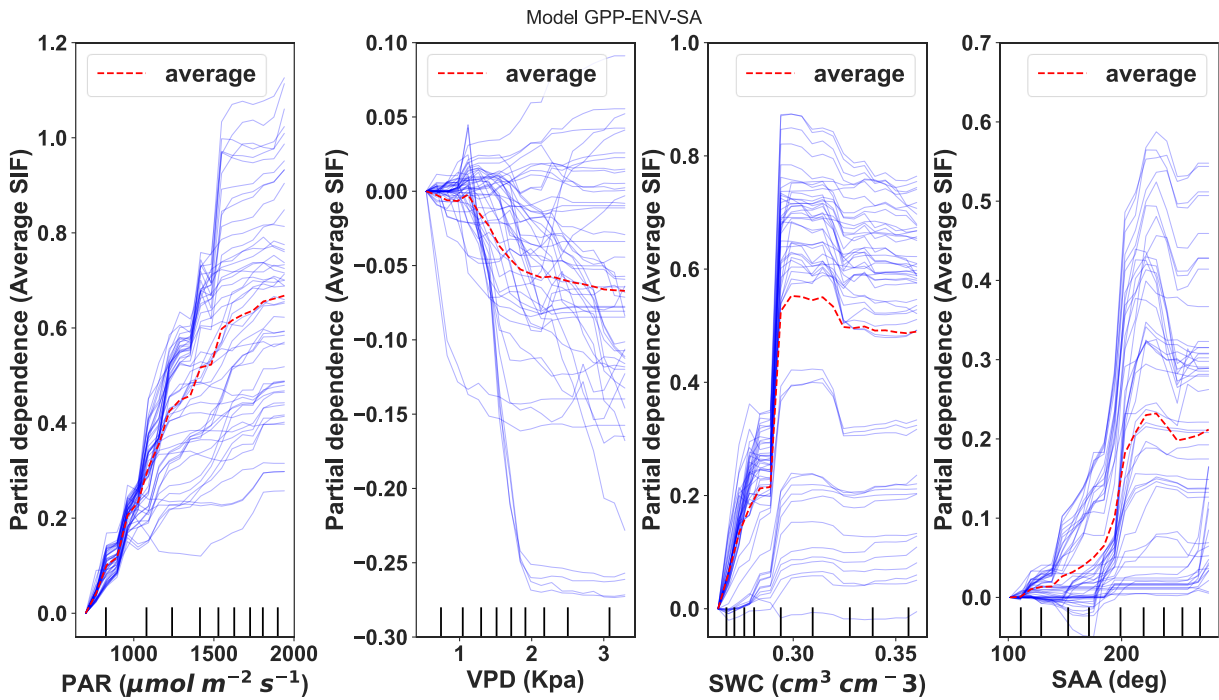
Figure S3. Partial dependence describing the effect of each variable on GPP variations under clear sky days at half-hourly timescale for the GPP-ENV-SA model.

The results in Figure S3 show that SWC has a positive relationship with GPP, but their correlations stayed almost constant before becoming positive again. The relationship between GPP and VPD, and between GPP and SAA are strongly negative. However, the relation between GPP and PAR saturates at high PAR values.