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Potential of carbon uptake and local aerosol production in boreal and hemi-boreal ecosystems across Finland and in Estonia

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Table S1. Analyzer and meteorological sensors for air temperature, humidity, and PAR

Parameter		CO_2/H_2O fast analyzer	3-D sonic anemometer	Air Temperature (°C)	Relative humidity	PAR (mmol/m^2/s)	Canopy height (m)	Measurement height of eddy covariance	Soil type
Forest	Värriö	LI-7200, LI-COR Biosciences, USA	METEK uSonic-1, Elmshorn, Germany	PT-100	MP106A, Rotronic, Switzerland	LI-190SB, LI-COR Bioscience, USA	10	15 m	Haplic podzol
	Hyytiälä	LI-6262 (before 2018.03) and LI-7200 (after 2018.03), LI-COR, Biosciences, USA	Gill HS-50 anemometer, Gill Instruments, UK	PT-100	MP102H Rotronic, Switzerland (after 2012.06)	LI-190SZ quantum sensor, LI-COR Biosciences, UK	18	23.3 m before 3/2018, 27 m after 3/2018	Haplic podzol
	Ränskälän korpi	LI-7200, LI-COR Biosciences, USA	METEK uSonic-3, Elmshorn, Germany	Hmp155	HMP155, Vaisala, Finland	PQS, Kipp & Zonen B.V., Netherlands	14	29 m	Drained peat
	Järvselja	LI-7200, LI-COR Biosciences, USA	METEK uSonic-3, Elmshorn, Germany	PT-100	WXT520, Vaisala, Finland	Delta-T Pyranometer (only for global radiation)	17.3	30 m	Pseudo podzolic
Agricultural fields	Haltiala	LI-7200, LI-COR Biosciences, USA	METEK uSonic-3, Elmshorn, Germany	HC2, Rotronic, Switzerland	HC2, Rotronic, Switzerland	Li-190R, LI-COR Biosciences, USA	<1.5[a]	3.0 m	Silty clay
	Qvidja	LI-7200, LI-COR Biosciences, USA	METEK uSonic-3, Elmshorn, Germany	HMP155, Vaisala, Finland	HMP155, Vaisala, Finland	PQS, Kipp & Zonen B.V., Netherlands	<1.2[a]	2.3 m	Clay loam
	Viikki	LI-7200, LI-COR Biosciences, USA	Metek uSonic-3, Elmshorn, Germany	HMP110, Vaisala	HMP110, Vaisala	Kipp&Zonen PQS 1, B.V., Netherlands	<1.2[a]	2.5m	Clay loam

Peatland	Siikaneva	LI-7200, LI-COR Biosciences, USA	METEK uSonic-1, Elmshorn, Germany	HC2, Rotronic, Switzerland	HC2, Rotronic, Switzerland	Li-190R, LI-COR Biosciences, USA	0.3	3.0 m	Peat
Urban garden	Kumpula	LI-7200, LI-COR Biosciences, USA	METEK uSonic-1, Elmshorn, Germany	PT-100	HMP243, Vaisala, Finland	PARlite, Kipp & Zonen B.V., Netherlands	------	29 m	-------
Coastal area	Tvärminne	LI-7200RS, LI-COR Biosciences, USA	METEK uSonic-3, Elmshorn, Germany	HMP155, Vaisala, Finland	HMP155, Vaisala, Finland	----	------	4.2 m	Sediments

[a]Estimated as the maximum plant height in growing season; ------- not determined

Table S2. Comparison of ΔN_{neg} across the hemi-boreal and boreal ecosystems in midday (10:00-14:00) of spring and summer.

Ecosystem	Site (site ID)	Spring ΔN_{neg} (1/cm^3, 50%)	Comparing with Hyytiälä median ΔN_{neg}	Comparing with Hyytiälä 75th percentile ΔN_{neg}	Summer ΔN_{neg} (1/cm^3, 50%)	Comparing with Hyytiälä median ΔN_{neg}	Comparing with Hyytiälä 75th percentile ΔN_{neg}
Forest	Hyytiälä	2.0	1	1	1.4	1	1
	Värriö	0.84	0.42	0.42	0.98	0.70	1.0
	Järvselja	0.73	0.36	0.28	0.66	0.47	0.57
Drained peatland forest	Ränskälänkorpi	0.76	0.38	0.5	0.67	0.48	0.6
Agricultural land	Haltiala	7.7	3.8	2.3	1.4	1.0	1.1
	Qvidja	2.4	1.2	1.2	1.7	1.2	1.4
	Viikki	2.3	1.13	1	1.7	1.2	1.2
Peatland	Siikaneva	1.1	0.54	0.52	1.5	1.1	1.1
Urban vegetated area	Kumpula	4.9	2.4	2.4	5.0	3.6	3.9
Coastal area	Tvärminne	0.19	0.1	0.13	0.45	0.32	0.49

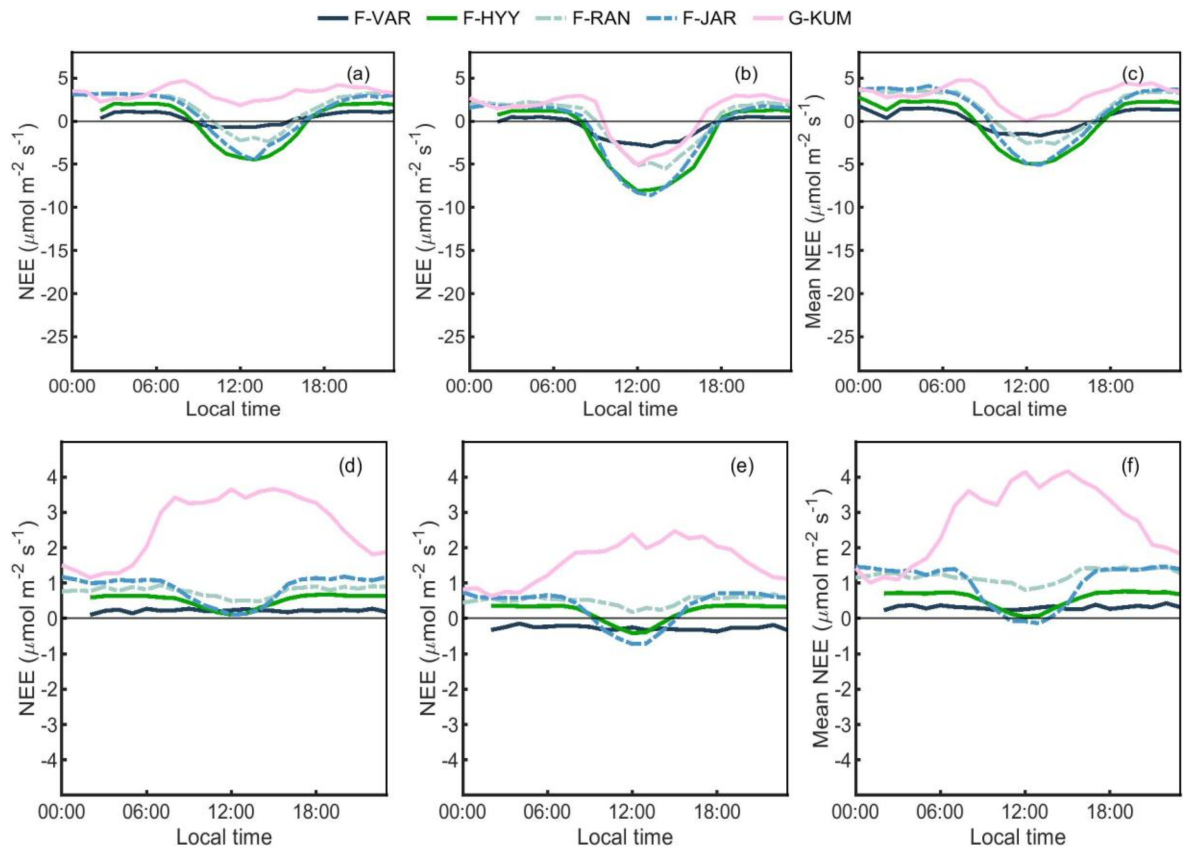

Figure S1. The 50th percentile (a), 25th percentile (b), and mean values (c) of NEE at each hour for the forest sites and urban gardens in the autumn and the corresponding 50th percentile, 25th percentile, and mean values in the winter, (d), (e), (f), respectively.

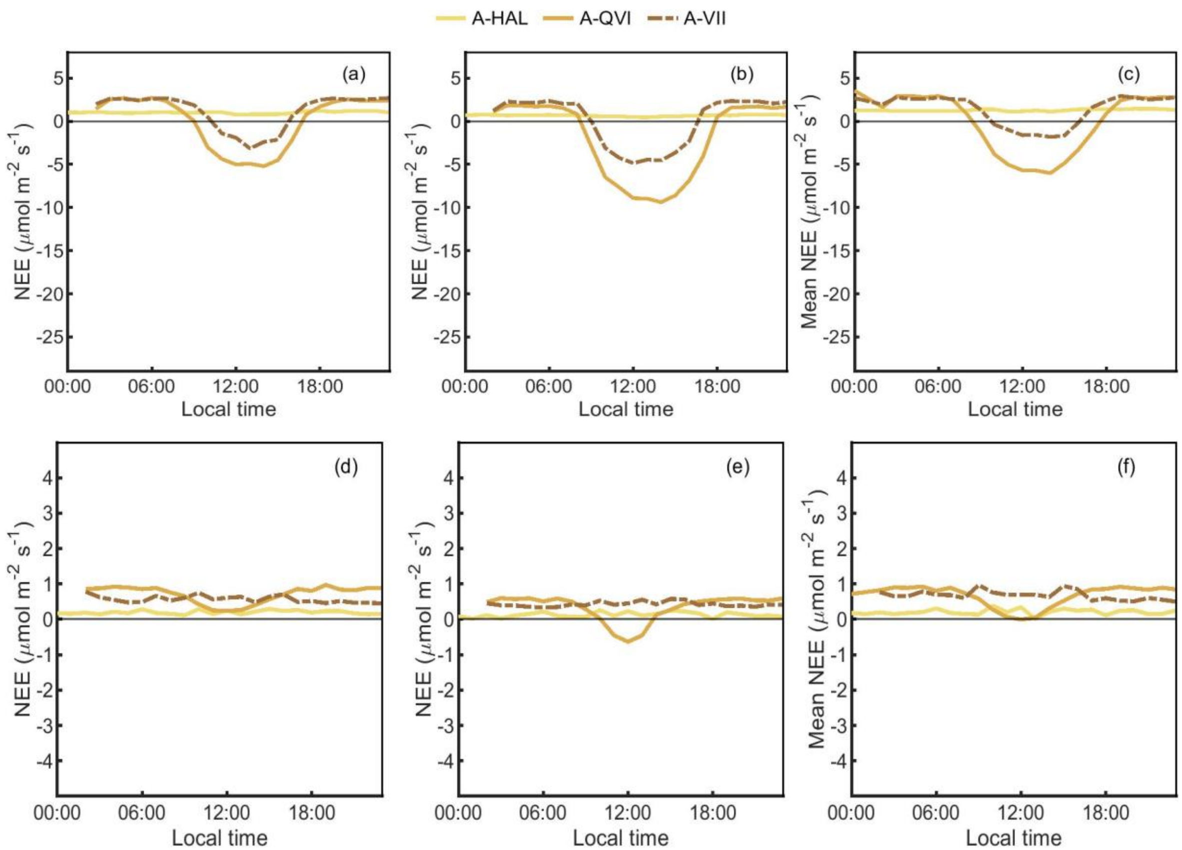

Figure S2. The 50th percentile (a), 25th percentile (b), and mean values (c) of NEE at each hour for the agricultural lands in the autumn and the corresponding 50th percentile, 25th percentile, and mean values, (d), (e), (f) in the winter, respectively.

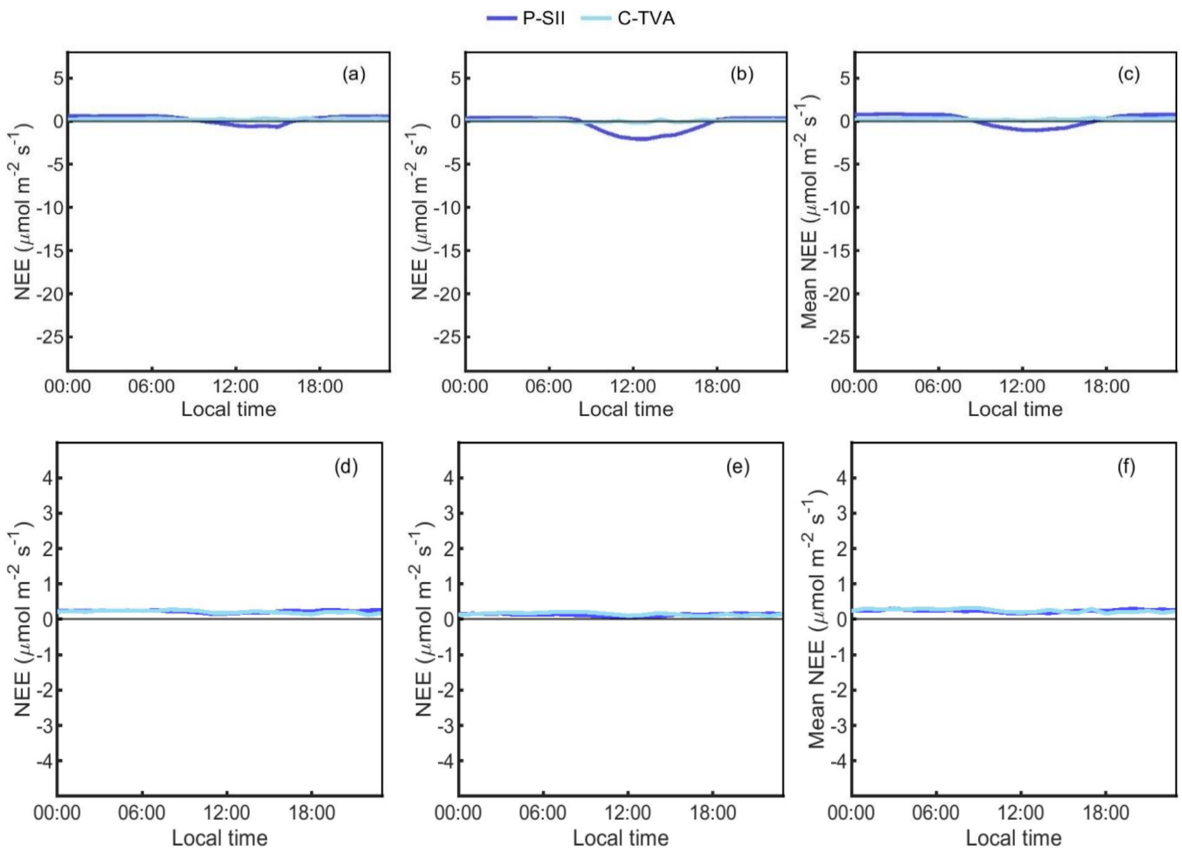

Figure S3. The 50th percentile (a), 25th percentile (b), and mean values (c) of NEE at each hour for the open peatland and coastal area in the autumn and the corresponding 50th percentile, 25th percentile, and mean values, (d), (e), (f) in the winter, respectively.

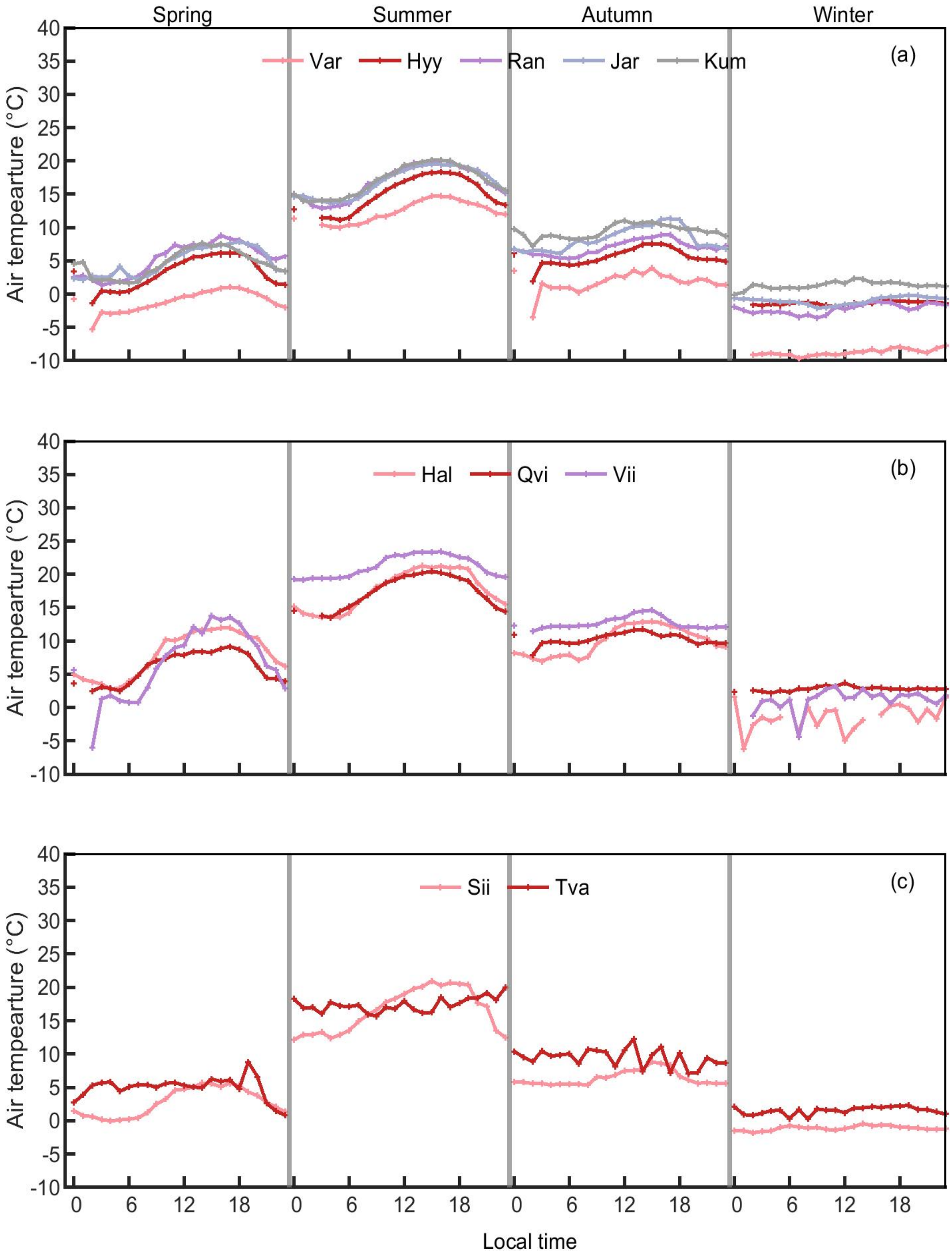

Figure S4. The median diurnal variation of the air temperature in the forests (a), agricultural fields (b), and peatland and coastal area (c) in each season.

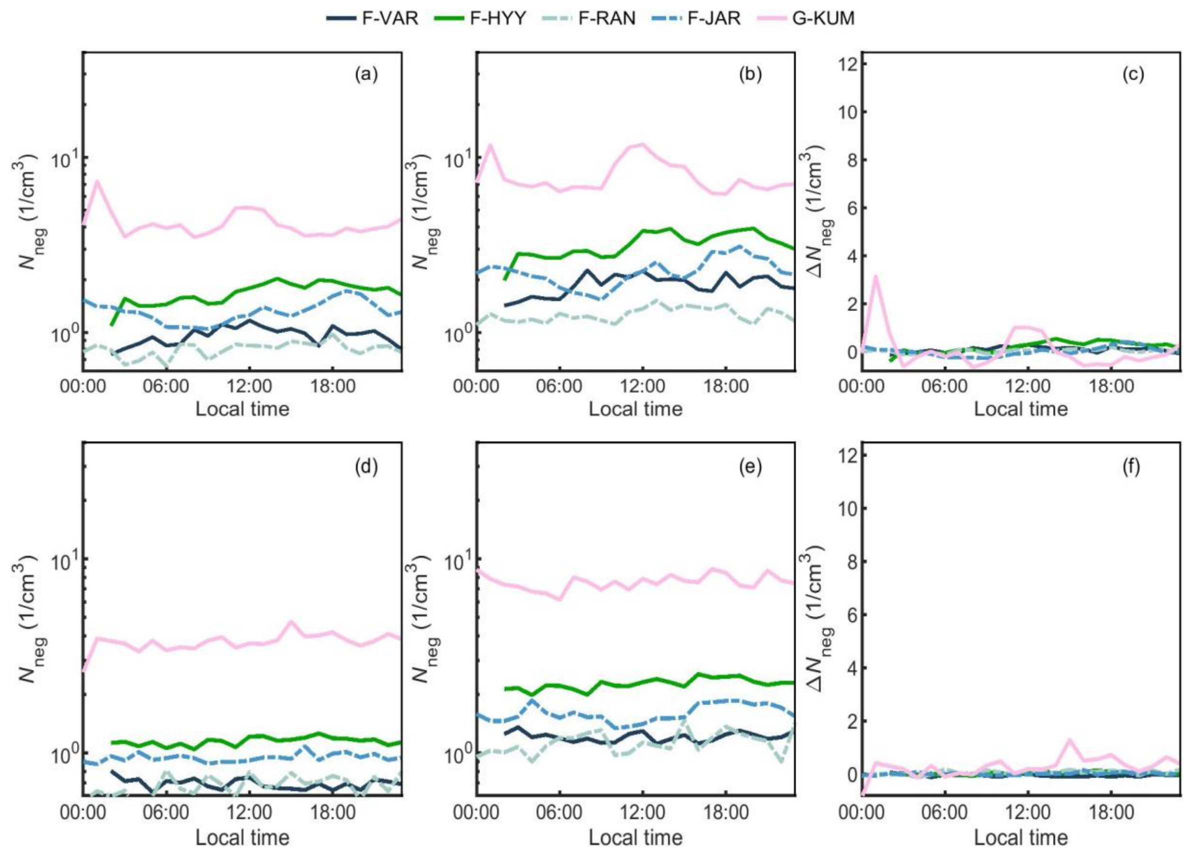

Figure S5. The 50th percentile (a), 75th percentile (b), and median daily fluctuations (c) of negative ions at each hour for the forest sites and urban gardens in the autumn and the corresponding 50th percentile, 75th percentile, and median daily fluctuations in the winter, (d), (e), (f), respectively.

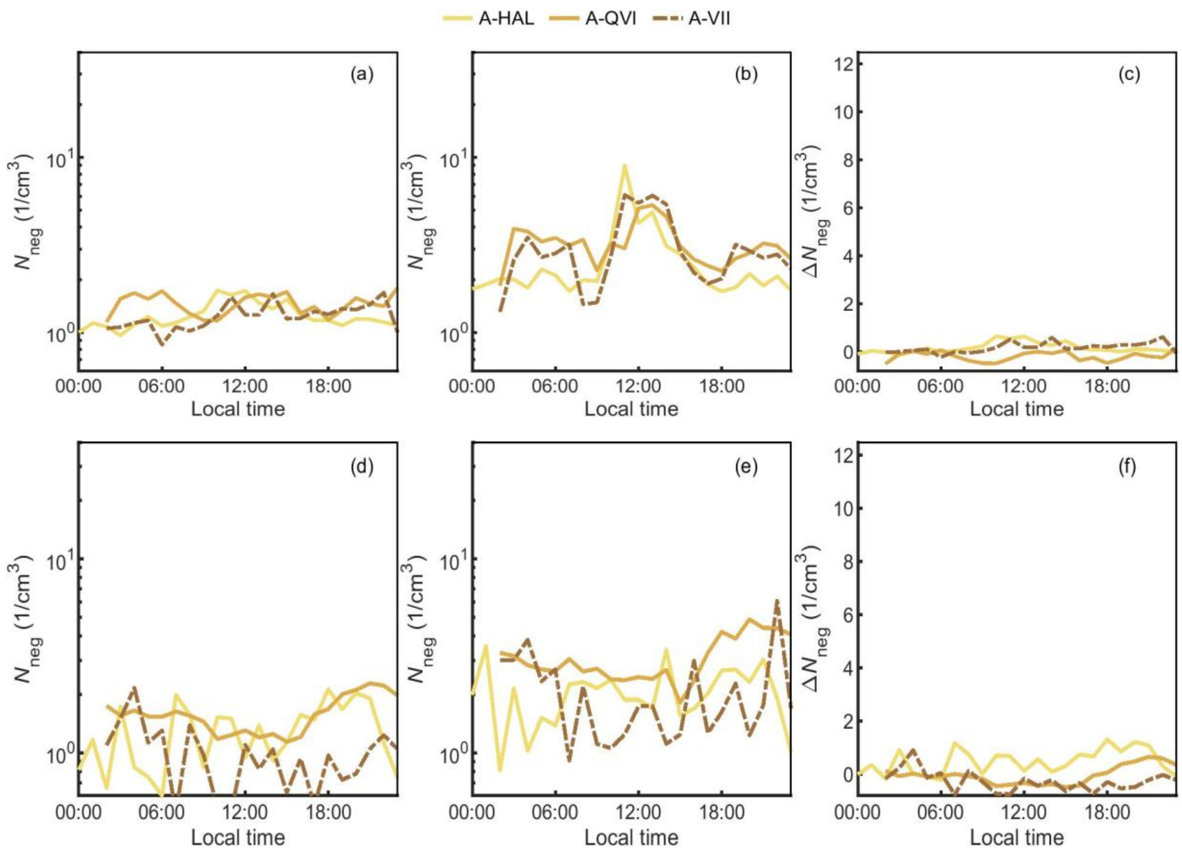

Figure S6. The 50th percentile (a), 75th percentile (b), and median daily fluctuations (c) of negative ions at each hour for agricultural fields in the autumn and the corresponding 50th percentile, 75th percentile, and median daily fluctuations in the winter, (d), (e), (f), respectively.

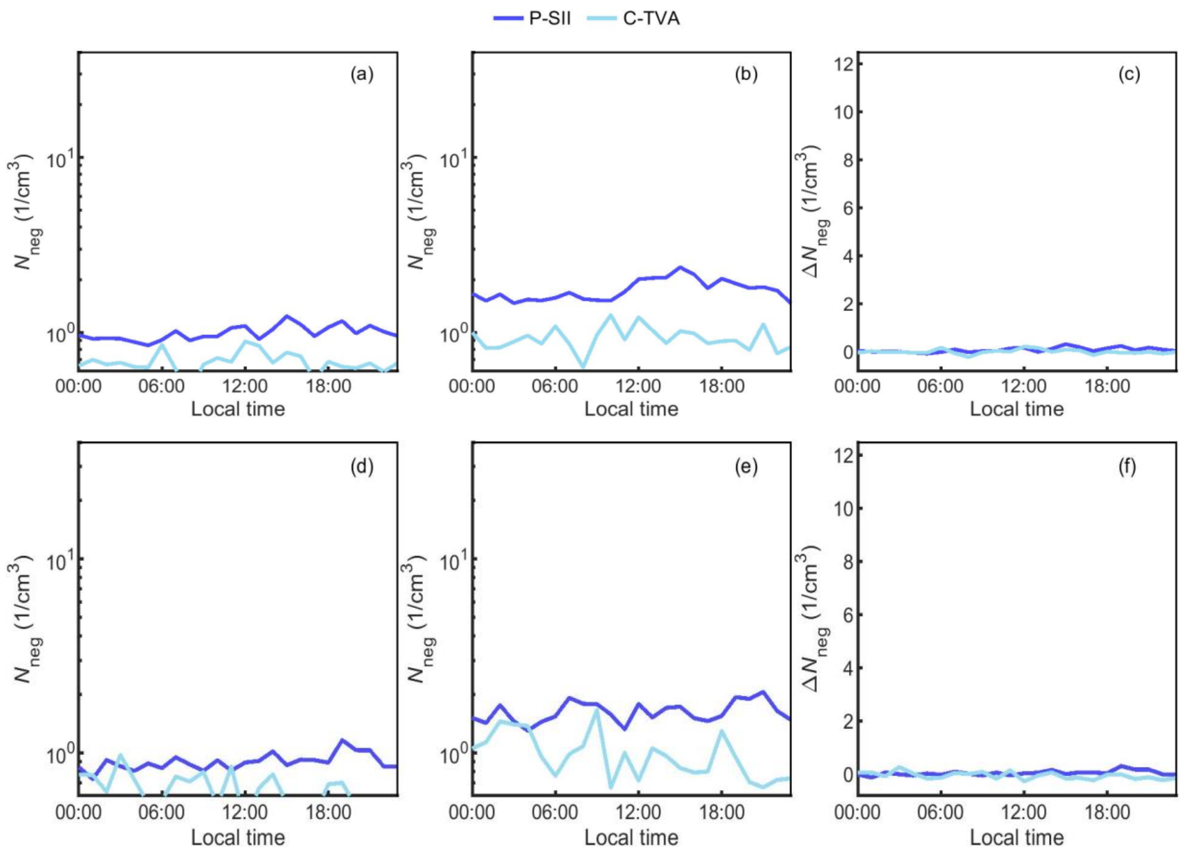

Figure S7. The 50th percentile (a), 75th percentile (b), and median daily fluctuations (c) of negative ions at each hour for open peatland and coastal area in the autumn and the corresponding 50th percentile, 75th percentile, and median daily fluctuations in the winter, (d), (e), (f), respectively.

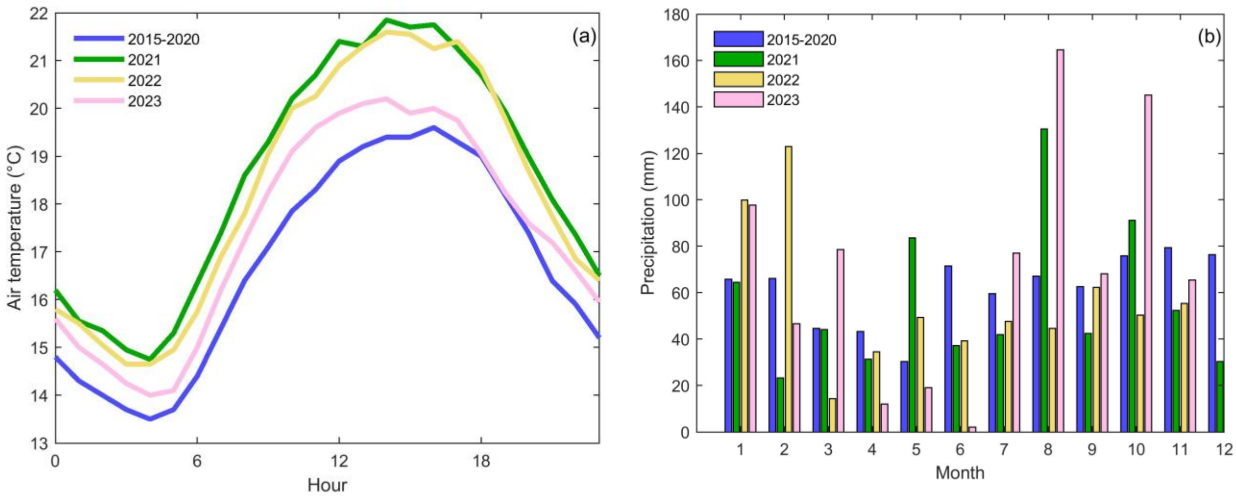

Figure S8. The yearly changes of median air temperature in summer (a) and precipitations (b) in Viikki cropland. The data in Kumpula, Helsinki, which is ~5.6 km away from Viikki croplands, was applied to represent yearly changes in Viikki croplands. All data are from Finnish Metrological Institute.

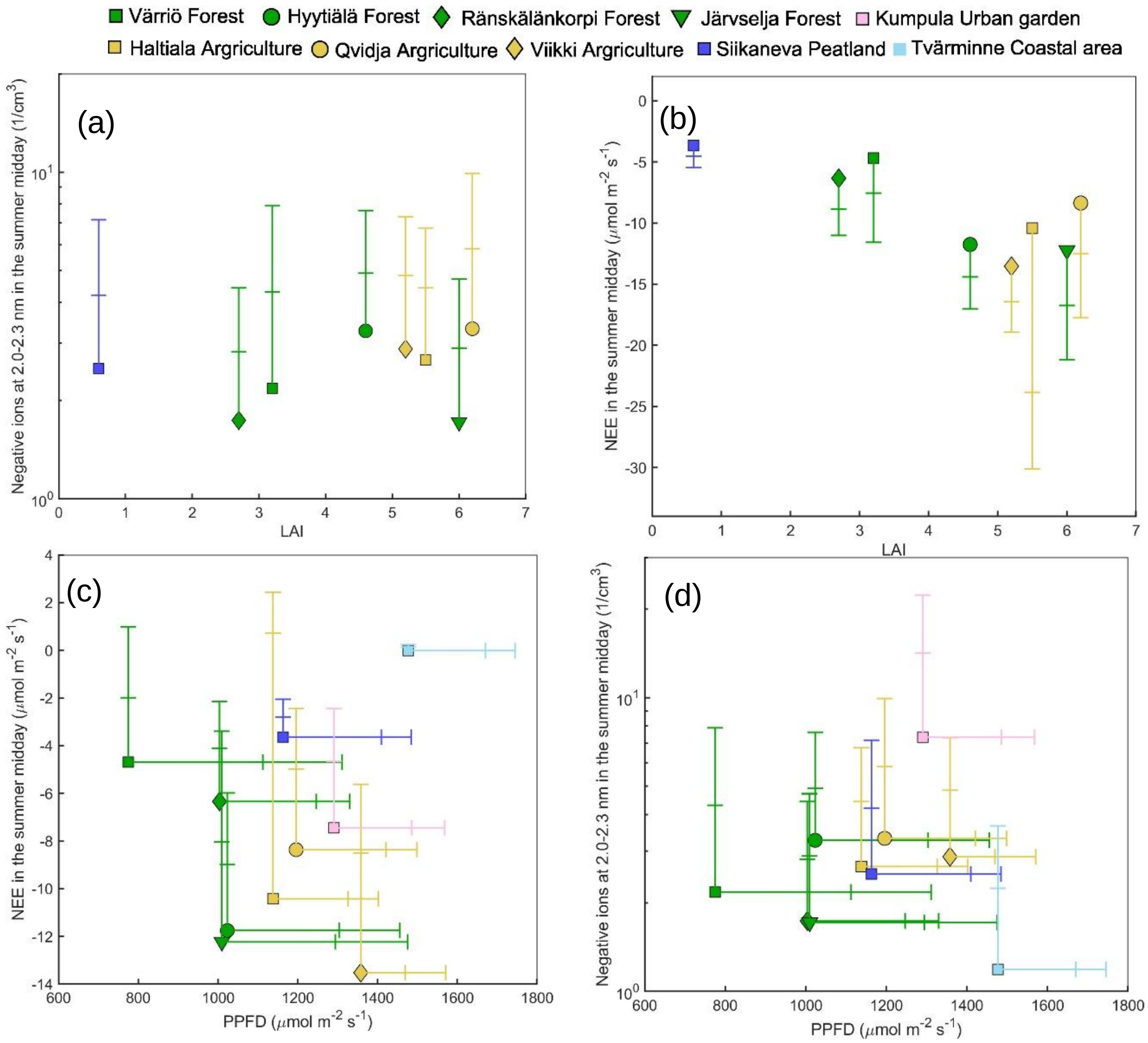

Figure S9. Comparison between median NEE, median negative intermediate ions at 2.0-2.3 nm, leaf area index, and median photosynthetic photo flux density (PPFD) at midday in summer between the sites. The error bars are 10th and 25th percentile for NEE, 75th and 90th percentile for the negative intermediate ions, and 75th and 90th percentile for PPFD at each site.