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Retrieval of cloud fraction using machine learning algorithms based on FY-4A AGRI observations

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1. Influence on the model when the proportion of various cloud fraction in the training sample is different.

Table S1: Influence of samples with different proportions on model accuracy.

		5:1:1:1:1:1:5				1:1:1			
Sky Classification		Day RF	Night RF	Day MLP	Night MLP	Day RF	Night RF	Day MLP	Night MLP
POD	Clear Sky	0.964	0.919	0.959	0.905	0.935	0.895	0.931	0.890
	Partly cloudy	0.914	0.845	0.895	0.808	0.784	0.730	0.752	0.695
	Overcast	0.959	0.919	0.957	0.920	0.926	0.910	0.924	0.904
FAR	Clear Sky	0.047	0.102	0.064	0.131	0.128	0.162	0.157	0.193
	Partly cloudy	0.078	0.153	0.085	0.172	0.152	0.215	0.159	0.225
	Overcast	0.038	0.061	0.039	0.063	0.077	0.089	0.078	0.098

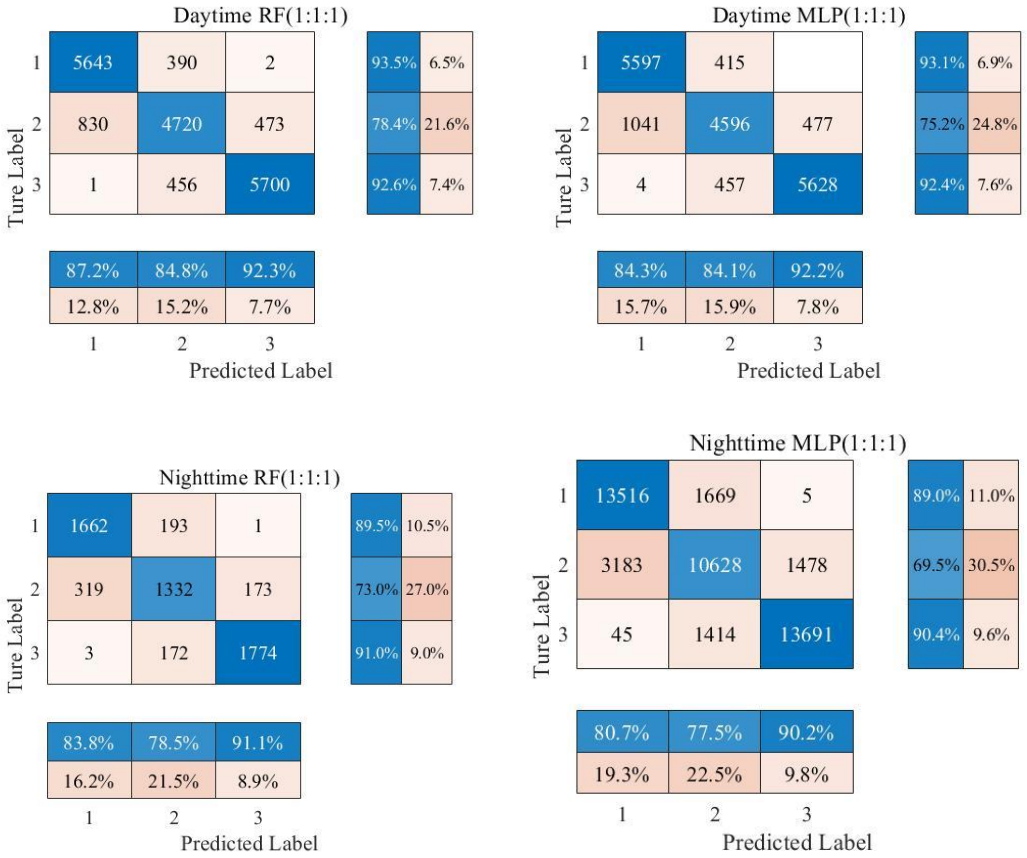

Fig. S1: In the training sample set, clear sky: partly cloudy: overcast = 1:1:1. That is, the accuracy of each model when the proportion of cloud fraction in partily cloudy is unknown.

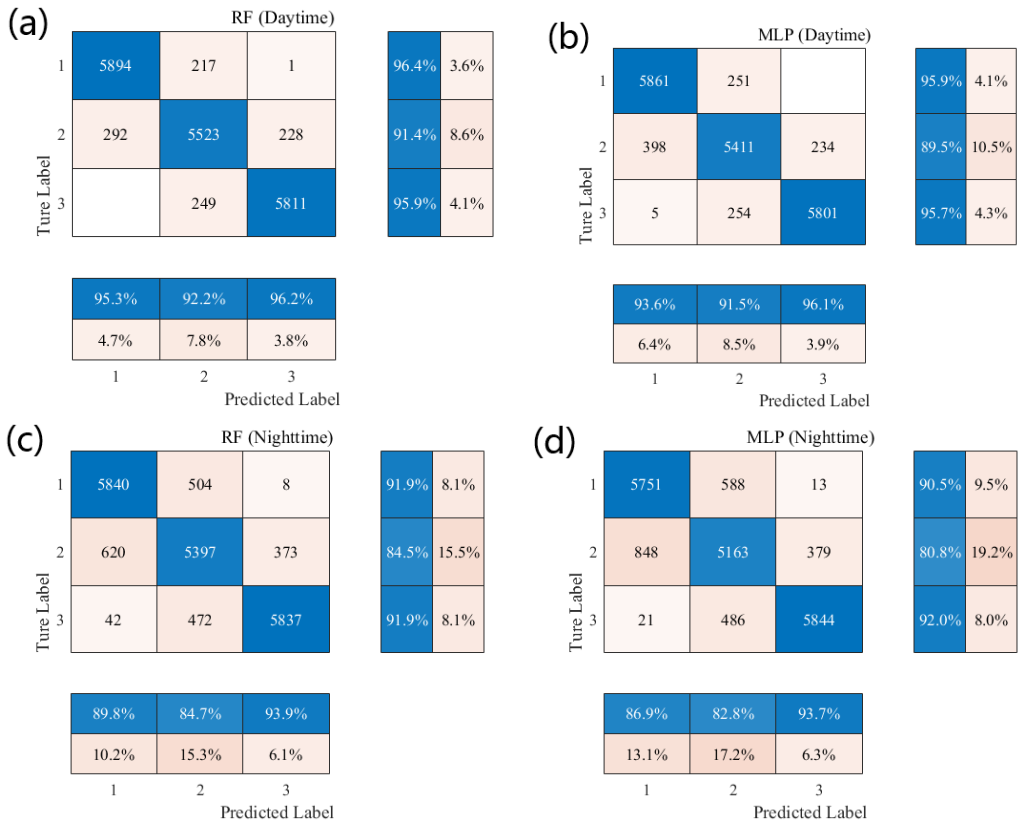

Fig. S2: The accuracy of each model when 0:0.16:0.33:0.5:0.67:0.83:1 = 5:1:1:1:1:1:5 in the training sample.

2. The results obtained by using different numbers of hidden layers.

Table S2. The influence of different numbers of hidden layers on the accuracy of the models.

number of hidden layers	2	3	4	5	6	7	8	9
Day CL accuracy	0.9067	0.9122	0.9337	**0.9369**	0.9360	0.9355	0.9355	0.9364
Night CL accuracy	0.8605	0.8691	0.8838	**0.8878**	0.8843	0.8795	0.8845	0.8849

Table S3. The influence of different numbers of hidden layers on the precision of the models.

number of hidden layers		2	3	4	5	6	7	8	9
Day RE	ME	-0.0047	0.0037	**-0.0009**	-0.0101	-0.0024	0.0044	0.0042	-0.0009
	MAE	0.1397	0.1240	**0.1053**	0.1048	0.1065	0.1036	0.1032	0.1301
	RMSE	0.1677	0.1513	**0.1332**	0.1334	0.1314	0.1312	0.1319	0.1303
Night RE	ME	-0.0006	--0.0059	0.0009	0.0070	**-0.0032**	-0.0006	-0.0062	-0.0043
	MAE	0.1613	0.1510	0.1413	0.1371	**0.1322**	0.1325	0.1310	0.1321
	RMSE	0.2133	0.1810	0.1716	0.1630	**0.1623**	0.1633	0.1665	0.1625

According to the results in the above table, the following conclusions can be drawn: (1) MLP classification model for daytime: number of hidden layers = 5. (2) MLP classification model for nighttime: number of hidden layers = 5. (3) MLP regression model for daytime: number of hidden layers = 4. (4) MLP regression model for nighttime: number of hidden layers = 6.