

Table S1 Validation results of the estimated hourly GHI values at CERN stations.

Stations	RMSE	MAE	RMSD	MAD	MBD	SD	R	U95	TS	NSE	WIA	LCE	KSI	OVER	CPI	GPI
SAY	143.41	96.71	39.69	26.76	9.24	39.69	0.90	110.02	51.84	0.80	1.00	0.65	183.50	175.17	109.51	1.889
SAJ	161.32	124.95	58.25	45.12	8.33	58.25	0.81	161.46	31.50	0.62	1.00	0.42	115.88	103.50	83.97	0.593
DOH	129.13	94.20	50.89	37.12	24.75	50.89	0.91	141.05	121.97	0.76	0.98	0.57	238.12	219.53	139.86	0.224
LIZ	158.60	121.93	43.03	33.08	20.33	43.03	0.90	119.27	116.94	0.70	0.98	0.51	153.20	139.74	94.75	0.592
HUT	138.59	86.26	73.15	45.53	32.53	73.15	0.88	202.75	117.53	0.70	0.98	0.56	269.69	257.56	168.39	-1.004
NMG	146.53	85.47	49.72	29.00	10.26	49.71	0.89	137.80	47.77	0.75	1.00	0.66	97.10	93.63	72.54	2.230
BKF	161.02	108.58	77.03	51.94	5.14	77.03	0.84	213.52	14.28	0.61	1.00	0.48	302.20	269.00	181.32	-0.835
QYZ	124.79	81.40	57.54	37.53	26.68	57.54	0.92	159.49	122.99	0.78	0.98	0.63	265.41	250.44	157.73	0.102
ALS	198.31	133.60	77.53	52.23	31.86	77.53	0.83	214.89	105.87	0.58	0.97	0.46	315.39	294.84	191.32	-2.685
DYW	161.10	104.84	72.87	47.42	17.92	72.87	0.85	201.99	63.90	0.68	0.99	0.55	226.49	215.43	146.92	-0.455
TAL	123.61	87.60	46.76	33.14	18.46	46.76	0.91	129.61	96.90	0.80	0.99	0.62	224.03	199.58	129.28	1.078
NAM	131.92	92.29	40.78	28.53	17.06	40.78	0.91	113.04	99.46	0.78	0.99	0.61	115.26	115.13	77.99	1.887
ANS	132.66	86.75	48.32	31.60	23.45	48.32	0.92	133.94	126.40	0.79	0.98	0.65	200.59	191.87	122.28	0.880
FEQ	101.70	67.71	39.61	26.37	12.71	39.61	0.93	109.78	75.72	0.84	0.99	0.69	147.63	124.34	87.80	2.695
CHS	119.42	82.00	50.11	34.41	18.51	50.11	0.91	138.89	92.32	0.79	0.99	0.63	209.80	192.85	125.72	1.153
LAS	264.08	208.87	57.96	45.84	14.09	57.96	0.73	160.65	53.01	0.43	0.99	0.31	218.75	204.26	134.73	-2.363
LUC	122.90	88.47	44.75	32.22	27.18	44.75	0.94	124.05	163.65	0.77	0.97	0.59	176.26	158.17	105.99	0.774
TAY	113.82	72.88	57.24	36.65	25.87	57.24	0.92	158.65	120.85	0.80	0.98	0.64	251.93	227.15	148.39	0.502
SHY	124.46	92.54	43.07	32.03	12.03	43.07	0.89	119.40	62.12	0.77	0.99	0.58	128.14	112.33	81.65	2.017
SPT	180.58	129.13	53.51	38.26	12.51	53.51	0.84	148.33	53.91	0.67	0.99	0.51	201.30	189.72	124.51	0.540
DTH	148.66	106.98	42.71	30.74	24.21	42.71	0.92	118.39	145.64	0.73	0.97	0.55	165.88	161.07	103.09	3.248
HAB	180.58	129.13	53.51	38.26	12.51	53.51	0.84	148.33	53.91	0.67	0.99	0.51	201.30	189.72	124.51	0.103
HUJ	125.57	72.54	87.97	50.81	39.09	87.96	0.89	243.83	109.06	0.70	0.98	0.57	232.43	227.76	159.03	-0.990
YAT	120.53	77.80	66.59	42.98	21.97	66.58	0.88	184.56	82.47	0.75	0.99	0.58	245.10	233.43	152.93	0.122

SLJ	120.63	71.83	76.75	45.70	21.72	76.74	0.89	212.73	66.87	0.76	0.99	0.60	217.38	198.96	142.46	0.317
YUC	98.43	66.85	35.38	24.03	13.77	35.38	0.94	98.07	93.73	0.86	0.99	0.70	131.80	109.98	78.14	2.920
CHL	239.58	193.06	69.47	55.98	11.88	69.47	0.68	192.56	33.55	0.27	0.99	0.20	132.84	100.42	93.05	-2.220
JZW	112.70	75.78	44.22	29.73	17.07	44.21	0.93	122.56	91.91	0.82	0.99	0.66	146.93	121.36	89.18	2.165
MAO	157.35	112.23	64.49	46.00	30.41	64.49	0.87	178.76	118.99	0.69	0.97	0.51	341.58	336.33	201.73	-1.815
XSB	166.32	110.48	61.46	40.82	26.94	61.45	0.88	170.34	115.45	0.70	0.98	0.57	249.71	235.98	152.15	-0.668
GSF	222.84	143.59	160.98	103.73	82.54	160.98	0.74	446.21	147.03	0.14	0.92	0.13	466.07	452.05	310.02	-9.869
GSS	156.11	105.18	71.59	48.23	23.28	71.59	0.85	198.42	83.00	0.69	0.99	0.53	356.71	348.55	212.11	-1.637
EDS	162.71	118.09	46.56	33.79	23.22	46.56	0.89	129.05	111.70	0.67	0.97	0.51	155.05	150.83	99.75	0.319
CHW	142.83	100.15	51.41	36.05	14.90	51.41	0.88	142.51	66.70	0.75	0.99	0.58	175.54	158.97	109.33	1.073
CHS	167.66	119.84	58.74	41.99	8.62	58.74	0.84	162.82	22.27	0.68	1.00	0.52	151.25	136.93	101.41	0.775
FUK	194.61	147.62	62.51	47.42	10.77	62.51	0.80	173.28	38.33	0.55	1.00	0.41	129.64	105.34	90.00	-0.201
AKA	187.69	135.08	90.33	65.01	55.67	90.33	0.84	250.37	169.34	0.50	0.93	0.34	424.87	418.61	256.03	-5.528
HES	130.96	76.48	87.02	50.82	26.30	87.02	0.88	241.21	91.45	0.70	0.99	0.58	217.07	211.11	150.55	-0.543
YIT	105.03	63.42	52.50	31.70	13.37	52.50	0.93	145.51	66.08	0.85	1.00	0.71	205.71	181.09	122.95	1.990
DHS	117.20	63.65	71.03	38.57	19.75	71.03	0.90	196.88	80.92	0.78	0.99	0.67	234.16	219.67	148.97	0.624