Supplement

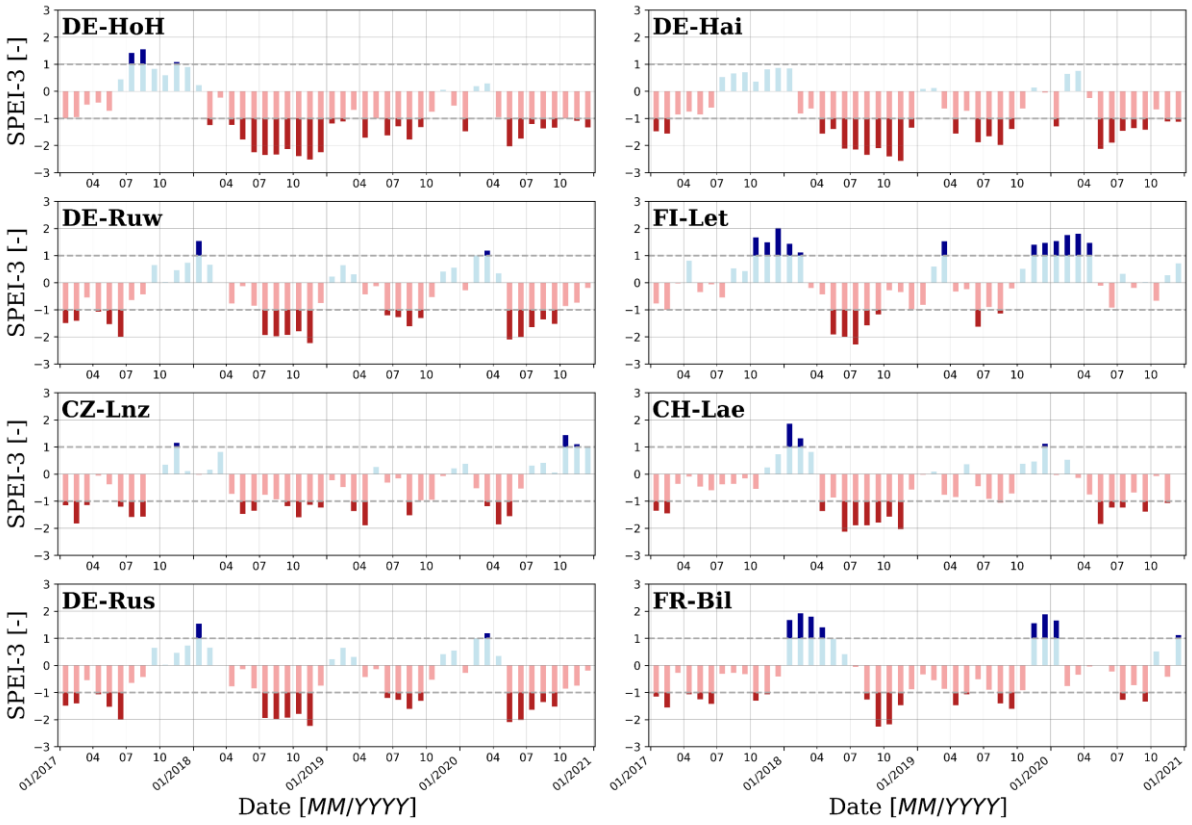


Figure S1. The 3-monthly standardized precipitation-evapotranspiration index, SPEI [-], (Beguería et al., 2023) for the period 2017-2020 at investigated ICOS stations. The vertical dashed lines give the thresholds at -1 and 1 for indicating too dry or too wet months, respectively.

Table S1. Percentages per landcover classes according to the Corine Land Cover (CLC) 2018 (European Environment Agency, 2019) within the 3 km x 3 km footprint around every investigated ICOS station (see Fig. 2).

Corine Land Cover (CLC) classes 2018 [%]	**ICOS STATIONS**							
	DE-HoH	DE-Hai	DE-Ruw	FI-Let	CZ-Lnz	CH-Lae	DE-Rus	FR-Bil
Urban	2.2				0.7	13.3	17.2	
Industrial or commercial units							5.1	
Mineral extraction sites							4.4	
Non-irrigated arable land	**45.6**	3.3			3.2	**32.2**	**63.1**	14.2
Pastures		11.0	4.5		3.9		6.7	
Complex cultivation patterns						4.3		
Land occupied by agriculture with areas of natural vegetation					6.7	7.7		
Broad-leaved forest	**45.5**	**82.4**	3.2		**56.5**	10.2	2	
Coniferous forest	2.7		**86.7**	**51.1**				**41.4**
Mixed forest	2.6		3.3	36.7		**30.3**	1.3	
Natural grasslands		3.2						
Transitional woodland-shrub				7.9	27.6			**44.4**
Water bodies				3.9				
Others	1.4	0.8	2.3	0.4	1.4	2.1	0.2	

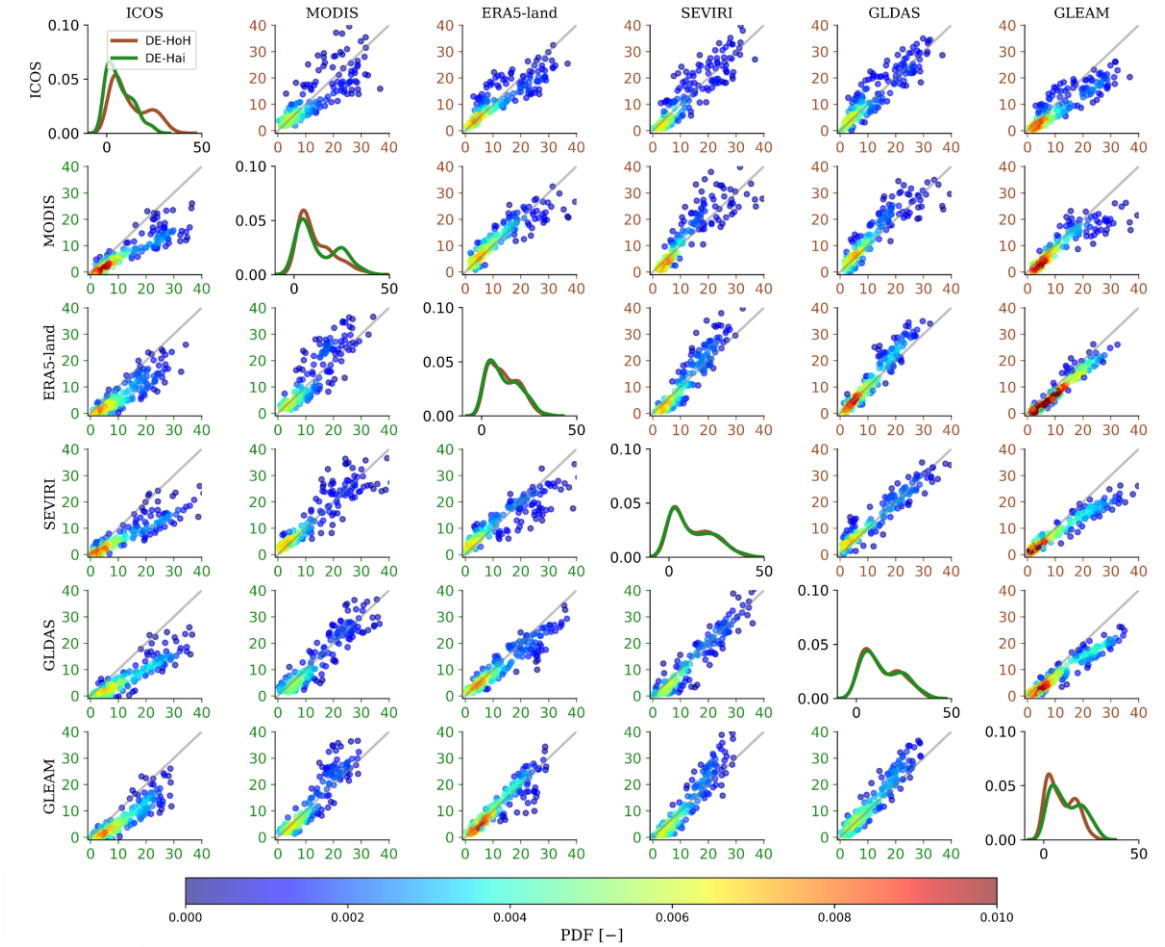


Figure S2. Comparison of seasonal dynamics of ET [mm/8-days] products for the period 2017-2020 at investigated ICOS stations DE-HoH (right panels above the diagonal of the matrix) and DE-Hai (left panels below the diagonal of the matrix). All time series were averaged to 8-daily sums at MODIS dates, and cleaned for daily and weekly dynamics using a Savitzky-Golay filter with a window size of 31 days.

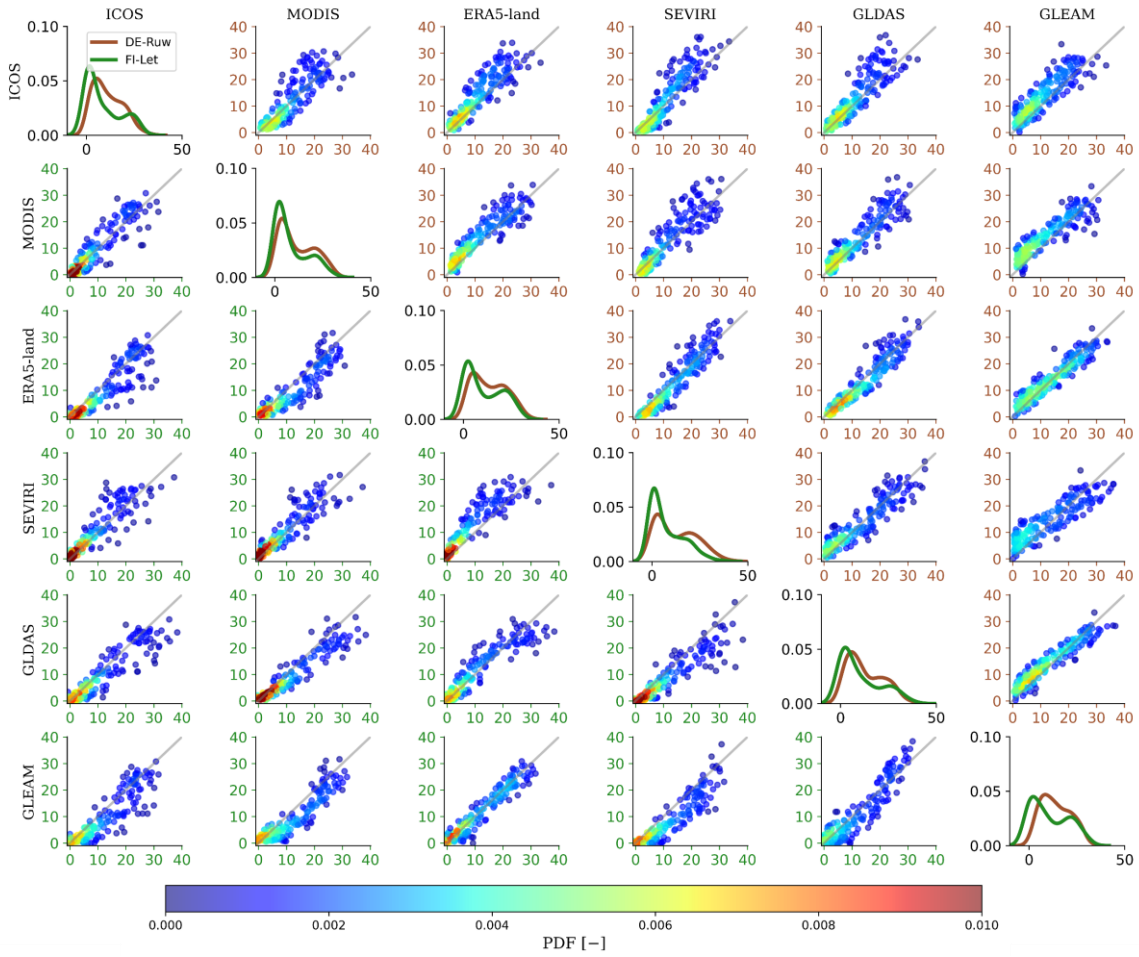
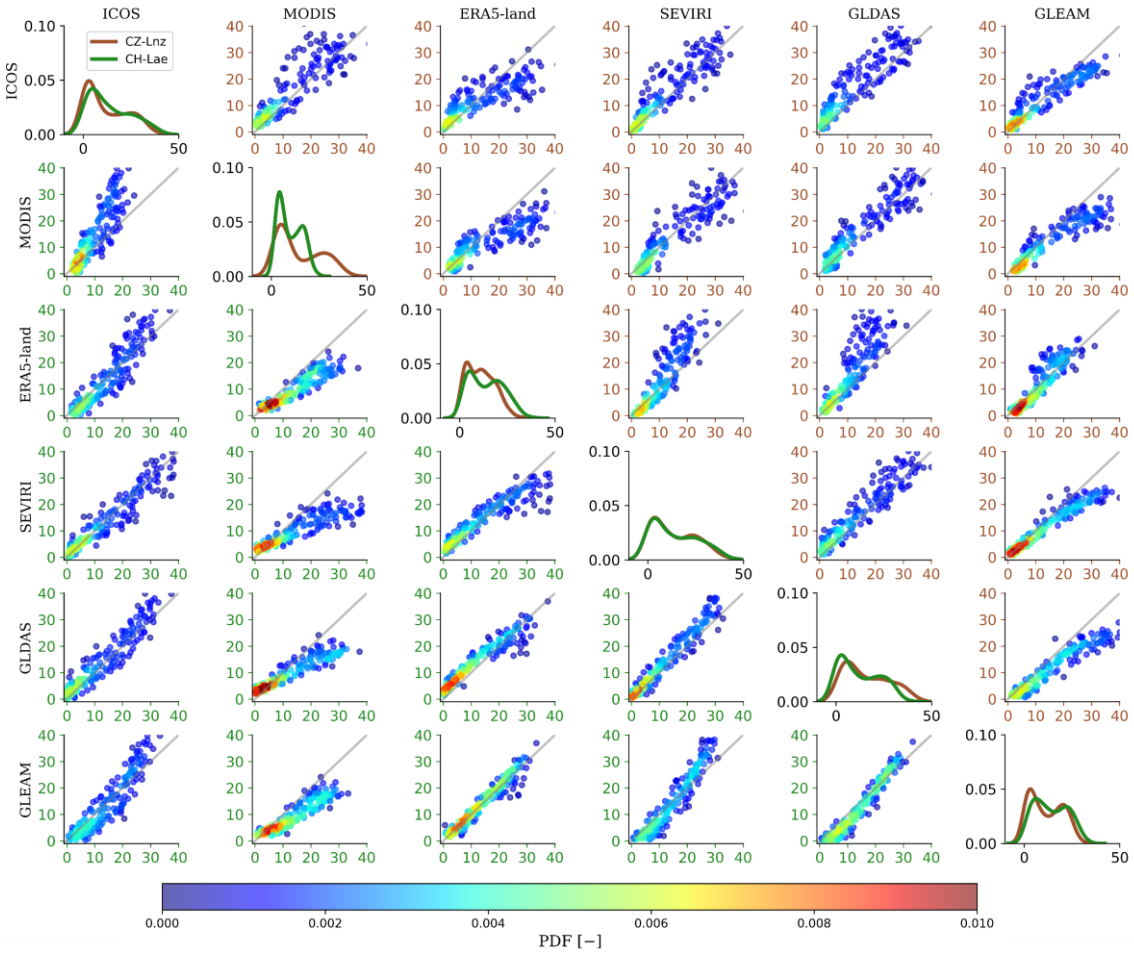


Figure S3. Same as figure S2 but for ICOS stations DE-Ruw (right panels above the diagonal of the matrix) and FI-Let (left panels below the diagonal of the matrix).



20 Figure S4. Same as figure S2 but for ICOS stations CZ-Lnz (right panels above the diagonal of the matrix) and CH-Lae (left panels below the diagonal of the matrix).

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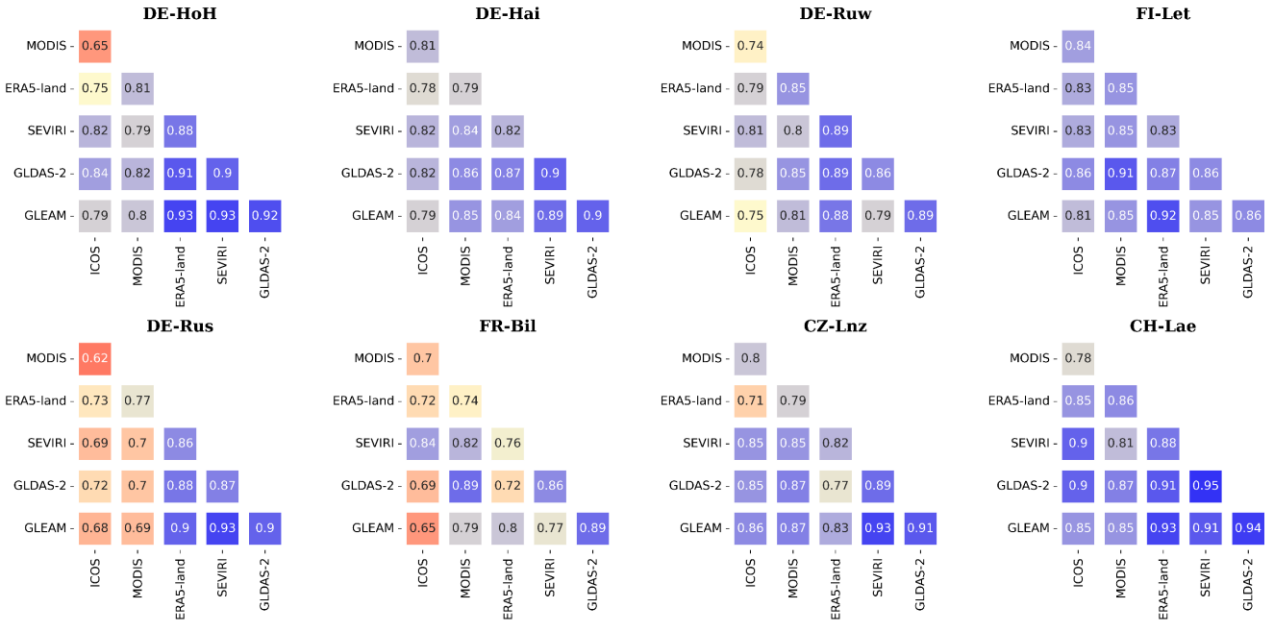

Figure S5. Pearson's coefficient of determination (R^2) among all ET [mm/8-days] products for the period 2017-2020 at investigated ICOS stations. All time series were averaged to 8-daily sums at MODIS dates, and cleaned for daily and weekly dynamics using a Savitzky-Golay filter with a window size of 31 days. The color ranges from low correlations (red) to high correlations (blue).

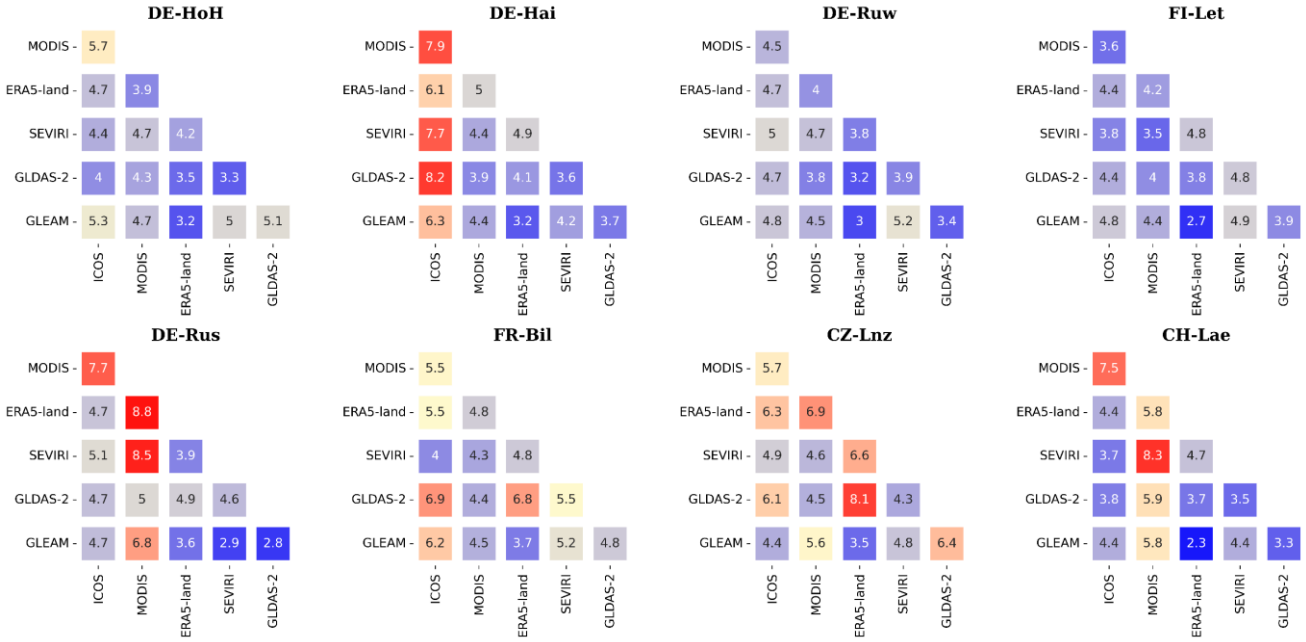

Figure S6. Root-mean square error (RMSE) [mm/8-days] between all ET [mm/8-days] products for the period 2017-2020 at investigated ICOS stations. All time series were averaged to 8-daily sums at MODIS dates, and cleaned for daily and weekly dynamics using a Savitzky-Golay filter with a window size of 31 days. The color ranges from low RMSE (blue) to high RMSE (red).

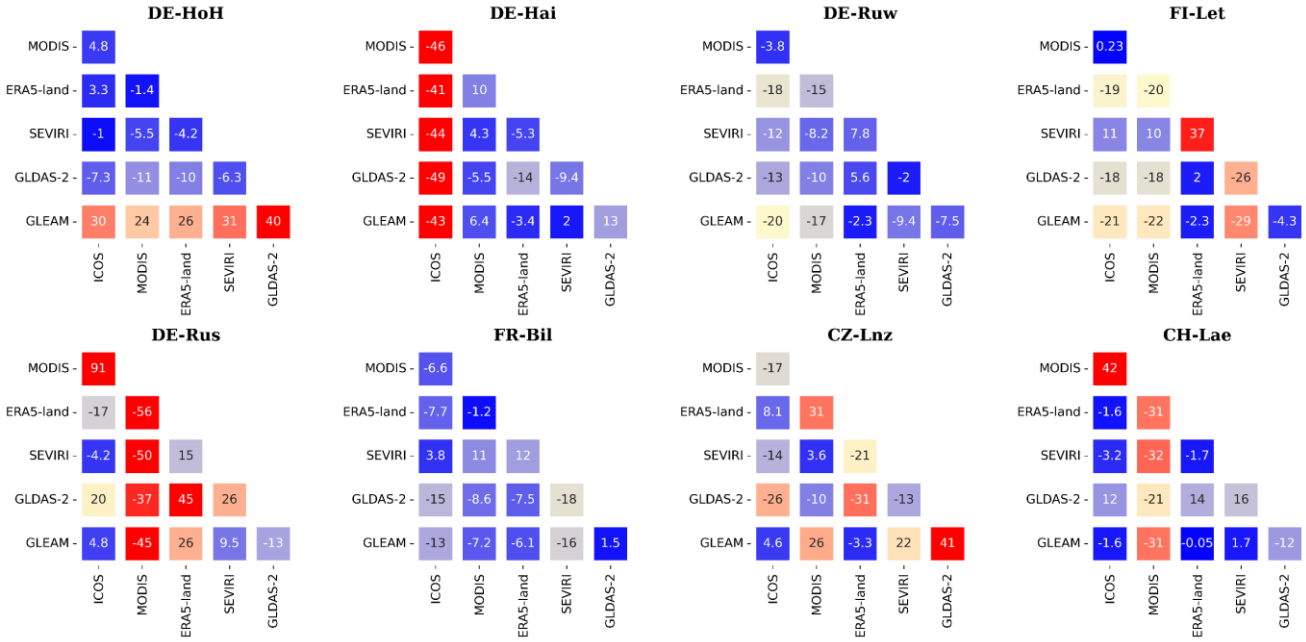

Figure S7. Percentage bias (PBIAS) [%] between all ET [mm/8-days] products for the period 2017-2020 at investigated ICOS stations. All time series were averaged to 8-daily sums at MODIS dates, and cleaned for daily and weekly dynamics using a Savitzky-Golay filter with a window size of 31 days. The color ranges from low PBIAS (blue) to high PBIAS (red).

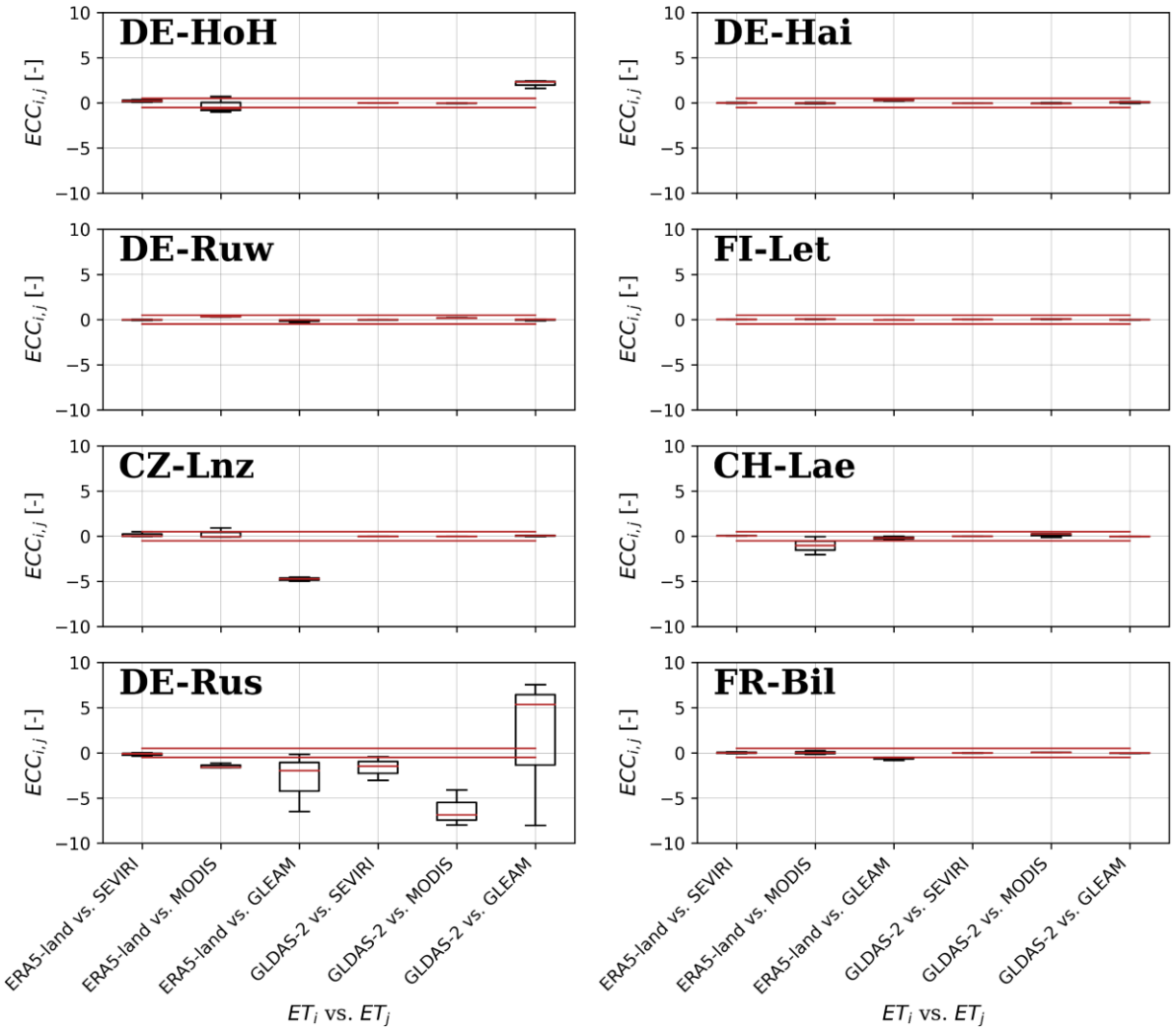

Figure S8. Error cross-correlation (ECC) results between ET products at investigated ICOS stations. The area between the horizontal red lines at -0.5 and 0.5 indicate the range of acceptable ECC (see Sec. 2.3.1).

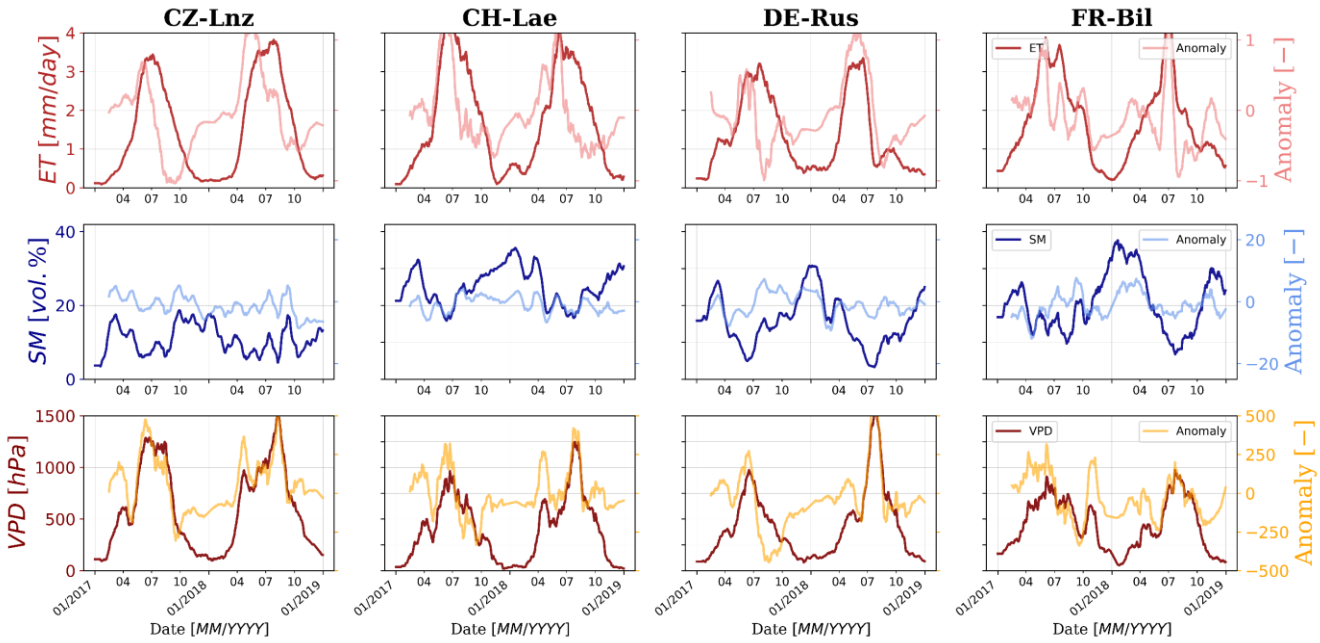

Figure S9. Time series of daily ICOS ET [mm/day], SMAP SM [vol.%], and in-situ VPD [hPa] for 2017 and 2018 at mixed forest (CZ-Lnz, CH-Lae), and agriculture (DE-Rus, FR-Bil) stations compared to their respective anomalies, calculated as described in sec. 2.3.2. All time series were cleaned for daily and weekly dynamics using a Savitzky-Golay filter with a window size of 31 days.

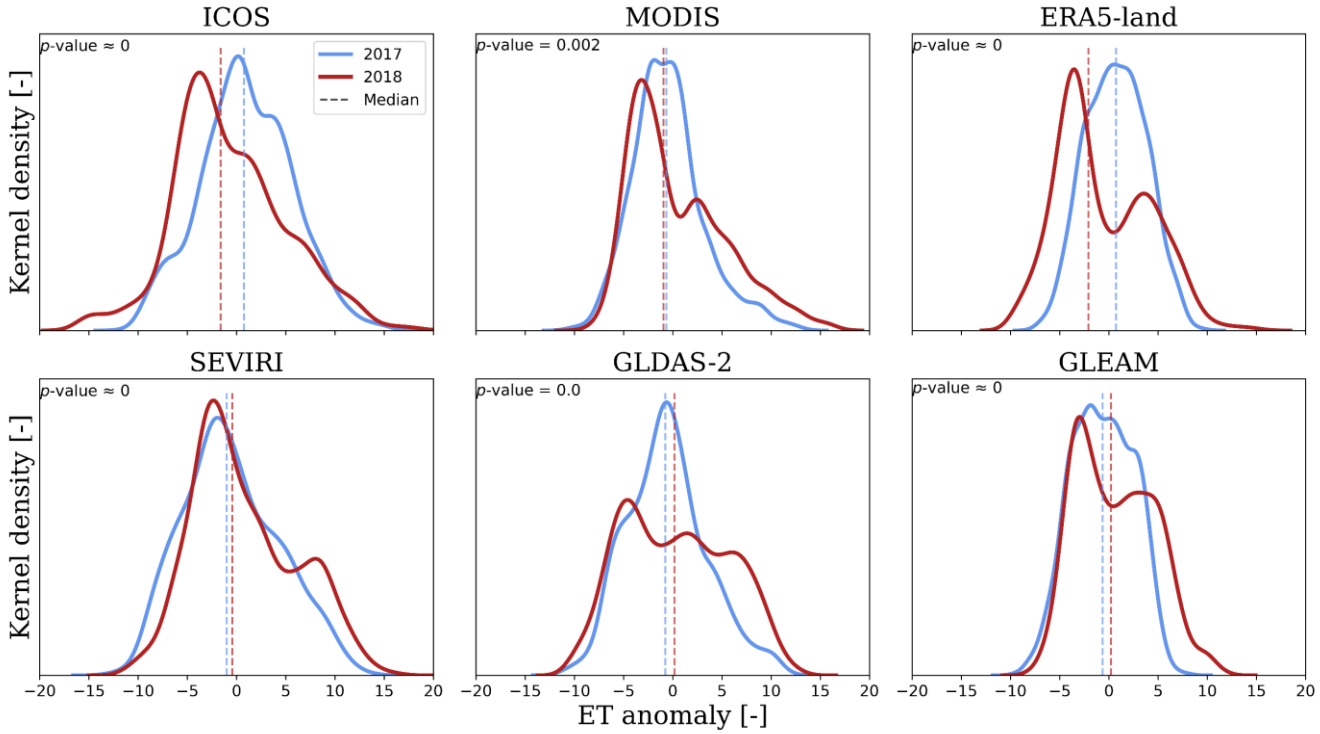

Figure S10. Kernel density estimates of 8-daily ET anomalies (see Sec. 2.3.2) for all investigated ET products during April to October of 2017 and 2018 across all investigated stations. The daily time series were aggregated to 8-daily sums before detrending to account for the temporal resolution of the MODIS ET product. The dashed lines represent the seasonal median of respective parameters and years. The *p*-values of a two-sided Wilcoxon rank-sum test indicate the acceptance (> 0.05) or rejection (< 0.05) of the null hypothesis regarding continuous distributions with equal medians at the 5% significance level.