

Supplementary Information

Table S1 presents the forecast error results of solar radiation power density for the horizontal plane and for the following angular settings: $\beta = 30^\circ, 45^\circ, 60^\circ$. Because of the considerable forecast errors of the Steven and Unsworth model, deviating from the remaining results, further calculations using this model were skipped. Calculations were carried out for the Liu-Jordan (L), Hay (H), Badescu (B), Tian (T) and Koronakis (K) models and the isotropic model (M) using the diffuse correction coefficient implemented by the author.

Table S1. Values of RMSE% and MBE% with Pearson correlation coefficient for tested models.

			<u>L</u>	<u>H</u>	<u>B</u>	<u>T</u>	<u>K</u>	<u>M</u>				<u>L</u>	<u>H</u>	<u>B</u>	<u>T</u>	<u>K</u>	<u>M</u>
January	30	RMSE%	5.035	8.030	12.869	19.716	8.688	3.975	July	5.571	5.502	10.942	15.438	4.277	4.259		
		MBE%	-2.133	-1.237	-6.438	-10.036	-2.453	1.571		-2.790	-2.185	-7.408	-10.853	-0.756	0.859		
		k	1.000	0.998	0.999	0.998	0.997	1.000		0.997	0.997	0.997	0.997	0.998	0.998		
	45	RMSE%	10.205	12.736	24.887	25.135	10.238	4.904		10.039	9.585	20.353	20.372	6.303	6.245		
		MBE%	-4.714	-3.306	-12.461	-12.666	-2.934	-1.096		-5.932	-5.129	-14.216	-14.227	-1.363	-1.518		
		k	0.999	0.998	0.996	0.996	0.997	1.000		0.994	0.993	0.993	0.993	0.995	0.995		
	60	RMSE%	17.004	18.657	34.978	29.101	12.488	11.095		15.051	14.760	28.619	23.853	7.657	9.803		
		MBE%	-8.103	-6.489	-17.603	-14.497	-3.784	-4.740		-9.930	-9.484	-20.468	-16.871	-2.439	-5.411		
		k	0.998	0.996	0.994	0.995	0.997	0.999		0.991	0.990	0.990	0.991	0.993	0.993		
February	30	RMSE%	3.256	6.497	8.596	13.367	3.572	4.989	August	2.930	3.044	8.395	12.516	1.685	2.666		
		MBE%	-0.744	1.702	-4.585	-7.325	0.670	2.053		-1.716	0.054	-5.647	-8.465	-0.186	1.343		
		k	1.000	0.999	0.999	0.999	1.000	1.000		1.000	1.000	1.000	0.999	1.000	1.000		
	45	RMSE%	5.546	7.727	15.866	15.866	4.834	4.457		5.538	4.602	15.497	15.497	2.493	2.366		
		MBE%	-2.217	0.966	-8.700	-8.700	0.861	0.547		-3.521	-1.282	-10.511	-10.511	-0.232	-0.378		
		k	0.999	0.999	0.999	0.999	0.999	0.999		0.999	0.999	0.999	0.999	1.000	1.000		
	60	RMSE%	8.805	8.753	21.479	17.069	5.945	5.717		9.037	7.277	21.329	17.172	3.536	3.605		
		MBE%	-4.246	-0.588	-11.872	-9.347	0.008	-1.543		-5.917	-3.486	-14.501	-11.648	-0.194	-1.760		
		k	0.999	0.998	0.998	0.998	0.999	0.999		0.999	0.998	0.997	0.998	0.999	0.999		
March	30	RMSE%	2.447	4.286	7.546	11.543	2.956	2.403	September	2.296	2.941	8.702	13.450	1.356	1.399		
		MBE%	-1.233	1.410	-4.475	-6.796	-1.070	1.244		-1.178	1.450	-5.416	-8.458	0.470	0.658		
		k	1.000	1.000	1.000	1.000	1.000	1.000		1.000	1.000	0.999	0.998	1.000	1.000		
	45	RMSE%	4.004	5.152	13.453	13.450	2.554	1.441		5.362	2.803	16.735	16.746	2.103	2.429		
		MBE%	-2.365	1.020	-7.948	-7.944	-0.420	0.090		-3.042	0.261	-10.461	-10.471	0.461	-0.841		
		k	1.000	1.000	0.999	0.999	1.000	1.000		0.999	0.999	0.996	0.996	0.999	0.999		
	60	RMSE%	6.648	5.993	17.857	14.076	3.128	3.062		9.604	5.168	23.255	29.517	3.024	6.240		
		MBE%	-3.824	0.024	-10.505	-8.282	0.271	-1.336		-5.640	-2.088	-14.473	-14.944	0.337	-3.400		
		k	1.000	0.999	0.998	0.999	1.000	1.000		0.997	0.997	0.992	0.936	0.999	0.998		

Table S1. *Cont.*

			<u>L</u>	<u>H</u>	<u>B</u>	<u>T</u>	<u>K</u>	<u>M</u>		<u>L</u>	<u>H</u>	<u>B</u>	<u>T</u>	<u>K</u>	<u>M</u>
April	30	RMSE%	6.529	5.795	11.356	15.407	6.224	5.517	October	4.338	2.771	12.960	19.151	1.248	0.787
		MBE%	-3.386	-1.691	-7.386	-10.300	-2.771	-0.207		-2.451	-1.587	-7.431	-11.006	-0.537	-0.044
		k	0.998	0.998	0.998	0.998	0.998	0.998		1.000	1.000	1.000	1.000	1.000	1.000
	45	RMSE%	10.355	8.487	19.596	19.640	8.324	7.620		9.466	7.388	24.631	24.631	2.444	1.652
		MBE%	-5.963	-3.710	-13.082	-13.114	-3.721	-2.809		-5.415	-4.276	-14.160	-14.160	-1.294	-0.793
		k	0.996	0.996	0.996	0.996	0.996	0.996		1.000	1.000	1.000	1.000	1.000	1.000
	60	RMSE%	14.705	10.014	26.469	22.330	10.347	11.166		16.122	13.734	34.259	28.234	4.060	3.115
		MBE%	-9.092	-6.023	-17.821	-14.896	-4.145	-5.876		-9.269	-7.943	-19.698	-16.246	-2.275	-1.736
		k	0.994	0.997	0.994	0.994	0.994	0.995		1.000	1.000	0.999	0.999	1.000	1.000
May	30	RMSE%	6.214	6.096	10.320	14.061	5.434	4.631	November	4.480	10.613	13.472	20.194	8.898	4.223
		MBE%	-2.779	-2.652	-6.768	-9.726	-1.092	0.014		-1.971	-4.127	-6.648	-10.039	-0.582	1.777
		k	0.998	0.998	0.997	0.997	0.998	0.998		1.000	0.991	1.000	0.999	0.997	1.000
	45	RMSE%	9.724	9.725	18.146	18.142	8.004	7.283		9.421	17.036	25.362	25.362	9.329	3.442
		MBE%	-4.986	-4.987	-12.416	-12.414	-1.633	-1.690		-4.508	-7.314	-12.616	-12.784	-0.602	-0.917
		k	0.995	0.995	0.994	0.994	0.995	0.996		1.000	0.985	0.998	0.998	0.997	1.000
	60	RMSE%	13.908	13.909	24.862	20.957	10.471	10.253		16.038	29.373	34.994	28.660	6.145	9.292
		MBE%	-7.979	-7.980	-17.228	-14.147	-2.006	-3.729		-7.869	-10.816	-17.440	-14.259	-1.866	-4.341
		k	0.992	0.992	0.990	0.990	0.992	0.993		0.999	0.977	0.996	0.997	0.999	0.999
June	30	RMSE%	6.355	6.346	10.054	13.789	6.458	6.103	December	5.473	5.465	16.104	23.892	2.231	1.875
		MBE%	-0.793	-0.038	-5.184	-8.335	1.180	2.425		-2.503	-2.502	-7.666	-11.344	-0.537	1.141
		k	0.995	0.994	0.993	0.992	0.995	0.996		1.000	1.000	0.999	0.998	1.000	1.000
	45	RMSE%	10.342	23.744	18.338	18.350	9.178	8.561		11.927	11.924	30.559	30.584	4.681	3.161
		MBE%	-2.516	-5.646	-10.570	-10.543	1.288	1.023		-5.577	-5.575	-14.560	-14.566	-1.077	-0.554
		k	0.988	0.934	0.984	0.984	0.989	0.991		0.999	0.999	0.997	0.997	1.000	1.000
	60	RMSE%	14.073	15.306	25.393	21.287	10.902	10.426		14.828	14.828	30.884	25.615	4.895	3.993
		MBE%	-5.758	-0.312	-15.847	-12.489	0.729	-2.276		-6.994	-6.994	-14.691	-12.190	-1.771	-1.260
		k	0.982	0.971	0.975	0.978	0.985	0.987		0.998	0.998	0.993	0.995	0.999	0.999

Hourly insolation for representative days for six month period using the typical meteorological year data and the modified model with proposed R_d factor is presented in Table S2. Calculated values for south direction for elevation angle 30° , 45° , 60° were described as 30S, 45S, 60S.

Table S2. Hourly insolation for six month period for elevation angle 30°, 45°, 60° and south orientation.

	January			February			March			April			May			June		
	30	45	60	30	45	60	30	45	60	30	45	60	30	45	60	30	45	60
Hour	Hourly insolation for representative days (Wh/m ²)																	
5.00	0	0	0	0	0	0	0	0	0	68.6	68.6	68.6	130.7	125.5	119.7	154.4	149.7	144.7
6.00	0	0	0	0	0	0	22.1	22.1	22.1	184.1	182.2	175.9	199.9	197.2	193.1	191.6	190	187.9
7.00	0	0	0	34.9	34.9	34.9	49.2	49.3	49.3	295.0	296.5	290.4	282.2	279.7	274.8	319.6	314.7	306.9
8.00	79.1	79.1	79.1	93	93	93	75	75.1	75.1	413.4	418.7	411.4	420.7	416.9	405.5	398.2	393.3	383.9
9.00	146.5	146.5	146.5	223.5	237.7	245.5	97.2	97.4	97.4	469.7	476.6	470.1	504	501.2	487.4	543.1	534.3	513.6
10.00	172.1	172.1	172.1	277.4	294.2	303	355	362.9	363.9	490.3	497.3	491.7	565.3	563.1	547	517.3	512.3	498.9
11.00	291.9	329.3	352.6	370.8	401	416.4	452.8	468.3	470.2	510.8	518.6	512.7	585.5	583.4	566.1	533.2	528	513.7
12.00	130.3	130.3	130.3	322.2	345.4	357.3	518.7	542.2	545.2	399.4	402.9	400.1	554.6	552	535.5	398.3	396.5	391.8
13.00	112.8	112.8	112.8	185.9	192.7	196.3	456	476.5	479.3	342.2	344.6	342.2	485.7	481.9	467.3	451.3	445.9	434.1
14.00	53.5	53.5	53.5	100	100	100	392.5	412.3	415.5	269.0	270.1	268.2	398.4	393.2	380.4	472	457.8	432.5
15.00	0	0	0	19.8	19.8	19.8	319.4	340.4	344.9	188.9	189.1	187.6	301.1	294.3	282.8	392.2	371.1	340.5
16.00	0	0	0	0	0	0	83.7	83.7	83.7	104.7	104.7	104.7	212.7	200.8	185.9	277.9	249.3	215.2
17.00	0	0	0	0	0	0	0	0	0	23.3	23.3	23.3	123.3	123.3	123.3	146.1	116.3	116.1
18.00	0	0	0	0	0	0	0	0	0	0	0	0	22.1	22.1	22.1	91.9	91.9	91.9