

INSAT-3D Sounder Cloud Mask Validation Report

Validation Criteria :

1. Spatial Collocation : 10km (nominal resolution of INSAT-3D Sounder)
2. Temporal Collocation : 5 minutes

INSAT-3D sounder operational cloud mask product is available at 10km resolution at nadir. MODIS cloud mask product is available at 1 km resolution at nadir. Hence there will be approximately 100 pixels of Modis inside one Sounder Pixels provided both are looking at nadir. In general, there is around 40-60 pixels of MODIS per sounder pixel.

Furthermore operational MODIS cloud mask has 4 flags : Confident clear, probably clear, probably cloudy and cloudy, while operational sounder cloud mask has only 3 flags : Clear, Cloudy and Uncertain. For validation we follow these steps :

1. Spatial and Temporal Collocation
2. Resampling of MODIS cloud Mask on sounder observation area
3. Conversion of 4 cloud flags of MODIS into 3 cloud flags of sounder

The following methodology is adopted for conversion of MODIS cloud flag to sounder cloud flag

(i) A probability value is assigned to each of the modis cloud flag. Here we have assigned the values of 0.125,0.25,0.5,1 for confident clear, probably clear, probably cloudy and cloudy respectively.

(ii) For each collocated sounder pixel , a single probability value for MODIS is obtained using the following 3 methods of averaging :

- a) Taking mode of modis pixel probability value
- b) Taking weighted average of probability values
- c) Taking weighted products of the odds and subtracting the final results from 1

(iii)Based on probability value (p) obtained from above mentioned methods, the cloud mask flag for modis is decided for each method as follows :

$p < 0.35$: Cloudy

$p = 0.35-0.75$: Uncertain

$p > 0.75$: Clear

Based on this flag , confusion matrix and skill scores were computed for each of the 3 methods.

The validation statistics are presented in following order :

1. All Surface
2. Land
3. Ocean
4. Coast
5. Highland (surface height > 2000 m)

For each of the 5 surface types , results are further categorised according to time of the day

1. All times
2. Daytime (0-12 UTC i.e. 05:30-17:30 IST)
3. Nighttime (12-24 UTC i.e. 17:30-05:30 IST)

For each of these cases following statistics are shown :

1. 3X3 Confusion matrices for clear, cloudy and uncertain conditions
2. Following skill scores based on confusion matrices :-
 - i). False Alarm Ratio (FAR)
 - ii). Frequency Bias (FB)
 - iii). Probability of Detection (POD)
 - iv). False Alarm Rate (F)
 - v). Proportion Correct (PCr)
 - vi). Kuiper Skill Score (KSS)
 - vii). Heidke Skill Score (HSS)

Following plots are also shown :

1. Time series of Total number of collocations obtained for each of the 5 categories
2. Time series of percentage correct pixels ($100 * PCr$)
3. Sample spatial plot of operational cloud products and collocations on Land and Ocean

INSAT-3D Sounder vs MODIS for January , 2017 (All times (day and night)) on all surface types

1. Confusion matrix of Total number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	77268	33622	24990
Sounder Uncertain	10029	2538	14710
Sounder Cloudy	5439	697	20039

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	71814	42279	21787
Sounder Uncertain	7850	6678	12749
Sounder Cloudy	4460	2621	19094

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	65273	46691	23916
Sounder Uncertain	6724	7023	13530
Sounder Cloudy	3989	2794	19392

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	40.81	17.76	13.20
Sounder Uncertain	5.30	1.34	7.77
Sounder Cloudy	2.87	0.37	10.58

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	37.93	22.33	11.51
Sounder Uncertain	4.15	3.53	6.73
Sounder Cloudy	2.36	1.38	10.08

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	34.48	24.66	12.63
Sounder Uncertain	3.55	3.71	7.15
Sounder Cloudy	2.11	1.48	10.24

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.43	0.91	0.23
Frequency Bias	1.47	0.74	0.44
Probability of Detection	0.83	0.07	0.34
False Alarm Rate	0.65	0.28	0.07

Overall Skill Score

Skill Score	Value
Proportion Correct	0.527
Kuiper Skill Score	0.167
Heidke Skill Score	0.181

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.47	0.76	0.27
Frequency Bias	1.62	0.53	0.49
Probability of Detection	0.85	0.13	0.36
False Alarm Rate	0.70	0.22	0.08

Overall Skill Score

Skill Score	Value
Proportion Correct	0.515
Kuiper Skill Score	0.182
Heidke Skill Score	0.196

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.52	0.74	0.26
Frequency Bias	1.79	0.48	0.46
Probability of Detection	0.86	0.12	0.34
False Alarm Rate	0.72	0.21	0.07

Overall Skill Score

Skill Score	Value
Proportion Correct	0.484
Kuiper Skill Score	0.169
Heidke Skill Score	0.178

INSAT-3D Sounder vs MODIS for January , 2017 (Day) on all surface types

1. Confusion matrix of Total number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	40015	16136	9709
Sounder Uncertain	5558	1233	5131
Sounder Cloudy	1930	267	11729

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	38247	18797	8816
Sounder Uncertain	4580	2896	4446
Sounder Cloudy	1409	1266	11251

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	33473	22729	9658
Sounder Uncertain	3887	3295	4740
Sounder Cloudy	1214	1310	11402

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	43.63	17.59	10.59
Sounder Uncertain	6.06	1.34	5.59
Sounder Cloudy	2.10	0.29	12.79

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	41.71	20.50	9.61
Sounder Uncertain	4.99	3.16	4.85
Sounder Cloudy	1.54	1.38	12.27

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	36.50	24.78	10.53
Sounder Uncertain	4.24	3.59	5.17
Sounder Cloudy	1.32	1.43	12.43

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.39	0.90	0.16
Frequency Bias	1.39	0.68	0.52
Probability of Detection	0.84	0.07	0.44
False Alarm Rate	0.67	0.28	0.06

Overall Skill Score

Skill Score	Value
Proportion Correct	0.578
Kuiper Skill Score	0.224
Heidke Skill Score	0.245

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.42	0.76	0.19
Frequency Bias	1.49	0.52	0.57
Probability of Detection	0.86	0.13	0.46
False Alarm Rate	0.70	0.23	0.07

Overall Skill Score

Skill Score	Value
Proportion Correct	0.571
Kuiper Skill Score	0.240
Heidke Skill Score	0.261

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.49	0.72	0.18
Frequency Bias	1.71	0.44	0.54
Probability of Detection	0.87	0.12	0.44
False Alarm Rate	0.74	0.20	0.06

Overall Skill Score

Skill Score	Value
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Proportion Correct	0.525
Kuiper Skill Score	0.216
Heidke Skill Score	0.230

INSAT-3D Sounder vs MODIS for January , 2017 (Night) on all surface types

1. Confusion matrix of Total number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	37253	17486	15281
Sounder Uncertain	4471	1305	9579
Sounder Cloudy	3509	430	8310

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	33567	23482	12971
Sounder Uncertain	3270	3782	8303
Sounder Cloudy	3051	1355	7843

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	31800	23962	14258
Sounder Uncertain	2837	3728	8790
Sounder Cloudy	2775	1484	7990

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	38.16	17.91	15.65
Sounder Uncertain	4.58	1.34	9.81
Sounder Cloudy	3.59	0.44	8.51

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	34.38	24.05	13.29
Sounder Uncertain	3.35	3.87	8.51
Sounder Cloudy	3.13	1.39	8.03

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	32.57	24.55	14.61
Sounder Uncertain	2.91	3.82	9.00
Sounder Cloudy	2.84	1.52	8.18

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.47	0.92	0.32
Frequency Bias	1.55	0.80	0.37
Probability of Detection	0.82	0.07	0.25
False Alarm Rate	0.65	0.28	0.08

Overall Skill Score

Skill Score	Value
Proportion Correct	0.480
Kuiper Skill Score	0.118
Heidke Skill Score	0.125

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
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False Alarm Ratio	0.52	0.75	0.36
Frequency Bias	1.76	0.54	0.42
Probability of Detection	0.84	0.13	0.27
False Alarm Rate	0.70	0.22	0.08

Overall Skill Score

Skill Score	Value
Proportion Correct	0.463
Kuiper Skill Score	0.131
Heidke Skill Score	0.138

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.55	0.76	0.35
Frequency Bias	1.87	0.53	0.39
Probability of Detection	0.85	0.13	0.26
False Alarm Rate	0.71	0.21	0.08

Overall Skill Score

Skill Score	Value
Proportion Correct	0.446
Kuiper Skill Score	0.127
Heidke Skill Score	0.132

INSAT-3D Sounder vs MODIS for January , 2017 (All times (day and night)) on Land

1. Confusion matrix of Total number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
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Sounder Clear	56728	7222	10097
Sounder Uncertain	5414	996	6751
Sounder Cloudy	1981	191	12091

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	53960	12075	8012
Sounder Uncertain	4502	2749	5910
Sounder Cloudy	1790	566	11907

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	48981	16342	8724
Sounder Uncertain	3876	3068	6217
Sounder Cloudy	1667	638	11958

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	55.91	7.12	9.95
Sounder Uncertain	5.34	0.98	6.65
Sounder Cloudy	1.95	0.19	11.92

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	53.18	11.90	7.90
Sounder Uncertain	4.44	2.71	5.82
Sounder Cloudy	1.76	0.56	11.73

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	48.27	16.11	8.60

Sounder Uncertain	3.82	3.02	6.13
Sounder Cloudy	1.64	0.63	11.78

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.23	0.92	0.15
Frequency Bias	1.15	1.57	0.49
Probability of Detection	0.88	0.12	0.42
False Alarm Rate	0.55	0.38	0.07

Overall Skill Score

Skill Score	Value
Proportion Correct	0.688
Kuiper Skill Score	0.344
Heidke Skill Score	0.361

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.27	0.79	0.17
Frequency Bias	1.23	0.86	0.55
Probability of Detection	0.90	0.18	0.46
False Alarm Rate	0.61	0.32	0.07

Overall Skill Score

Skill Score	Value
Proportion Correct	0.676
Kuiper Skill Score	0.335
Heidke Skill Score	0.367

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.34	0.77	0.16

Frequency Bias	1.36	0.66	0.53
Probability of Detection	0.90	0.15	0.44
False Alarm Rate	0.67	0.27	0.06

Overall Skill Score

Skill Score	Value
Proportion Correct	0.631
Kuiper Skill Score	0.292
Heidke Skill Score	0.323

INSAT-3D Sounder vs MODIS for January , 2017 (Day) on Land

1. Confusion matrix of Total number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	25470	6628	3598
Sounder Uncertain	3018	804	1896
Sounder Cloudy	207	140	6673

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	24489	8386	2821
Sounder Uncertain	2605	1567	1546
Sounder Cloudy	112	353	6555

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	20594	11899	3203

Sounder Uncertain	2160	1864	1694
Sounder Cloudy	85	341	6594

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	52.59	13.68	7.43
Sounder Uncertain	6.23	1.66	3.91
Sounder Cloudy	0.43	0.29	13.78

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	50.56	17.31	5.82
Sounder Uncertain	5.38	3.24	3.19
Sounder Cloudy	0.23	0.73	13.53

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	42.52	24.57	6.61
Sounder Uncertain	4.46	3.85	3.50
Sounder Cloudy	0.18	0.70	13.61

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.29	0.86	0.05
Frequency Bias	1.24	0.76	0.58
Probability of Detection	0.89	0.11	0.55
False Alarm Rate	0.66	0.32	0.02

Overall Skill Score

Skill Score	Value
Proportion Correct	0.680
Kuiper Skill Score	0.336
Heidke Skill Score	0.371

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.31	0.73	0.07
Frequency Bias	1.31	0.55	0.64
Probability of Detection	0.90	0.15	0.60
False Alarm Rate	0.71	0.26	0.03

Overall Skill Score

Skill Score	Value
Proportion Correct	0.673
Kuiper Skill Score	0.343
Heidke Skill Score	0.382

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.42	0.67	0.06
Frequency Bias	1.56	0.41	0.61
Probability of Detection	0.90	0.13	0.57
False Alarm Rate	0.78	0.20	0.02

Overall Skill Score

Skill Score	Value
Proportion Correct	0.600
Kuiper Skill Score	0.288
Heidke Skill Score	0.314

INSAT-3D Sounder vs MODIS for January , 2017 (Night) on Land

1. Confusion matrix of Total number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	31258	594	6499
Sounder Uncertain	2396	192	4855
Sounder Cloudy	1774	51	5418

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	29471	3689	5191
Sounder Uncertain	1897	1182	4364
Sounder Cloudy	1678	213	5352

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	28387	4443	5521
Sounder Uncertain	1716	1204	4523
Sounder Cloudy	1582	297	5364

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	58.94	1.12	12.25
Sounder Uncertain	4.52	0.36	9.15
Sounder Cloudy	3.34	0.10	10.22

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	55.57	6.96	9.79
Sounder Uncertain	3.58	2.23	8.23
Sounder Cloudy	3.16	0.40	10.09

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	53.52	8.38	10.41
Sounder Uncertain	3.24	2.27	8.53
Sounder Cloudy	2.98	0.56	10.11

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.18	0.97	0.25
Frequency Bias	1.08	8.89	0.43
Probability of Detection	0.88	0.23	0.32
False Alarm Rate	0.44	0.45	0.11

Overall Skill Score

Skill Score	Value
Proportion Correct	0.695
Kuiper Skill Score	0.368
Heidke Skill Score	0.354

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.23	0.84	0.26
Frequency Bias	1.16	1.46	0.49
Probability of Detection	0.89	0.23	0.36
False Alarm Rate	0.52	0.37	0.11

Overall Skill Score

Skill Score	Value
Proportion Correct	0.679
Kuiper Skill Score	0.337
Heidke Skill Score	0.355

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.26	0.84	0.26
Frequency Bias	1.21	1.25	0.47
Probability of Detection	0.90	0.20	0.35
False Alarm Rate	0.55	0.35	0.10

Overall Skill Score

Skill Score	Value
Proportion Correct	0.659
Kuiper Skill Score	0.314
Heidke Skill Score	0.335

INSAT-3D Sounder vs MODIS for January , 2017 (All times (day and night)) on Ocean

1. Confusion matrix of Total number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	14746	24232	10687
Sounder Uncertain	1113	725	3342
Sounder Cloudy	81	14	1872

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	12991	26212	10462
Sounder Uncertain	787	1310	3083
Sounder Cloudy	59	67	1841

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	12098	26124	11443
Sounder Uncertain	683	1278	3219
Sounder Cloudy	55	60	1852

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	25.96	42.65	18.81
Sounder Uncertain	1.96	1.28	5.88
Sounder Cloudy	0.14	0.02	3.30

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	22.87	46.14	18.42
Sounder Uncertain	1.39	2.31	5.43
Sounder Cloudy	0.10	0.12	3.24

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	21.29	45.98	20.14
Sounder Uncertain	1.20	2.25	5.67
Sounder Cloudy	0.10	0.11	3.26

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.70	0.86	0.05
Frequency Bias	3.12	0.21	0.12
Probability of Detection	0.93	0.03	0.12
False Alarm Rate	0.88	0.11	0.00

Overall Skill Score

Skill Score	Value
Proportion Correct	0.305
Kuiper Skill Score	0.016
Heidke Skill Score	0.015

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.74	0.75	0.06
Frequency Bias	3.59	0.19	0.13
Probability of Detection	0.94	0.05	0.12
False Alarm Rate	0.90	0.10	0.00

Overall Skill Score

Skill Score	Value
Proportion Correct	0.284
Kuiper Skill Score	0.028
Heidke Skill Score	0.024

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.76	0.75	0.06
Frequency Bias	3.87	0.19	0.12
Probability of Detection	0.94	0.05	0.11
False Alarm Rate	0.90	0.09	0.00

Overall Skill Score

Skill Score	Value
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Proportion Correct	0.268
Kuiper Skill Score	0.026
Heidke Skill Score	0.022

INSAT-3D Sounder vs MODIS for January , 2017 (Day) on Ocean

1. Confusion matrix of Total number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	11869	9207	5483
Sounder Uncertain	743	301	1731
Sounder Cloudy	49	5	1041

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	11320	9746	5493
Sounder Uncertain	599	529	1647
Sounder Cloudy	45	16	1034

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	10695	9962	5902
Sounder Uncertain	542	523	1710
Sounder Cloudy	44	14	1037

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	39.01	30.26	18.02
Sounder Uncertain	2.44	0.99	5.69
Sounder Cloudy	0.16	0.02	3.42

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	37.20	32.03	18.05
Sounder Uncertain	1.97	1.74	5.41
Sounder Cloudy	0.15	0.05	3.40

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	35.15	32.74	19.40
Sounder Uncertain	1.78	1.72	5.62
Sounder Cloudy	0.14	0.05	3.41

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.55	0.89	0.05
Frequency Bias	2.10	0.29	0.13
Probability of Detection	0.94	0.03	0.13
False Alarm Rate	0.85	0.14	0.00

Overall Skill Score

Skill Score	Value
Proportion Correct	0.434
Kuiper Skill Score	0.050
Heidke Skill Score	0.055

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
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False Alarm Ratio	0.57	0.81	0.06
Frequency Bias	2.22	0.27	0.13
Probability of Detection	0.95	0.05	0.13
False Alarm Rate	0.87	0.13	0.00

Overall Skill Score

Skill Score	Value
Proportion Correct	0.423
Kuiper Skill Score	0.060
Heidke Skill Score	0.064

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.60	0.81	0.05
Frequency Bias	2.35	0.26	0.13
Probability of Detection	0.95	0.05	0.12
False Alarm Rate	0.87	0.12	0.00

Overall Skill Score

Skill Score	Value
Proportion Correct	0.403
Kuiper Skill Score	0.057
Heidke Skill Score	0.059

INSAT-3D Sounder vs MODIS for January , 2017 (Night) on Ocean

1. Confusion matrix of Total number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
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Sounder Clear	2877	15025	5204
Sounder Uncertain	370	424	1611
Sounder Cloudy	32	9	831

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	1671	16466	4969
Sounder Uncertain	188	781	1436
Sounder Cloudy	14	51	807

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	1403	16162	5541
Sounder Uncertain	141	755	1509
Sounder Cloudy	11	46	815

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	10.90	56.95	19.72
Sounder Uncertain	1.40	1.61	6.11
Sounder Cloudy	0.12	0.03	3.15

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	6.33	62.41	18.83
Sounder Uncertain	0.71	2.96	5.44
Sounder Cloudy	0.05	0.19	3.06

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	5.32	61.26	21.00

Sounder Uncertain	0.53	2.86	5.72
Sounder Cloudy	0.04	0.17	3.09

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.88	0.82	0.05
Frequency Bias	7.05	0.16	0.11
Probability of Detection	0.88	0.03	0.11
False Alarm Rate	0.91	0.09	0.00

Overall Skill Score

Skill Score	Value
Proportion Correct	0.157
Kuiper Skill Score	-0.027
Heidke Skill Score	-0.018

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.93	0.68	0.07
Frequency Bias	12.34	0.14	0.12
Probability of Detection	0.89	0.05	0.11
False Alarm Rate	0.93	0.07	0.00

Overall Skill Score

Skill Score	Value
Proportion Correct	0.124
Kuiper Skill Score	-0.015
Heidke Skill Score	-0.009

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.94	0.69	0.07

Frequency Bias	14.86	0.14	0.11
Probability of Detection	0.90	0.04	0.10
False Alarm Rate	0.93	0.07	0.00

Overall Skill Score

Skill Score	Value
Proportion Correct	0.113
Kuiper Skill Score	-0.015
Heidke Skill Score	-0.008

INSAT-3D Sounder vs MODIS for January , 2017 (All times (day and night)) on Coast

1. Confusion matrix of Total number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	480	94	113
Sounder Uncertain	142	29	73
Sounder Cloudy	7	5	103

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	415	197	75
Sounder Uncertain	125	62	57
Sounder Cloudy	6	9	100

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	367	239	81

Sounder Uncertain	113	71	60
Sounder Cloudy	5	8	102

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	45.89	8.99	10.80
Sounder Uncertain	13.58	2.77	6.98
Sounder Cloudy	0.67	0.48	9.85

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	39.67	18.83	7.17
Sounder Uncertain	11.95	5.93	5.45
Sounder Cloudy	0.57	0.86	9.56

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	35.09	22.85	7.74
Sounder Uncertain	10.80	6.79	5.74
Sounder Cloudy	0.48	0.76	9.75

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.30	0.88	0.10
Frequency Bias	1.09	1.91	0.40
Probability of Detection	0.76	0.23	0.36
False Alarm Rate	0.48	0.50	0.03

Overall Skill Score

Skill Score	Value
Proportion Correct	0.585
Kuiper Skill Score	0.240
Heidke Skill Score	0.240

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.40	0.75	0.13
Frequency Bias	1.26	0.91	0.50
Probability of Detection	0.76	0.23	0.43
False Alarm Rate	0.58	0.39	0.03

Overall Skill Score

Skill Score	Value
Proportion Correct	0.552
Kuiper Skill Score	0.203
Heidke Skill Score	0.218

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.47	0.71	0.11
Frequency Bias	1.42	0.77	0.47
Probability of Detection	0.76	0.22	0.42
False Alarm Rate	0.63	0.34	0.03

Overall Skill Score

Skill Score	Value
Proportion Correct	0.516
Kuiper Skill Score	0.180
Heidke Skill Score	0.192

INSAT-3D Sounder vs MODIS for January , 2017 (Day) on Coast

1. Confusion matrix of Total number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	319	34	61
Sounder Uncertain	109	16	28
Sounder Cloudy	6	3	24

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	298	68	48
Sounder Uncertain	104	30	19
Sounder Cloudy	5	4	24

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	266	98	50
Sounder Uncertain	97	37	19
Sounder Cloudy	4	5	24

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	53.17	5.67	10.17
Sounder Uncertain	18.17	2.67	4.67
Sounder Cloudy	1.00	0.50	4.00

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	49.67	11.33	8.00
Sounder Uncertain	17.33	5.00	3.17
Sounder Cloudy	0.83	0.67	4.00

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	44.33	16.33	8.33
Sounder Uncertain	16.17	6.17	3.17
Sounder Cloudy	0.67	0.83	4.00

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.23	0.90	0.27
Frequency Bias	0.95	2.89	0.29
Probability of Detection	0.74	0.30	0.21
False Alarm Rate	0.39	0.57	0.04

Overall Skill Score

Skill Score	Value
Proportion Correct	0.598
Kuiper Skill Score	0.153
Heidke Skill Score	0.142

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.28	0.80	0.27
Frequency Bias	1.02	1.50	0.36
Probability of Detection	0.73	0.29	0.26
False Alarm Rate	0.47	0.50	0.04

Overall Skill Score

Skill Score	Value
Proportion Correct	0.587
Kuiper Skill Score	0.137
Heidke Skill Score	0.139

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.36	0.76	0.27
Frequency Bias	1.13	1.09	0.35
Probability of Detection	0.72	0.26	0.26
False Alarm Rate	0.54	0.42	0.03

Overall Skill Score

Skill Score	Value
Proportion Correct	0.545
Kuiper Skill Score	0.100
Heidke Skill Score	0.108

INSAT-3D Sounder vs MODIS for January , 2017 (Night) on Coast

1. Confusion matrix of Total number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	161	60	52
Sounder Uncertain	33	13	45
Sounder Cloudy	1	2	79

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	117	129	27
Sounder Uncertain	21	32	38
Sounder Cloudy	1	5	76

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	101	141	31
Sounder Uncertain	16	34	41
Sounder Cloudy	1	3	78

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	36.10	13.45	11.66
Sounder Uncertain	7.40	2.91	10.09
Sounder Cloudy	0.22	0.45	17.71

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	26.23	28.92	6.05
Sounder Uncertain	4.71	7.17	8.52
Sounder Cloudy	0.22	1.12	17.04

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	22.65	31.61	6.95
Sounder Uncertain	3.59	7.62	9.19
Sounder Cloudy	0.22	0.67	17.49

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.41	0.86	0.04
Frequency Bias	1.40	1.21	0.47
Probability of Detection	0.83	0.17	0.45
False Alarm Rate	0.58	0.40	0.02

Overall Skill Score

Skill Score	Value
Proportion Correct	0.567
Kuiper Skill Score	0.309
Heidke Skill Score	0.308

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.57	0.65	0.07
Frequency Bias	1.96	0.55	0.58
Probability of Detection	0.84	0.19	0.54
False Alarm Rate	0.71	0.27	0.03

Overall Skill Score

Skill Score	Value
Proportion Correct	0.504
Kuiper Skill Score	0.270
Heidke Skill Score	0.266

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.63	0.63	0.05
Frequency Bias	2.31	0.51	0.55
Probability of Detection	0.86	0.19	0.52
False Alarm Rate	0.74	0.24	0.02

Overall Skill Score

Skill Score	Value
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Proportion Correct	0.478
Kuiper Skill Score	0.262
Heidke Skill Score	0.248

INSAT-3D Sounder vs MODIS for January , 2017 (All times (day and night)) on Highland (>2000 m)

1. Confusion matrix of Total number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	2984	1571	3502
Sounder Uncertain	2816	695	4233
Sounder Cloudy	3305	450	5598

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	2365	2906	2786
Sounder Uncertain	1966	2349	3429
Sounder Cloudy	2550	1922	4881

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	1996	2901	3160
Sounder Uncertain	1645	2350	3749
Sounder Cloudy	2217	2029	5107

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	11.86	6.25	13.92
Sounder Uncertain	11.20	2.76	16.83
Sounder Cloudy	13.14	1.79	22.25

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	9.40	11.55	11.08
Sounder Uncertain	7.82	9.34	13.63
Sounder Cloudy	10.14	7.64	19.40

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	7.94	11.53	12.56
Sounder Uncertain	6.54	9.34	14.90
Sounder Cloudy	8.81	8.07	20.30

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.63	0.91	0.40
Frequency Bias	0.88	2.85	0.70
Probability of Detection	0.33	0.26	0.42
False Alarm Rate	0.32	0.44	0.24

Overall Skill Score

Skill Score	Value
Proportion Correct	0.369
Kuiper Skill Score	0.039
Heidke Skill Score	0.034

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
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False Alarm Ratio	0.71	0.70	0.48
Frequency Bias	1.17	1.08	0.84
Probability of Detection	0.34	0.33	0.44
False Alarm Rate	0.37	0.35	0.29

Overall Skill Score

Skill Score	Value
Proportion Correct	0.381
Kuiper Skill Score	0.065
Heidke Skill Score	0.064

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.75	0.70	0.45
Frequency Bias	1.38	1.06	0.78
Probability of Detection	0.34	0.32	0.43
False Alarm Rate	0.39	0.34	0.27

Overall Skill Score

Skill Score	Value
Proportion Correct	0.376
Kuiper Skill Score	0.054
Heidke Skill Score	0.052

INSAT-3D Sounder vs MODIS for January , 2017 (Day) on Highland (>2000 m)

1. Confusion matrix of Total number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
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Sounder Clear	865	35	254
Sounder Uncertain	1239	54	1353
Sounder Cloudy	1623	111	3906

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	732	221	201
Sounder Uncertain	867	639	1140
Sounder Cloudy	1205	877	3558

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	662	272	220
Sounder Uncertain	734	701	1211
Sounder Cloudy	1046	929	3665

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	9.16	0.37	2.69
Sounder Uncertain	13.12	0.57	14.33
Sounder Cloudy	17.19	1.18	41.38

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	7.75	2.34	2.13
Sounder Uncertain	9.18	6.77	12.08
Sounder Cloudy	12.76	9.29	37.69

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	7.01	2.88	2.33

Sounder Uncertain	7.78	7.43	12.83
Sounder Cloudy	11.08	9.84	38.82

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.25	0.98	0.31
Frequency Bias	0.31	13.23	1.02
Probability of Detection	0.23	0.27	0.71
False Alarm Rate	0.06	0.56	0.38

Overall Skill Score

Skill Score	Value
Proportion Correct	0.511
Kuiper Skill Score	0.215
Heidke Skill Score	0.181

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.37	0.76	0.37
Frequency Bias	0.41	1.52	1.15
Probability of Detection	0.26	0.37	0.73
False Alarm Rate	0.09	0.44	0.46

Overall Skill Score

Skill Score	Value
Proportion Correct	0.522
Kuiper Skill Score	0.204
Heidke Skill Score	0.206

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.43	0.74	0.35

Frequency Bias	0.47	1.39	1.11
Probability of Detection	0.27	0.37	0.72
False Alarm Rate	0.11	0.44	0.45

Overall Skill Score

Skill Score	Value
Proportion Correct	0.533
Kuiper Skill Score	0.203
Heidke Skill Score	0.207

INSAT-3D Sounder vs MODIS for January , 2017 (Night) on Highland (>2000 m)

1. Confusion matrix of Total number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	2119	1536	3248
Sounder Uncertain	1577	641	2880
Sounder Cloudy	1682	339	1692

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	1633	2685	2585
Sounder Uncertain	1099	1710	2289
Sounder Cloudy	1345	1045	1323

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	1334	2629	2940

Sounder Uncertain	911	1649	2538
Sounder Cloudy	1171	1100	1442

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	13.48	9.77	20.67
Sounder Uncertain	10.04	4.08	18.33
Sounder Cloudy	10.70	2.16	10.77

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	10.39	17.09	16.45
Sounder Uncertain	6.99	10.88	14.57
Sounder Cloudy	8.56	6.65	8.42

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	8.49	16.73	18.71
Sounder Uncertain	5.80	10.49	16.15
Sounder Cloudy	7.45	7.00	9.18

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.69	0.87	0.54
Frequency Bias	1.28	2.03	0.47
Probability of Detection	0.39	0.25	0.22
False Alarm Rate	0.42	0.40	0.18

Overall Skill Score

Skill Score	Value
Proportion Correct	0.283
Kuiper Skill Score	-0.060
Heidke Skill Score	-0.054

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.76	0.66	0.64
Frequency Bias	1.69	0.94	0.60
Probability of Detection	0.40	0.31	0.21
False Alarm Rate	0.48	0.31	0.22

Overall Skill Score

Skill Score	Value
Proportion Correct	0.297
Kuiper Skill Score	-0.034
Heidke Skill Score	-0.033

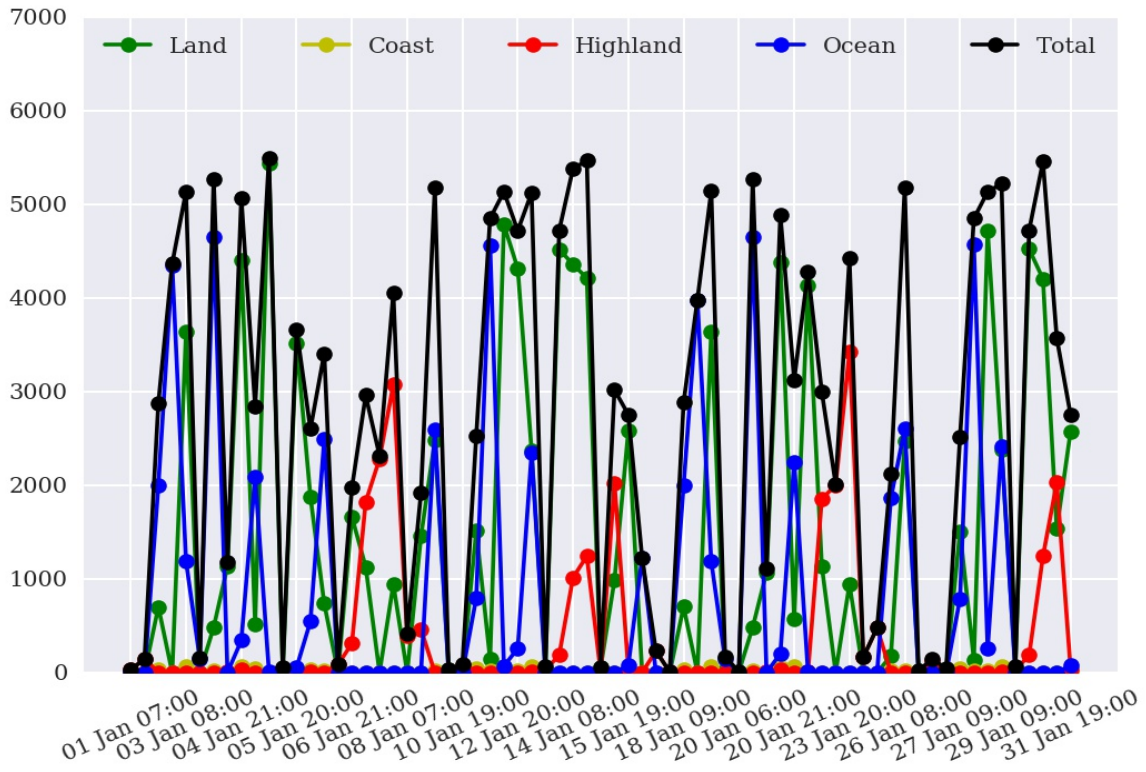
Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.81	0.68	0.61
Frequency Bias	2.02	0.95	0.54
Probability of Detection	0.39	0.31	0.21
False Alarm Rate	0.49	0.31	0.20

Overall Skill Score

Skill Score	Value
Proportion Correct	0.282
Kuiper Skill Score	-0.045
Heidke Skill Score	-0.042

Number of Collocations for Jan-2017



Percentage Correct for Jan-2017

