

Supplementary Materials

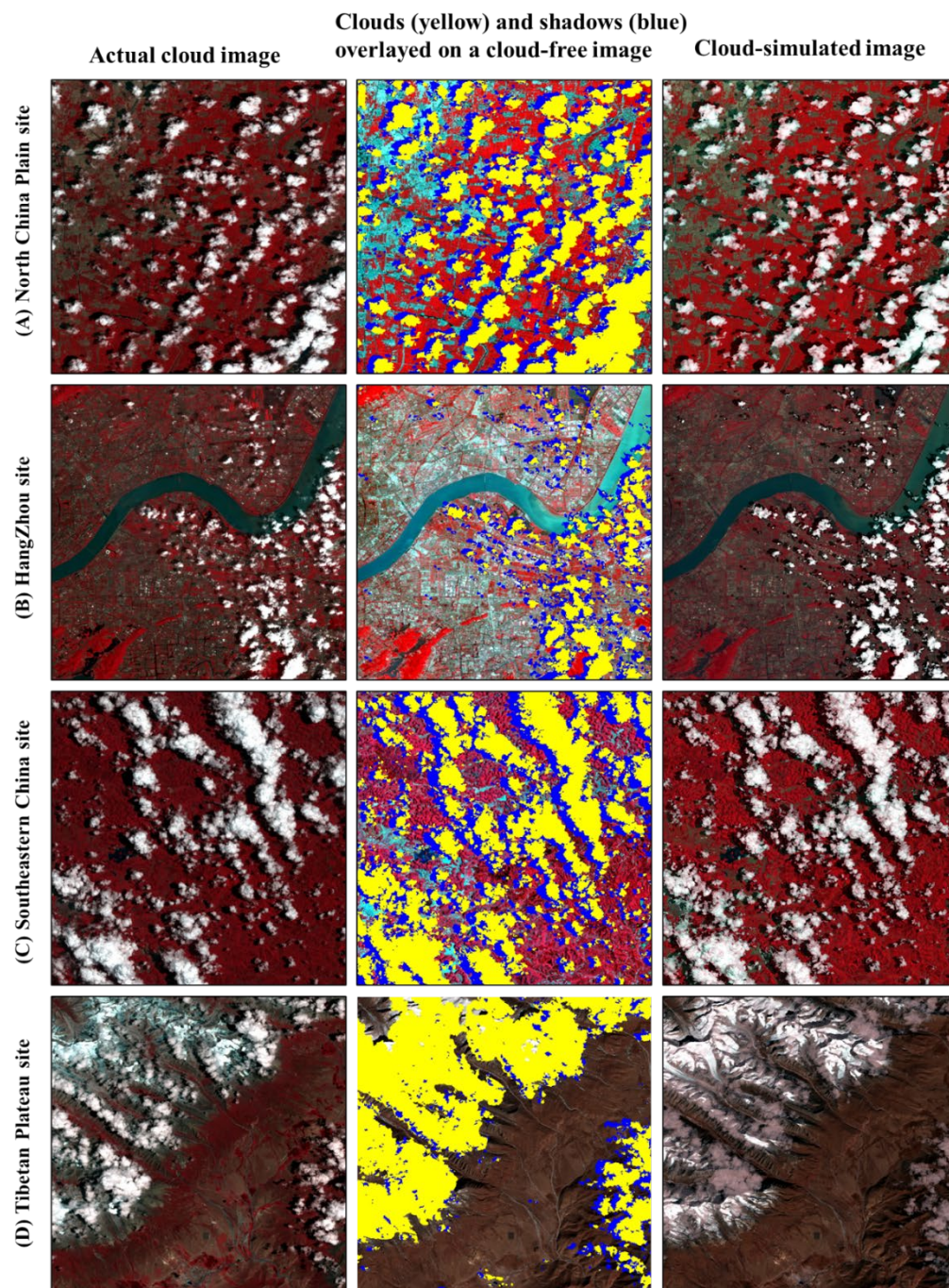


Figure S1. The generation of the cloud-simulated images at the four local sites of China. In each row from left to right panels are the actual cloud image, the reference mask of the actual cloud image that was overlapped on a cloud-free image, and the reflectance values of clouds and cloud shadows in (B) that were simulated by MODTRAN (For details, please refer to section 3.1.2).

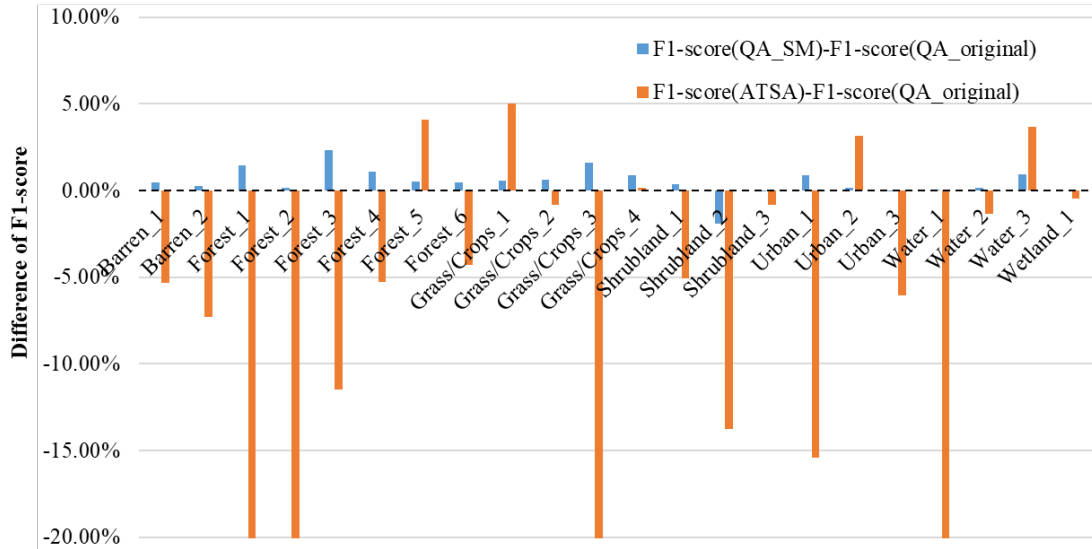


Figure S2. The difference of F1-score between QA_SM and QA_original (blue color) and between ATSA and QA_original (orange color) at each L8_Biome scene. A negative (positive) value suggests worse (better) performance of the method than QA_original.

Table S1. The RMSE and SSIM values for cloud removal at each band in **experiment II** by using different QA bands.

L8_Biome site	QA band	Commission (%)	Omission (%)	F1-Score
Barren_1 CC=64.06%	QA_original	0.76%	10.19%	94.29%
	QA_SM	0.74%	9.35%	94.76%
	ATSA	14.50%	4.77%	90.10%
Barren_2 CC=7.33%	QA_original	16.24%	16.59%	83.60%
	QA_SM	20.43%	9.98%	84.47%
	ATSA	25.03%	21.16%	76.86%
Forest_1 CC=7.09%	QA_original	24.86%	37.05%	68.51%
	QA_SM	24.39%	32.77%	71.18%
	QA_ATSA	31.34%	66.98%	44.59%
Forest_2 CC=5.44%	QA_original	32.65%	47.23%	59.18%
	QA_SM	32.62%	47.47%	59.03%
	QA_ATSA	94.42%	18.08%	6.86%
Forest_3 CC=12.04%	QA_original	31.08%	15.99%	75.72%
	QA_SM	28.41%	10.97%	79.36%
	QA_ATSA	25.71%	41.71%	65.33%
Forest_4 CC=49.59%	QA_original	15.87%	5.02%	89.23%
	QA_SM	14.77%	4.06%	90.27%
	QA_ATSA	7.62%	24.04%	83.37%
Forest_5 CC=53.70%	QA_original	31.09%	0.40%	81.46%
	QA_SM	30.52%	0.09%	81.96%
	QA_ATSA	21.89 %	5.48 %	85.53%
Forest_6 CC=5.05%	QA_original	26.93%	9.30%	80.94%
	QA_SM	26.19%	8.42%	81.74%
	QA_ATSA	7.86%	39.97 %	72.69%
Grass/Crops_1 CC=17.15%	QA_original	56.68%	11.86%	58.09%
	QA_SM	55.58%	8.80%	59.74%
	QA_ATSA	68.92%	6.99%	46.59%
Grass/Crops_2 CC=58.97%	QA_original	2.96%	13.93%	91.23%
	QA_SM	2.80%	12.64%	92.02%
	QA_ATSA	2.94%	14.23%	91.07%
Grass/Crops_3 CC=32.41%	QA_original	11.04%	13.43%	87.75%
	QA_SM	11.12%	10.66%	89.11%
	QA_ATSA	49.07%	9.57%	65.16%
Grass/Crops_4 CC=33.01%	QA_original	39.03%	4.95%	74.29%
	QA_SM	38.31%	3.03%	75.41%
	QA_ATSA	35.29%	16.05%	73.09%

Shrubland_1 CC=6.7%	QA_original	54.23%	4.11%	61.96%
	QA_SM	53.55%	3.23%	62.77%
	QA_ATSA	59.66%	28.42%	51.60%
Shrubland_2 CC=2.65%	QA_original	9.87%	21.97%	83.64%
	QA_SM	19.54%	11.50%	84.29%
	QA_ATSA	10.90%	40.36%	71.45%
Shrubland_3 CC=76.28%	QA_original	16.84%	0.61%	90.56%
	QA_SM	16.87%	0.54%	90.56%
	QA_ATSA	16.90%	2.89%	89.56%
Urban_1 CC=3.70%	QA_original	46.09%	21.11%	64.05%
	QA_SM	45.18%	18.50%	65.55%
	QA_ATSA	33.41%	63.37%	47.26%
Urban_2 CC=3.06%	QA_original	44.15%	6.46%	69.94%
	QA_SM	44.00%	6.21%	70.13%
	QA_ATSA	29.04%	39.29%	65.43%
Urban_3 CC=20.29%	QA_original	64.49%	1.69%	52.17%
	QA_SM	64.51%	1.40%	52.19%
	QA_ATSA	62.23%	7.31%	53.67%
Water_1 CC=45.23%	QA_original	25.95%	20.17%	76.83%
	QA_SM	25.74%	19.82%	77.10%
	QA_ATSA	70.79 %	51.16 %	36.55%
Water_2 CC=6.57%	QA_original	48.38%	3.81%	67.18%
	QA_SM	47.28%	4.32%	67.98%
	QA_ATSA	49.76%	19.66%	61.82%
Water_3 CC=8.23%	QA_original	46.16%	5.70%	68.54%
	QA_SM	45.08%	3.78%	69.93%
	QA_ATSA	30.55%	28.26%	70.58%
Wetland_1 CC=64.93%	QA_original	18.62%	0.64%	89.48%
	QA_SM	18.64%	0.35%	89.58%
	QA_ATSA	2.78%	19.00%	88.37%