

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 June , 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	26930	14229	37860
Sounder Uncertain	5592	3145	23056
Sounder Cloudy	5582	2281	96593

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	21055	22660	35304
Sounder Uncertain	3808	6031	21954
Sounder Cloudy	3744	5758	94954

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	18081	23455	37483
Sounder Uncertain	3096	5984	22713
Sounder Cloudy	2881	5891	95684

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	12.51	6.61	17.59
Sounder Uncertain	2.60	1.46	10.71
Sounder Cloudy	2.59	1.06	44.87

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	9.78	10.53	16.40
Sounder Uncertain	1.77	2.80	10.20
Sounder Cloudy	1.74	2.67	44.11

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	8.40	10.90	17.41
Sounder Uncertain	1.44	2.78	10.55
Sounder Cloudy	1.34	2.74	44.45

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.66	0.90	0.08
Frequency Bias	2.07	1.62	0.66
Probability of Detection	0.71	0.16	0.61
False Alarm Rate	0.59	0.32	0.09

Overall Skill Score

Skill Score	Value
Proportion Correct	0.588
Kuiper Skill Score	0.365
Heidke Skill Score	0.273

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.73	0.81	0.09
Frequency Bias	2.76	0.92	0.69
Probability of Detection	0.74	0.18	0.62
False Alarm Rate	0.62	0.28	0.10

Overall Skill Score

Skill Score	Value
Proportion Correct	0.567
Kuiper Skill Score	0.331
Heidke Skill Score	0.259

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.77	0.81	0.08
Frequency Bias	3.28	0.90	0.67
Probability of Detection	0.75	0.17	0.61
False Alarm Rate	0.64	0.27	0.09

Overall Skill Score

Skill Score	Value
Proportion Correct	0.556
Kuiper Skill Score	0.320
Heidke Skill Score	0.239

INSAT-3D Sounder vs MODIS for June , 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	11711	8464	19750
Sounder Uncertain	2981	1382	10730
Sounder Cloudy	4797	1428	41348

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	8686	12225	19014
Sounder Uncertain	1871	3118	10104
Sounder Cloudy	3263	4268	40042

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	7216	12388	20321
Sounder Uncertain	1481	3075	10537
Sounder Cloudy	2505	4500	40568

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	11.42	8.25	19.25
Sounder Uncertain	2.91	1.35	10.46
Sounder Cloudy	4.68	1.39	40.30

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	8.47	11.92	18.53
Sounder Uncertain	1.82	3.04	9.85
Sounder Cloudy	3.18	4.16	39.03

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	7.03	12.08	19.81
Sounder Uncertain	1.44	3.00	10.27
Sounder Cloudy	2.44	4.39	39.54

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.71	0.91	0.13
Frequency Bias	2.05	1.34	0.66
Probability of Detection	0.60	0.12	0.58
False Alarm Rate	0.59	0.28	0.13

Overall Skill Score

Skill Score	Value
Proportion Correct	0.531
Kuiper Skill Score	0.251
Heidke Skill Score	0.198

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.78	0.79	0.16
Frequency Bias	2.89	0.77	0.69
Probability of Detection	0.63	0.16	0.58
False Alarm Rate	0.62	0.24	0.15

Overall Skill Score

Skill Score	Value
Proportion Correct	0.505
Kuiper Skill Score	0.229
Heidke Skill Score	0.185

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.82	0.80	0.15
Frequency Bias	3.56	0.76	0.67
Probability of Detection	0.64	0.15	0.57
False Alarm Rate	0.63	0.23	0.14

Overall Skill Score

Skill Score	Value
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Proportion Correct	0.496
Kuiper Skill Score	0.219
Heidke Skill Score	0.168

INSAT-3D Sounder vs MODIS for June , 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	15219	5765	18110
Sounder Uncertain	2611	1763	12326
Sounder Cloudy	785	853	55245

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	12369	10435	16290
Sounder Uncertain	1937	2913	11850
Sounder Cloudy	481	1490	54912

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	10865	11067	17162
Sounder Uncertain	1615	2909	12176
Sounder Cloudy	376	1391	55116

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	13.51	5.12	16.07
Sounder Uncertain	2.32	1.56	10.94
Sounder Cloudy	0.70	0.76	49.03

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	10.98	9.26	14.46
Sounder Uncertain	1.72	2.59	10.52
Sounder Cloudy	0.43	1.32	48.73

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	9.64	9.82	15.23
Sounder Uncertain	1.43	2.58	10.81
Sounder Cloudy	0.33	1.23	48.92

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.61	0.89	0.03
Frequency Bias	2.10	1.99	0.66
Probability of Detection	0.82	0.21	0.64
False Alarm Rate	0.59	0.37	0.04

Overall Skill Score

Skill Score	Value
Proportion Correct	0.641
Kuiper Skill Score	0.485
Heidke Skill Score	0.345

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
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False Alarm Ratio	0.68	0.83	0.03
Frequency Bias	2.64	1.13	0.68
Probability of Detection	0.84	0.20	0.66
False Alarm Rate	0.63	0.32	0.05

Overall Skill Score

Skill Score	Value
Proportion Correct	0.623
Kuiper Skill Score	0.440
Heidke Skill Score	0.330

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.72	0.83	0.03
Frequency Bias	3.04	1.09	0.67
Probability of Detection	0.85	0.19	0.65
False Alarm Rate	0.64	0.31	0.04

Overall Skill Score

Skill Score	Value
Proportion Correct	0.611
Kuiper Skill Score	0.426
Heidke Skill Score	0.308

INSAT-3D Sounder vs MODIS for June , 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	12675	3800	8513
Sounder Uncertain	2509	1269	5982
Sounder Cloudy	4234	1686	35094

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	11308	6143	7537
Sounder Uncertain	1832	2461	5467
Sounder Cloudy	3015	3907	34092

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	9913	7004	8071
Sounder Uncertain	1471	2548	5741
Sounder Cloudy	2278	4171	34565

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	16.73	5.02	11.24
Sounder Uncertain	3.31	1.67	7.90
Sounder Cloudy	5.59	2.23	46.32

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	14.93	8.11	9.95
Sounder Uncertain	2.42	3.25	7.22
Sounder Cloudy	3.98	5.16	45.00

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	13.08	9.24	10.65

Sounder Uncertain	1.94	3.36	7.58
Sounder Cloudy	3.01	5.51	45.62

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.49	0.87	0.14
Frequency Bias	1.29	1.44	0.83
Probability of Detection	0.65	0.19	0.71
False Alarm Rate	0.46	0.32	0.22

Overall Skill Score

Skill Score	Value
Proportion Correct	0.647
Kuiper Skill Score	0.395
Heidke Skill Score	0.358

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.55	0.75	0.17
Frequency Bias	1.55	0.78	0.87
Probability of Detection	0.70	0.20	0.72
False Alarm Rate	0.49	0.26	0.25

Overall Skill Score

Skill Score	Value
Proportion Correct	0.632
Kuiper Skill Score	0.376
Heidke Skill Score	0.356

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.60	0.74	0.16

Frequency Bias	1.83	0.71	0.85
Probability of Detection	0.73	0.19	0.71
False Alarm Rate	0.52	0.25	0.22

Overall Skill Score

Skill Score	Value
Proportion Correct	0.621
Kuiper Skill Score	0.365
Heidke Skill Score	0.336

INSAT-3D Sounder vs MODIS for June , 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	5564	1062	3989
Sounder Uncertain	1306	344	2689
Sounder Cloudy	3913	1083	20540

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	4367	3071	3177
Sounder Uncertain	767	1311	2261
Sounder Cloudy	2752	3196	19588

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	3642	3433	3540

Sounder Uncertain	571	1334	2434
Sounder Cloudy	2098	3457	19981

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	13.74	2.62	9.85
Sounder Uncertain	3.23	0.85	6.64
Sounder Cloudy	9.66	2.67	50.73

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	10.79	7.58	7.85
Sounder Uncertain	1.89	3.24	5.58
Sounder Cloudy	6.80	7.89	48.38

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	8.99	8.48	8.74
Sounder Uncertain	1.41	3.29	6.01
Sounder Cloudy	5.18	8.54	49.35

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.48	0.92	0.20
Frequency Bias	0.98	1.74	0.94
Probability of Detection	0.52	0.14	0.75
False Alarm Rate	0.36	0.28	0.36

Overall Skill Score

Skill Score	Value
Proportion Correct	0.653
Kuiper Skill Score	0.323
Heidke Skill Score	0.306

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.59	0.70	0.23
Frequency Bias	1.35	0.57	1.02
Probability of Detection	0.55	0.17	0.78
False Alarm Rate	0.41	0.20	0.39

Overall Skill Score

Skill Score	Value
Proportion Correct	0.624
Kuiper Skill Score	0.299
Heidke Skill Score	0.303

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.66	0.69	0.22
Frequency Bias	1.68	0.53	0.98
Probability of Detection	0.58	0.16	0.77
False Alarm Rate	0.45	0.19	0.36

Overall Skill Score

Skill Score	Value
Proportion Correct	0.616
Kuiper Skill Score	0.285
Heidke Skill Score	0.280

INSAT-3D Sounder vs MODIS for June , 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	7111	2738	4524
Sounder Uncertain	1203	925	3293
Sounder Cloudy	321	603	14554

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	6941	3072	4360
Sounder Uncertain	1065	1150	3206
Sounder Cloudy	263	711	14504

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	6271	3571	4531
Sounder Uncertain	900	1214	3307
Sounder Cloudy	180	714	14584

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	20.16	7.76	12.83
Sounder Uncertain	3.41	2.62	9.34
Sounder Cloudy	0.91	1.71	41.26

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	19.68	8.71	12.36
Sounder Uncertain	3.02	3.26	9.09
Sounder Cloudy	0.75	2.02	41.12

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	17.78	10.12	12.85
Sounder Uncertain	2.55	3.44	9.38
Sounder Cloudy	0.51	2.02	41.35

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.51	0.83	0.06
Frequency Bias	1.66	1.27	0.69
Probability of Detection	0.82	0.22	0.65
False Alarm Rate	0.57	0.35	0.07

Overall Skill Score

Skill Score	Value
Proportion Correct	0.640
Kuiper Skill Score	0.466
Heidke Skill Score	0.404

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.52	0.79	0.06
Frequency Bias	1.74	1.10	0.70
Probability of Detection	0.84	0.23	0.66
False Alarm Rate	0.59	0.34	0.08

Overall Skill Score

Skill Score	Value
Proportion Correct	0.641
Kuiper Skill Score	0.466
Heidke Skill Score	0.409

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.56	0.78	0.06
Frequency Bias	1.96	0.99	0.69
Probability of Detection	0.85	0.22	0.65
False Alarm Rate	0.61	0.32	0.07

Overall Skill Score

Skill Score	Value
Proportion Correct	0.626
Kuiper Skill Score	0.450
Heidke Skill Score	0.389

INSAT-3D Sounder vs MODIS for June , 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	12528	9443	27594
Sounder Uncertain	1812	1478	15295
Sounder Cloudy	679	433	55895

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	8381	14910	26274
Sounder Uncertain	1089	2506	14990
Sounder Cloudy	355	1062	55590

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	7087	14677	27801
Sounder Uncertain	909	2311	15365
Sounder Cloudy	309	954	55744

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	10.01	7.54	22.05
Sounder Uncertain	1.45	1.18	12.22
Sounder Cloudy	0.54	0.35	44.66

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	6.70	11.91	20.99
Sounder Uncertain	0.87	2.00	11.98
Sounder Cloudy	0.28	0.85	44.42

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	5.66	11.73	22.21
Sounder Uncertain	0.73	1.85	12.28
Sounder Cloudy	0.25	0.76	44.54

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.75	0.92	0.02
Frequency Bias	3.30	1.64	0.58
Probability of Detection	0.83	0.13	0.57
False Alarm Rate	0.67	0.31	0.02

Overall Skill Score

Skill Score	Value
Proportion Correct	0.559
Kuiper Skill Score	0.389
Heidke Skill Score	0.238

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.83	0.87	0.02
Frequency Bias	5.04	1.01	0.59
Probability of Detection	0.85	0.14	0.57
False Alarm Rate	0.70	0.27	0.02

Overall Skill Score

Skill Score	Value
Proportion Correct	0.531
Kuiper Skill Score	0.337
Heidke Skill Score	0.211

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.86	0.88	0.02
Frequency Bias	5.97	1.04	0.58
Probability of Detection	0.85	0.13	0.56
False Alarm Rate	0.71	0.27	0.02

Overall Skill Score

Skill Score	Value
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Proportion Correct	0.520
Kuiper Skill Score	0.322
Heidke Skill Score	0.191

INSAT-3D Sounder vs MODIS for June , 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	5471	7192	15167
Sounder Uncertain	752	984	7344
Sounder Cloudy	267	233	17339

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	3842	8592	15396
Sounder Uncertain	483	1238	7359
Sounder Cloudy	174	372	17293

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	3164	8381	16285
Sounder Uncertain	392	1130	7558
Sounder Cloudy	144	355	17340

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	9.99	13.14	27.70
Sounder Uncertain	1.37	1.80	13.41
Sounder Cloudy	0.49	0.43	31.67

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	7.02	15.69	28.12
Sounder Uncertain	0.88	2.26	13.44
Sounder Cloudy	0.32	0.68	31.59

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	5.78	15.31	29.74
Sounder Uncertain	0.72	2.06	13.80
Sounder Cloudy	0.26	0.65	31.67

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.80	0.89	0.03
Frequency Bias	4.29	1.08	0.45
Probability of Detection	0.84	0.12	0.44
False Alarm Rate	0.72	0.26	0.02

Overall Skill Score

Skill Score	Value
Proportion Correct	0.435
Kuiper Skill Score	0.258
Heidke Skill Score	0.165

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
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False Alarm Ratio	0.86	0.86	0.03
Frequency Bias	6.19	0.89	0.45
Probability of Detection	0.85	0.12	0.43
False Alarm Rate	0.74	0.24	0.02

Overall Skill Score

Skill Score	Value
Proportion Correct	0.409
Kuiper Skill Score	0.231
Heidke Skill Score	0.142

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.89	0.88	0.03
Frequency Bias	7.52	0.92	0.43
Probability of Detection	0.86	0.11	0.42
False Alarm Rate	0.74	0.24	0.02

Overall Skill Score

Skill Score	Value
Proportion Correct	0.395
Kuiper Skill Score	0.216
Heidke Skill Score	0.124

INSAT-3D Sounder vs MODIS for June , 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	7057	2251	12427
Sounder Uncertain	1060	494	7951
Sounder Cloudy	412	200	38556

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	4539	6318	10878
Sounder Uncertain	606	1268	7631
Sounder Cloudy	181	690	38297

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	3923	6296	11516
Sounder Uncertain	517	1181	7807
Sounder Cloudy	165	599	38404

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	10.02	3.20	17.65
Sounder Uncertain	1.51	0.70	11.29
Sounder Cloudy	0.59	0.28	54.76

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	6.45	8.97	15.45
Sounder Uncertain	0.86	1.80	10.84
Sounder Cloudy	0.26	0.98	54.39

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	5.57	8.94	16.36

Sounder Uncertain	0.73	1.68	11.09
Sounder Cloudy	0.23	0.85	54.54

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.68	0.95	0.02
Frequency Bias	2.55	3.23	0.66
Probability of Detection	0.83	0.17	0.65
False Alarm Rate	0.60	0.37	0.03

Overall Skill Score

Skill Score	Value
Proportion Correct	0.655
Kuiper Skill Score	0.517
Heidke Skill Score	0.298

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.79	0.87	0.02
Frequency Bias	4.08	1.15	0.69
Probability of Detection	0.85	0.15	0.67
False Alarm Rate	0.65	0.31	0.03

Overall Skill Score

Skill Score	Value
Proportion Correct	0.626
Kuiper Skill Score	0.420
Heidke Skill Score	0.270

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.82	0.88	0.02

Frequency Bias	4.72	1.18	0.68
Probability of Detection	0.85	0.15	0.67
False Alarm Rate	0.66	0.31	0.03

Overall Skill Score

Skill Score	Value
Proportion Correct	0.618
Kuiper Skill Score	0.407
Heidke Skill Score	0.248

INSAT-3D Sounder vs MODIS for June , 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	180	113	204
Sounder Uncertain	35	34	115
Sounder Cloudy	37	20	543

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	149	176	172
Sounder Uncertain	25	54	105
Sounder Cloudy	24	50	526

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	120	189	188

Sounder Uncertain	21	51	112
Sounder Cloudy	14	56	530

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	14.05	8.82	15.93
Sounder Uncertain	2.73	2.65	8.98
Sounder Cloudy	2.89	1.56	42.39

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	11.63	13.74	13.43
Sounder Uncertain	1.95	4.22	8.20
Sounder Cloudy	1.87	3.90	41.06

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	9.37	14.75	14.68
Sounder Uncertain	1.64	3.98	8.74
Sounder Cloudy	1.09	4.37	41.37

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.64	0.82	0.10
Frequency Bias	1.97	1.10	0.70
Probability of Detection	0.71	0.20	0.63
False Alarm Rate	0.60	0.29	0.11

Overall Skill Score

Skill Score	Value
Proportion Correct	0.591
Kuiper Skill Score	0.368
Heidke Skill Score	0.306

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.70	0.71	0.12
Frequency Bias	2.51	0.66	0.75
Probability of Detection	0.75	0.19	0.66
False Alarm Rate	0.63	0.24	0.13

Overall Skill Score

Skill Score	Value
Proportion Correct	0.569
Kuiper Skill Score	0.344
Heidke Skill Score	0.299

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.76	0.72	0.12
Frequency Bias	3.21	0.62	0.72
Probability of Detection	0.77	0.17	0.64
False Alarm Rate	0.65	0.23	0.12

Overall Skill Score

Skill Score	Value
Proportion Correct	0.547
Kuiper Skill Score	0.319
Heidke Skill Score	0.265

INSAT-3D Sounder vs MODIS for June , 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	51	45	97
Sounder Uncertain	10	10	47
Sounder Cloudy	36	16	239

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	32	85	76
Sounder Uncertain	6	19	42
Sounder Cloudy	24	42	225

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	26	79	88
Sounder Uncertain	5	16	46
Sounder Cloudy	14	49	228

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	9.26	8.17	17.60
Sounder Uncertain	1.81	1.81	8.53
Sounder Cloudy	6.53	2.90	43.38

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	5.81	15.43	13.79
Sounder Uncertain	1.09	3.45	7.62
Sounder Cloudy	4.36	7.62	40.83

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	4.72	14.34	15.97
Sounder Uncertain	0.91	2.90	8.35
Sounder Cloudy	2.54	8.89	41.38

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.74	0.85	0.18
Frequency Bias	1.99	0.94	0.76
Probability of Detection	0.53	0.14	0.62
False Alarm Rate	0.57	0.23	0.21

Overall Skill Score

Skill Score	Value
Proportion Correct	0.544
Kuiper Skill Score	0.213
Heidke Skill Score	0.180

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.83	0.72	0.23
Frequency Bias	3.11	0.46	0.85
Probability of Detection	0.52	0.13	0.66
False Alarm Rate	0.59	0.17	0.24

Overall Skill Score

Skill Score	Value
Proportion Correct	0.501
Kuiper Skill Score	0.190
Heidke Skill Score	0.168

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.87	0.76	0.22
Frequency Bias	4.29	0.47	0.80
Probability of Detection	0.58	0.11	0.63
False Alarm Rate	0.59	0.18	0.22

Overall Skill Score

Skill Score	Value
Proportion Correct	0.490
Kuiper Skill Score	0.168
Heidke Skill Score	0.139

INSAT-3D Sounder vs MODIS for June , 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	129	68	107
Sounder Uncertain	25	24	68
Sounder Cloudy	1	4	304

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	117	91	96
Sounder Uncertain	19	35	63
Sounder Cloudy	0	8	301

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	94	110	100
Sounder Uncertain	16	35	66
Sounder Cloudy	0	7	302

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	17.67	9.32	14.66
Sounder Uncertain	3.42	3.29	9.32
Sounder Cloudy	0.14	0.55	41.64

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	16.03	12.47	13.15
Sounder Uncertain	2.60	4.79	8.63
Sounder Cloudy	0.00	1.10	41.23

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	12.88	15.07	13.70
Sounder Uncertain	2.19	4.79	9.04
Sounder Cloudy	0.00	0.96	41.37

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.58	0.79	0.02
Frequency Bias	1.96	1.22	0.65
Probability of Detection	0.83	0.25	0.63
False Alarm Rate	0.64	0.34	0.02

Overall Skill Score

Skill Score	Value
Proportion Correct	0.626
Kuiper Skill Score	0.471
Heidke Skill Score	0.390

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.62	0.70	0.03
Frequency Bias	2.24	0.87	0.67
Probability of Detection	0.86	0.26	0.65
False Alarm Rate	0.68	0.30	0.03

Overall Skill Score

Skill Score	Value
Proportion Correct	0.621
Kuiper Skill Score	0.462
Heidke Skill Score	0.394

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.69	0.70	0.02
Frequency Bias	2.76	0.77	0.66
Probability of Detection	0.85	0.23	0.65
False Alarm Rate	0.70	0.27	0.02

Overall Skill Score

Skill Score	Value
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Proportion Correct	0.590
Kuiper Skill Score	0.426
Heidke Skill Score	0.352

INSAT-3D Sounder vs MODIS for June , 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	753	383	651
Sounder Uncertain	1077	277	1086
Sounder Cloudy	484	51	2502

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	600	624	563
Sounder Uncertain	753	800	887
Sounder Cloudy	253	554	2230

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	480	703	604
Sounder Uncertain	601	874	965
Sounder Cloudy	209	516	2312

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	10.37	5.27	8.96
Sounder Uncertain	14.83	3.81	14.95
Sounder Cloudy	6.66	0.70	34.44

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	8.26	8.59	7.75
Sounder Uncertain	10.37	11.01	12.21
Sounder Cloudy	3.48	7.63	30.70

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	6.61	9.68	8.31
Sounder Uncertain	8.27	12.03	13.28
Sounder Cloudy	2.88	7.10	31.83

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.58	0.89	0.18
Frequency Bias	0.77	3.43	0.72
Probability of Detection	0.33	0.39	0.59
False Alarm Rate	0.28	0.58	0.14

Overall Skill Score

Skill Score	Value
Proportion Correct	0.486
Kuiper Skill Score	0.239
Heidke Skill Score	0.203

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
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False Alarm Ratio	0.66	0.67	0.27
Frequency Bias	1.11	1.23	0.83
Probability of Detection	0.37	0.40	0.61
False Alarm Rate	0.33	0.45	0.22

Overall Skill Score

Skill Score	Value
Proportion Correct	0.500
Kuiper Skill Score	0.229
Heidke Skill Score	0.221

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.73	0.64	0.24
Frequency Bias	1.39	1.17	0.78
Probability of Detection	0.37	0.42	0.60
False Alarm Rate	0.36	0.44	0.20

Overall Skill Score

Skill Score	Value
Proportion Correct	0.505
Kuiper Skill Score	0.235
Heidke Skill Score	0.221

INSAT-3D Sounder vs MODIS for June , 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	344	6	92
Sounder Uncertain	855	11	380
Sounder Cloudy	445	19	2095

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	265	130	47
Sounder Uncertain	580	447	219
Sounder Cloudy	223	501	1835

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	232	153	57
Sounder Uncertain	484	501	261
Sounder Cloudy	182	472	1905

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	8.10	0.14	2.17
Sounder Uncertain	20.13	0.26	8.95
Sounder Cloudy	10.48	0.45	49.33

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	6.24	3.06	1.11
Sounder Uncertain	13.66	10.53	5.16
Sounder Cloudy	5.25	11.80	43.21

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	5.46	3.60	1.34

Sounder Uncertain	11.40	11.80	6.15
Sounder Cloudy	4.29	11.11	44.86

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.22	0.99	0.18
Frequency Bias	0.27	34.61	1.00
Probability of Detection	0.21	0.31	0.82
False Alarm Rate	0.05	0.69	0.26

Overall Skill Score

Skill Score	Value
Proportion Correct	0.577
Kuiper Skill Score	0.351
Heidke Skill Score	0.287

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.40	0.64	0.28
Frequency Bias	0.41	1.16	1.22
Probability of Detection	0.25	0.41	0.87
False Alarm Rate	0.10	0.47	0.43

Overall Skill Score

Skill Score	Value
Proportion Correct	0.600
Kuiper Skill Score	0.320
Heidke Skill Score	0.334

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.48	0.60	0.26

Frequency Bias	0.49	1.11	1.15
Probability of Detection	0.26	0.44	0.86
False Alarm Rate	0.13	0.46	0.41

Overall Skill Score

Skill Score	Value
Proportion Correct	0.621
Kuiper Skill Score	0.337
Heidke Skill Score	0.352

INSAT-3D Sounder vs MODIS for June , 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	409	377	559
Sounder Uncertain	222	266	706
Sounder Cloudy	39	32	407

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	335	494	516
Sounder Uncertain	173	353	668
Sounder Cloudy	30	53	395

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	248	550	547

Sounder Uncertain	117	373	704
Sounder Cloudy	27	44	407

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	13.56	12.50	18.53
Sounder Uncertain	7.36	8.82	23.40
Sounder Cloudy	1.29	1.06	13.49

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	11.10	16.37	17.10
Sounder Uncertain	5.73	11.70	22.14
Sounder Cloudy	0.99	1.76	13.09

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	8.22	18.23	18.13
Sounder Uncertain	3.88	12.36	23.33
Sounder Cloudy	0.89	1.46	13.49

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.70	0.78	0.15
Frequency Bias	2.01	1.77	0.29
Probability of Detection	0.61	0.39	0.24
False Alarm Rate	0.48	0.48	0.04

Overall Skill Score

Skill Score	Value
Proportion Correct	0.359
Kuiper Skill Score	0.140
Heidke Skill Score	0.115

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.75	0.70	0.17
Frequency Bias	2.50	1.33	0.30
Probability of Detection	0.62	0.39	0.25
False Alarm Rate	0.52	0.43	0.04

Overall Skill Score

Skill Score	Value
Proportion Correct	0.359
Kuiper Skill Score	0.130
Heidke Skill Score	0.109

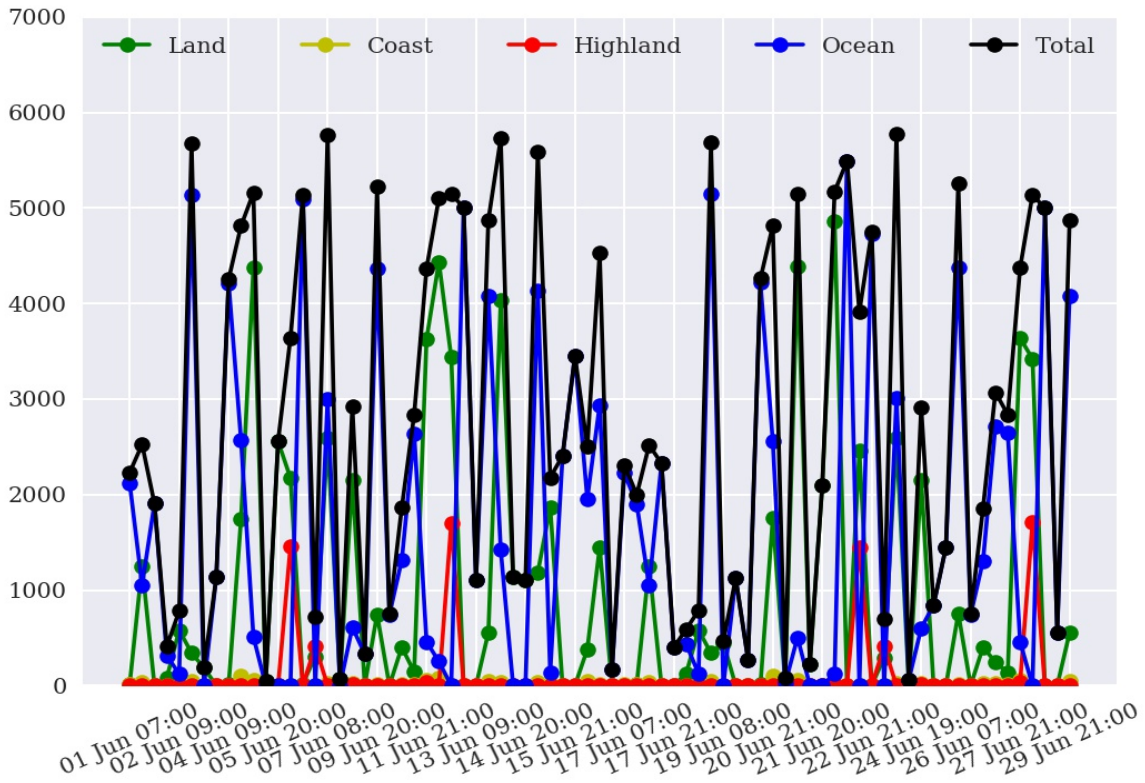
Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.82	0.69	0.15
Frequency Bias	3.43	1.23	0.29
Probability of Detection	0.63	0.39	0.25
False Alarm Rate	0.55	0.41	0.04

Overall Skill Score

Skill Score	Value
Proportion Correct	0.341
Kuiper Skill Score	0.119
Heidke Skill Score	0.095

Number of Collocations for Jun-2017



Percentage Correct for Jun-2017

