

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 March , 2016 (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	79102	33300	16405
Sounder Uncertain	16062	3879	14457
Sounder Cloudy	9473	2467	23532

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	73200	40882	14725
Sounder Uncertain	12577	9779	12042
Sounder Cloudy	7206	6803	21463

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	67247	44959	16601
Sounder Uncertain	10687	10749	12962
Sounder Cloudy	5954	7289	22229

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	39.81	16.76	8.26
Sounder Uncertain	8.08	1.95	7.28
Sounder Cloudy	4.77	1.24	11.84

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	36.84	20.58	7.41
Sounder Uncertain	6.33	4.92	6.06
Sounder Cloudy	3.63	3.42	10.80

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	33.85	22.63	8.36
Sounder Uncertain	5.38	5.41	6.52
Sounder Cloudy	3.00	3.67	11.19

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.39	0.89	0.34
Frequency Bias	1.23	0.87	0.65
Probability of Detection	0.76	0.10	0.43
False Alarm Rate	0.54	0.33	0.13

Overall Skill Score

Skill Score	Value
Proportion Correct	0.536
Kuiper Skill Score	0.183
Heidke Skill Score	0.193

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.43	0.72	0.39
Frequency Bias	1.39	0.60	0.74
Probability of Detection	0.79	0.17	0.45
False Alarm Rate	0.59	0.26	0.15

Overall Skill Score

Skill Score	Value
Proportion Correct	0.526
Kuiper Skill Score	0.202
Heidke Skill Score	0.214

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.48	0.69	0.37
Frequency Bias	1.54	0.55	0.68
Probability of Detection	0.80	0.17	0.43
False Alarm Rate	0.63	0.24	0.13

Overall Skill Score

Skill Score	Value
Proportion Correct	0.504
Kuiper Skill Score	0.198
Heidke Skill Score	0.207

INSAT-3D Sounder vs MODIS for March , 2016 (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	42652	18942	7527
Sounder Uncertain	9940	1995	5015
Sounder Cloudy	6350	1479	14197

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	40048	21530	7543
Sounder Uncertain	7754	5373	3823
Sounder Cloudy	4630	4778	12618

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	36102	24425	8594
Sounder Uncertain	6462	6215	4273
Sounder Cloudy	3652	5228	13146

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	39.46	17.52	6.96
Sounder Uncertain	9.20	1.85	4.64
Sounder Cloudy	5.87	1.37	13.13

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	37.05	19.92	6.98
Sounder Uncertain	7.17	4.97	3.54
Sounder Cloudy	4.28	4.42	11.67

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	33.40	22.60	7.95
Sounder Uncertain	5.98	5.75	3.95
Sounder Cloudy	3.38	4.84	12.16

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.38	0.88	0.36
Frequency Bias	1.17	0.76	0.82
Probability of Detection	0.72	0.09	0.53
False Alarm Rate	0.54	0.30	0.16

Overall Skill Score

Skill Score	Value
Proportion Correct	0.544
Kuiper Skill Score	0.188
Heidke Skill Score	0.198

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.42	0.68	0.43
Frequency Bias	1.32	0.54	0.92
Probability of Detection	0.76	0.17	0.53
False Alarm Rate	0.58	0.23	0.19

Overall Skill Score

Skill Score	Value
Proportion Correct	0.537
Kuiper Skill Score	0.215
Heidke Skill Score	0.226

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.48	0.63	0.40
Frequency Bias	1.50	0.47	0.85
Probability of Detection	0.78	0.17	0.51
False Alarm Rate	0.63	0.20	0.17

Overall Skill Score

Skill Score	Value
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Proportion Correct	0.513
Kuiper Skill Score	0.214
Heidke Skill Score	0.222

INSAT-3D Sounder vs MODIS for March , 2016 (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	36450	14358	8878
Sounder Uncertain	6122	1884	9442
Sounder Cloudy	3123	988	9335

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	33152	19352	7182
Sounder Uncertain	4823	4406	8219
Sounder Cloudy	2576	2025	8845

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	31145	20534	8007
Sounder Uncertain	4225	4534	8689
Sounder Cloudy	2302	2061	9083

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	40.24	15.85	9.80
Sounder Uncertain	6.76	2.08	10.42
Sounder Cloudy	3.45	1.09	10.31

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	36.60	21.36	7.93
Sounder Uncertain	5.32	4.86	9.07
Sounder Cloudy	2.84	2.24	9.76

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	34.38	22.67	8.84
Sounder Uncertain	4.66	5.01	9.59
Sounder Cloudy	2.54	2.28	10.03

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.39	0.89	0.31
Frequency Bias	1.31	1.01	0.49
Probability of Detection	0.80	0.11	0.34
False Alarm Rate	0.54	0.36	0.10

Overall Skill Score

Skill Score	Value
Proportion Correct	0.526
Kuiper Skill Score	0.182
Heidke Skill Score	0.191

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
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False Alarm Ratio	0.44	0.75	0.34
Frequency Bias	1.47	0.68	0.55
Probability of Detection	0.82	0.17	0.36
False Alarm Rate	0.60	0.30	0.10

Overall Skill Score

Skill Score	Value
Proportion Correct	0.512
Kuiper Skill Score	0.190
Heidke Skill Score	0.201

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.48	0.74	0.32
Frequency Bias	1.58	0.64	0.52
Probability of Detection	0.83	0.17	0.35
False Alarm Rate	0.62	0.28	0.10

Overall Skill Score

Skill Score	Value
Proportion Correct	0.494
Kuiper Skill Score	0.183
Heidke Skill Score	0.192

INSAT-3D Sounder vs MODIS for March , 2016 (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	50290	4127	5463
Sounder Uncertain	11429	1322	7223
Sounder Cloudy	5774	1377	14270

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	47905	8010	3965
Sounder Uncertain	9190	5111	5673
Sounder Cloudy	4531	3776	13114

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	43860	11620	4400
Sounder Uncertain	7805	6022	6147
Sounder Cloudy	3631	4256	13534

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	49.66	4.08	5.39
Sounder Uncertain	11.29	1.31	7.13
Sounder Cloudy	5.70	1.36	14.09

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	47.30	7.91	3.92
Sounder Uncertain	9.07	5.05	5.60
Sounder Cloudy	4.47	3.73	12.95

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	43.31	11.47	4.34

Sounder Uncertain	7.71	5.95	6.07
Sounder Cloudy	3.59	4.20	13.36

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.16	0.93	0.33
Frequency Bias	0.89	2.93	0.79
Probability of Detection	0.75	0.19	0.53
False Alarm Rate	0.27	0.53	0.20

Overall Skill Score

Skill Score	Value
Proportion Correct	0.651
Kuiper Skill Score	0.389
Heidke Skill Score	0.348

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.20	0.74	0.39
Frequency Bias	0.97	1.18	0.94
Probability of Detection	0.78	0.30	0.58
False Alarm Rate	0.34	0.42	0.24

Overall Skill Score

Skill Score	Value
Proportion Correct	0.653
Kuiper Skill Score	0.386
Heidke Skill Score	0.380

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.27	0.70	0.37

Frequency Bias	1.08	0.91	0.89
Probability of Detection	0.79	0.28	0.56
False Alarm Rate	0.42	0.37	0.21

Overall Skill Score

Skill Score	Value
Proportion Correct	0.626
Kuiper Skill Score	0.352
Heidke Skill Score	0.360

INSAT-3D Sounder vs MODIS for March , 2016 (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	25685	2807	867
Sounder Uncertain	6979	885	1922
Sounder Cloudy	4395	1276	8312

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	24480	4397	482
Sounder Uncertain	5560	3036	1190
Sounder Cloudy	3305	3315	7363

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	21526	7216	617

Sounder Uncertain	4523	3851	1412
Sounder Cloudy	2536	3722	7725

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	48.35	5.28	1.63
Sounder Uncertain	13.14	1.67	3.62
Sounder Cloudy	8.27	2.40	15.65

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	46.08	8.28	0.91
Sounder Uncertain	10.47	5.71	2.24
Sounder Cloudy	6.22	6.24	13.86

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	40.52	13.58	1.16
Sounder Uncertain	8.51	7.25	2.66
Sounder Cloudy	4.77	7.01	14.54

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.13	0.91	0.41
Frequency Bias	0.79	1.97	1.26
Probability of Detection	0.69	0.18	0.75
False Alarm Rate	0.20	0.49	0.31

Overall Skill Score

Skill Score	Value
Proportion Correct	0.657
Kuiper Skill Score	0.431
Heidke Skill Score	0.367

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.17	0.69	0.47
Frequency Bias	0.88	0.91	1.55
Probability of Detection	0.73	0.28	0.81
False Alarm Rate	0.27	0.37	0.36

Overall Skill Score

Skill Score	Value
Proportion Correct	0.657
Kuiper Skill Score	0.425
Heidke Skill Score	0.399

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.27	0.61	0.45
Frequency Bias	1.03	0.66	1.43
Probability of Detection	0.75	0.26	0.79
False Alarm Rate	0.39	0.30	0.31

Overall Skill Score

Skill Score	Value
Proportion Correct	0.623
Kuiper Skill Score	0.377
Heidke Skill Score	0.375

INSAT-3D Sounder vs MODIS for March , 2016 (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	24605	1320	4596
Sounder Uncertain	4450	437	5301
Sounder Cloudy	1379	101	5958

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	23425	3613	3483
Sounder Uncertain	3630	2075	4483
Sounder Cloudy	1226	461	5751

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	22334	4404	3783
Sounder Uncertain	3282	2171	4735
Sounder Cloudy	1095	534	5809

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	51.10	2.74	9.55
Sounder Uncertain	9.24	0.91	11.01
Sounder Cloudy	2.86	0.21	12.37

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	48.65	7.50	7.23
Sounder Uncertain	7.54	4.31	9.31
Sounder Cloudy	2.55	0.96	11.94

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	46.39	9.15	7.86
Sounder Uncertain	6.82	4.51	9.83
Sounder Cloudy	2.27	1.11	12.07

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.19	0.96	0.20
Frequency Bias	1.00	5.48	0.47
Probability of Detection	0.81	0.24	0.38
False Alarm Rate	0.35	0.57	0.09

Overall Skill Score

Skill Score	Value
Proportion Correct	0.644
Kuiper Skill Score	0.375
Heidke Skill Score	0.341

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.23	0.80	0.23
Frequency Bias	1.08	1.66	0.54
Probability of Detection	0.83	0.34	0.42
False Alarm Rate	0.42	0.48	0.10

Overall Skill Score

Skill Score	Value
Proportion Correct	0.649
Kuiper Skill Score	0.369
Heidke Skill Score	0.370

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.27	0.79	0.22
Frequency Bias	1.14	1.43	0.52
Probability of Detection	0.84	0.31	0.41
False Alarm Rate	0.46	0.45	0.09

Overall Skill Score

Skill Score	Value
Proportion Correct	0.630
Kuiper Skill Score	0.345
Heidke Skill Score	0.351

INSAT-3D Sounder vs MODIS for March , 2016 (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	25588	27918	8784
Sounder Uncertain	2346	1822	4131
Sounder Cloudy	962	792	2774

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	22607	30620	9063
Sounder Uncertain	1634	2935	3730
Sounder Cloudy	664	1178	2686

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	21141	30839	10310
Sounder Uncertain	1461	2829	4009
Sounder Cloudy	592	1140	2796

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	34.06	37.17	11.69
Sounder Uncertain	3.12	2.43	5.50
Sounder Cloudy	1.28	1.05	3.69

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	30.10	40.76	12.07
Sounder Uncertain	2.18	3.91	4.97
Sounder Cloudy	0.88	1.57	3.58

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	28.14	41.05	13.73
Sounder Uncertain	1.94	3.77	5.34
Sounder Cloudy	0.79	1.52	3.72

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.59	0.78	0.39
Frequency Bias	2.16	0.27	0.29
Probability of Detection	0.89	0.06	0.18
False Alarm Rate	0.82	0.14	0.04

Overall Skill Score

Skill Score	Value
Proportion Correct	0.402
Kuiper Skill Score	0.039
Heidke Skill Score	0.041

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.64	0.65	0.41
Frequency Bias	2.50	0.24	0.29
Probability of Detection	0.91	0.08	0.17
False Alarm Rate	0.85	0.11	0.04

Overall Skill Score

Skill Score	Value
Proportion Correct	0.376
Kuiper Skill Score	0.059
Heidke Skill Score	0.056

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.66	0.66	0.38
Frequency Bias	2.69	0.24	0.26
Probability of Detection	0.91	0.08	0.16
False Alarm Rate	0.85	0.11	0.04

Overall Skill Score

Skill Score	Value
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Proportion Correct	0.356
Kuiper Skill Score	0.055
Heidke Skill Score	0.052

INSAT-3D Sounder vs MODIS for March , 2016 (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	15362	15809	6367
Sounder Uncertain	1683	954	2468
Sounder Cloudy	284	51	893

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	14118	16570	6850
Sounder Uncertain	1204	1697	2204
Sounder Cloudy	234	146	848

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	13262	16542	7734
Sounder Uncertain	1074	1648	2383
Sounder Cloudy	218	143	867

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	35.02	36.04	14.51
Sounder Uncertain	3.84	2.17	5.63
Sounder Cloudy	0.65	0.12	2.04

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	32.18	37.77	15.61
Sounder Uncertain	2.74	3.87	5.02
Sounder Cloudy	0.53	0.33	1.93

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	30.23	37.71	17.63
Sounder Uncertain	2.45	3.76	5.43
Sounder Cloudy	0.50	0.33	1.98

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.59	0.81	0.27
Frequency Bias	2.17	0.30	0.13
Probability of Detection	0.89	0.06	0.09
False Alarm Rate	0.83	0.16	0.01

Overall Skill Score

Skill Score	Value
Proportion Correct	0.392
Kuiper Skill Score	0.005
Heidke Skill Score	0.006

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
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False Alarm Ratio	0.62	0.67	0.31
Frequency Bias	2.41	0.28	0.12
Probability of Detection	0.91	0.09	0.09
False Alarm Rate	0.86	0.13	0.01

Overall Skill Score

Skill Score	Value
Proportion Correct	0.380
Kuiper Skill Score	0.033
Heidke Skill Score	0.033

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.65	0.68	0.29
Frequency Bias	2.58	0.28	0.11
Probability of Detection	0.91	0.09	0.08
False Alarm Rate	0.86	0.12	0.01

Overall Skill Score

Skill Score	Value
Proportion Correct	0.360
Kuiper Skill Score	0.031
Heidke Skill Score	0.030

INSAT-3D Sounder vs MODIS for March , 2016 (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	10226	12109	2417
Sounder Uncertain	663	868	1663
Sounder Cloudy	678	741	1881

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	8489	14050	2213
Sounder Uncertain	430	1238	1526
Sounder Cloudy	430	1032	1838

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	7879	14297	2576
Sounder Uncertain	387	1181	1626
Sounder Cloudy	374	997	1929

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	32.73	38.75	7.74
Sounder Uncertain	2.12	2.78	5.32
Sounder Cloudy	2.17	2.37	6.02

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	27.17	44.97	7.08
Sounder Uncertain	1.38	3.96	4.88
Sounder Cloudy	1.38	3.30	5.88

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	25.22	45.76	8.24

Sounder Uncertain	1.24	3.78	5.20
Sounder Cloudy	1.20	3.19	6.17

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.59	0.73	0.43
Frequency Bias	2.14	0.23	0.55
Probability of Detection	0.88	0.06	0.32
False Alarm Rate	0.80	0.13	0.08

Overall Skill Score

Skill Score	Value
Proportion Correct	0.415
Kuiper Skill Score	0.090
Heidke Skill Score	0.089

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.66	0.61	0.44
Frequency Bias	2.65	0.20	0.59
Probability of Detection	0.91	0.08	0.33
False Alarm Rate	0.83	0.10	0.07

Overall Skill Score

Skill Score	Value
Proportion Correct	0.370
Kuiper Skill Score	0.100
Heidke Skill Score	0.088

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.68	0.63	0.42

Frequency Bias	2.86	0.19	0.54
Probability of Detection	0.91	0.07	0.31
False Alarm Rate	0.83	0.10	0.07

Overall Skill Score

Skill Score	Value
Proportion Correct	0.352
Kuiper Skill Score	0.096
Heidke Skill Score	0.082

INSAT-3D Sounder vs MODIS for March , 2016 (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	390	138	116
Sounder Uncertain	140	39	100
Sounder Cloudy	73	17	120

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	318	263	63
Sounder Uncertain	116	82	81
Sounder Cloudy	62	43	105

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	259	315	70

Sounder Uncertain	99	96	84
Sounder Cloudy	53	49	108

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	34.42	12.18	10.24
Sounder Uncertain	12.36	3.44	8.83
Sounder Cloudy	6.44	1.50	10.59

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	28.07	23.21	5.56
Sounder Uncertain	10.24	7.24	7.15
Sounder Cloudy	5.47	3.80	9.27

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	22.86	27.80	6.18
Sounder Uncertain	8.74	8.47	7.41
Sounder Cloudy	4.68	4.32	9.53

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.39	0.86	0.43
Frequency Bias	1.07	1.44	0.62
Probability of Detection	0.65	0.20	0.36
False Alarm Rate	0.43	0.41	0.15

Overall Skill Score

Skill Score	Value
Proportion Correct	0.485
Kuiper Skill Score	0.142
Heidke Skill Score	0.141

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.51	0.71	0.50
Frequency Bias	1.30	0.72	0.84
Probability of Detection	0.64	0.21	0.42
False Alarm Rate	0.52	0.31	0.17

Overall Skill Score

Skill Score	Value
Proportion Correct	0.446
Kuiper Skill Score	0.112
Heidke Skill Score	0.115

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.60	0.66	0.49
Frequency Bias	1.57	0.61	0.80
Probability of Detection	0.63	0.21	0.41
False Alarm Rate	0.57	0.27	0.15

Overall Skill Score

Skill Score	Value
Proportion Correct	0.409
Kuiper Skill Score	0.092
Heidke Skill Score	0.092

INSAT-3D Sounder vs MODIS for March , 2016 (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	218	60	43
Sounder Uncertain	111	30	46
Sounder Cloudy	57	11	72

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	190	98	33
Sounder Uncertain	94	54	39
Sounder Cloudy	50	30	60

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	171	115	35
Sounder Uncertain	81	66	40
Sounder Cloudy	44	34	62

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	33.64	9.26	6.64
Sounder Uncertain	17.13	4.63	7.10
Sounder Cloudy	8.80	1.70	11.11

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	29.32	15.12	5.09
Sounder Uncertain	14.51	8.33	6.02
Sounder Cloudy	7.72	4.63	9.26

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	26.39	17.75	5.40
Sounder Uncertain	12.50	10.19	6.17
Sounder Cloudy	6.79	5.25	9.57

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.32	0.84	0.49
Frequency Bias	0.83	1.85	0.87
Probability of Detection	0.56	0.30	0.45
False Alarm Rate	0.31	0.48	0.21

Overall Skill Score

Skill Score	Value
Proportion Correct	0.494
Kuiper Skill Score	0.179
Heidke Skill Score	0.165

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.41	0.71	0.57
Frequency Bias	0.96	1.03	1.06
Probability of Detection	0.57	0.30	0.45
False Alarm Rate	0.38	0.39	0.23

Overall Skill Score

Skill Score	Value
Proportion Correct	0.469
Kuiper Skill Score	0.145
Heidke Skill Score	0.143

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.47	0.65	0.56
Frequency Bias	1.08	0.87	1.02
Probability of Detection	0.58	0.31	0.45
False Alarm Rate	0.43	0.35	0.22

Overall Skill Score

Skill Score	Value
Proportion Correct	0.461
Kuiper Skill Score	0.147
Heidke Skill Score	0.148

INSAT-3D Sounder vs MODIS for March , 2016 (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	172	78	73
Sounder Uncertain	29	9	54
Sounder Cloudy	16	6	48

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	128	165	30
Sounder Uncertain	22	28	42
Sounder Cloudy	12	13	45

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	88	200	35
Sounder Uncertain	18	30	44
Sounder Cloudy	9	15	46

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	35.46	16.08	15.05
Sounder Uncertain	5.98	1.86	11.13
Sounder Cloudy	3.30	1.24	9.90

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	26.39	34.02	6.19
Sounder Uncertain	4.54	5.77	8.66
Sounder Cloudy	2.47	2.68	9.28

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	18.14	41.24	7.22
Sounder Uncertain	3.71	6.19	9.07
Sounder Cloudy	1.86	3.09	9.48

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.47	0.90	0.31
Frequency Bias	1.49	0.99	0.40
Probability of Detection	0.79	0.10	0.27
False Alarm Rate	0.59	0.32	0.09

Overall Skill Score

Skill Score	Value
Proportion Correct	0.472
Kuiper Skill Score	0.135
Heidke Skill Score	0.140

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.60	0.70	0.36
Frequency Bias	1.99	0.45	0.60
Probability of Detection	0.79	0.14	0.38
False Alarm Rate	0.69	0.23	0.09

Overall Skill Score

Skill Score	Value
Proportion Correct	0.414
Kuiper Skill Score	0.118
Heidke Skill Score	0.116

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.73	0.67	0.34
Frequency Bias	2.81	0.38	0.56
Probability of Detection	0.77	0.12	0.37
False Alarm Rate	0.73	0.19	0.07

Overall Skill Score

Skill Score	Value
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Proportion Correct	0.338
Kuiper Skill Score	0.076
Heidke Skill Score	0.067

INSAT-3D Sounder vs MODIS for March , 2016 (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	987	498	1526
Sounder Uncertain	1584	566	2635
Sounder Cloudy	2181	173	5872

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	812	866	1333
Sounder Uncertain	1184	1331	2270
Sounder Cloudy	1534	1585	5107

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	668	902	1441
Sounder Uncertain	926	1452	2407
Sounder Cloudy	1310	1596	5320

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	6.16	3.11	9.52
Sounder Uncertain	9.89	3.53	16.45
Sounder Cloudy	13.61	1.08	36.65

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	5.07	5.41	8.32
Sounder Uncertain	7.39	8.31	14.17
Sounder Cloudy	9.57	9.89	31.87

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	4.17	5.63	8.99
Sounder Uncertain	5.78	9.06	15.02
Sounder Cloudy	8.18	9.96	33.20

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.67	0.88	0.29
Frequency Bias	0.63	3.87	0.82
Probability of Detection	0.21	0.46	0.59
False Alarm Rate	0.24	0.49	0.27

Overall Skill Score

Skill Score	Value
Proportion Correct	0.463
Kuiper Skill Score	0.123
Heidke Skill Score	0.105

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
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False Alarm Ratio	0.73	0.72	0.38
Frequency Bias	0.85	1.27	0.94
Probability of Detection	0.23	0.35	0.59
False Alarm Rate	0.25	0.39	0.36

Overall Skill Score

Skill Score	Value
Proportion Correct	0.453
Kuiper Skill Score	0.102
Heidke Skill Score	0.101

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.78	0.70	0.35
Frequency Bias	1.04	1.21	0.90
Probability of Detection	0.23	0.37	0.58
False Alarm Rate	0.27	0.39	0.34

Overall Skill Score

Skill Score	Value
Proportion Correct	0.464
Kuiper Skill Score	0.109
Heidke Skill Score	0.105

INSAT-3D Sounder vs MODIS for March , 2016 (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	351	9	58
Sounder Uncertain	719	21	402
Sounder Cloudy	1222	65	4584

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	315	66	37
Sounder Uncertain	520	361	261
Sounder Cloudy	707	1120	4044

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	297	79	42
Sounder Uncertain	450	401	291
Sounder Cloudy	551	1146	4174

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	4.72	0.12	0.78
Sounder Uncertain	9.68	0.28	5.41
Sounder Cloudy	16.44	0.87	61.69

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	4.24	0.89	0.50
Sounder Uncertain	7.00	4.86	3.51
Sounder Cloudy	9.51	15.07	54.42

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	4.00	1.06	0.57

Sounder Uncertain	6.06	5.40	3.92
Sounder Cloudy	7.41	15.42	56.17

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.16	0.98	0.22
Frequency Bias	0.18	12.02	1.16
Probability of Detection	0.15	0.22	0.91
False Alarm Rate	0.03	0.45	0.52

Overall Skill Score

Skill Score	Value
Proportion Correct	0.667
Kuiper Skill Score	0.251
Heidke Skill Score	0.251

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.25	0.68	0.31
Frequency Bias	0.27	0.74	1.35
Probability of Detection	0.20	0.23	0.93
False Alarm Rate	0.04	0.29	0.67

Overall Skill Score

Skill Score	Value
Proportion Correct	0.635
Kuiper Skill Score	0.227
Heidke Skill Score	0.263

Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.29	0.65	0.29

Frequency Bias	0.32	0.70	1.30
Probability of Detection	0.23	0.25	0.93
False Alarm Rate	0.05	0.29	0.66

Overall Skill Score

Skill Score	Value
Proportion Correct	0.656
Kuiper Skill Score	0.240
Heidke Skill Score	0.279

INSAT-3D Sounder vs MODIS for March , 2016 (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	636	489	1468
Sounder Uncertain	865	545	2233
Sounder Cloudy	959	108	1288

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	497	800	1296
Sounder Uncertain	664	970	2009
Sounder Cloudy	827	465	1063

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	371	823	1399

Sounder Uncertain	476	1051	2116
Sounder Cloudy	759	450	1146

2. Confusion matrix of percentage number of collocations

Method1 :Taking Mode of MODIS Pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	7.40	5.69	17.09
Sounder Uncertain	10.07	6.34	25.99
Sounder Cloudy	11.16	1.26	14.99

Method2 :Taking Weighted Average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	5.79	9.31	15.09
Sounder Uncertain	7.73	11.29	23.38
Sounder Cloudy	9.63	5.41	12.37

Method3: Taking Weighted Product average of MODIS pixels

MODIS/Sounder	MODIS Clear	MODIS Uncertain	MODIS Cloudy
Sounder Clear	4.32	9.58	16.28
Sounder Uncertain	5.54	12.23	24.63
Sounder Cloudy	8.83	5.24	13.34

3. Skill Scores

Method1 :Taking Mode of MODIS Pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.75	0.85	0.45
Frequency Bias	1.05	3.19	0.47
Probability of Detection	0.26	0.48	0.26
False Alarm Rate	0.32	0.51	0.17

Overall Skill Score

Skill Score	Value
Proportion Correct	0.287
Kuiper Skill Score	-0.026
Heidke Skill Score	-0.021

Method2 :Taking Weighted Average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.81	0.73	0.55
Frequency Bias	1.30	1.63	0.54
Probability of Detection	0.25	0.43	0.24
False Alarm Rate	0.35	0.44	0.21

Overall Skill Score

Skill Score	Value
Proportion Correct	0.294
Kuiper Skill Score	-0.040
Heidke Skill Score	-0.037

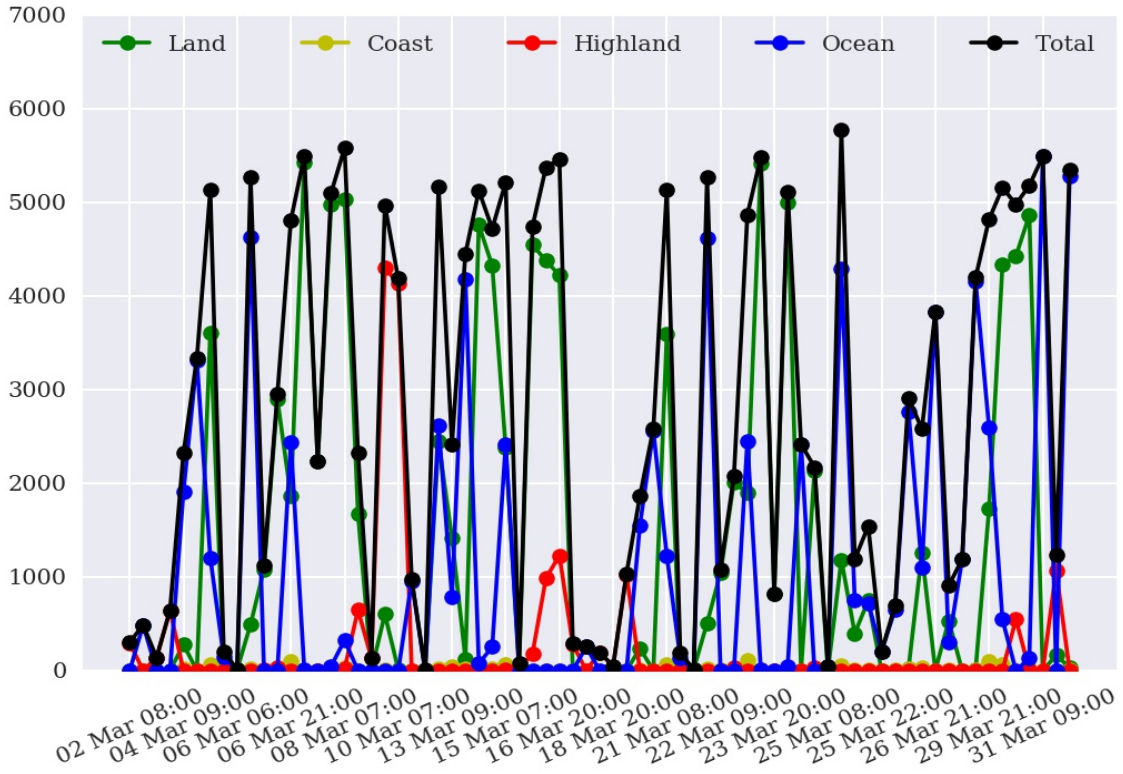
Method3: Taking Weighted Product average of MODIS pixels

Skill Score	Clear	Uncertain	Cloudy
False Alarm Ratio	0.86	0.71	0.51
Frequency Bias	1.61	1.57	0.51
Probability of Detection	0.23	0.45	0.25
False Alarm Rate	0.37	0.43	0.20

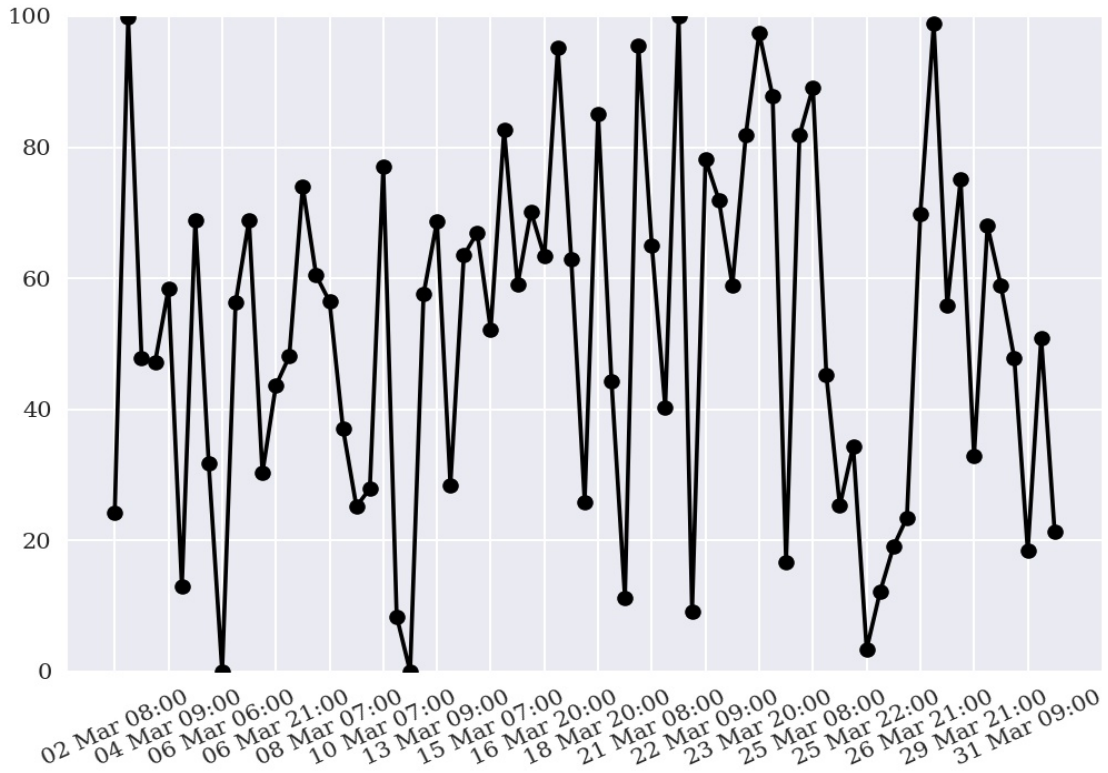
Overall Skill Score

Skill Score	Value
Proportion Correct	0.299
Kuiper Skill Score	-0.035
Heidke Skill Score	-0.031

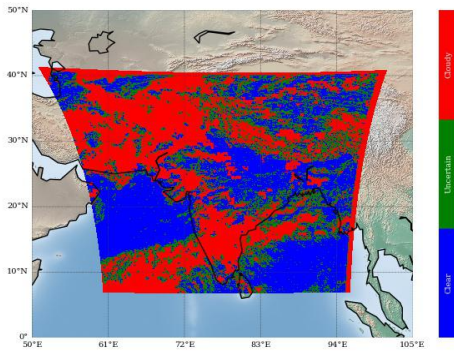
Number of Collocations for Mar-2016



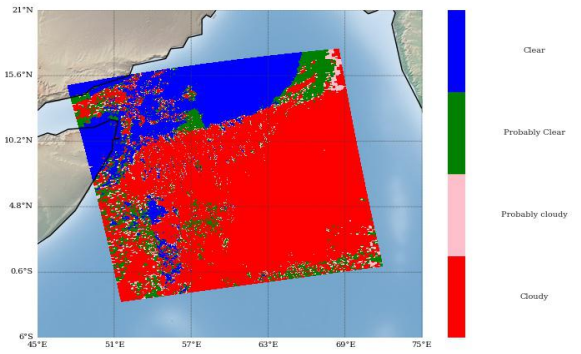
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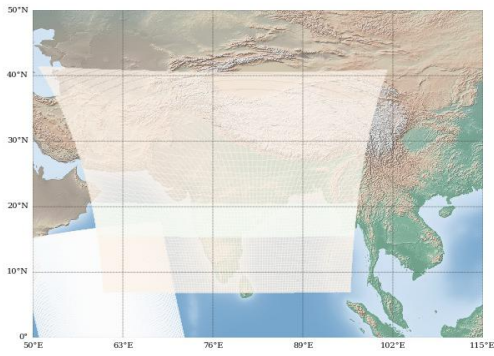
INSAT-3D Sounder Cloud Mask on
02 March, 2016 09:00 UTC



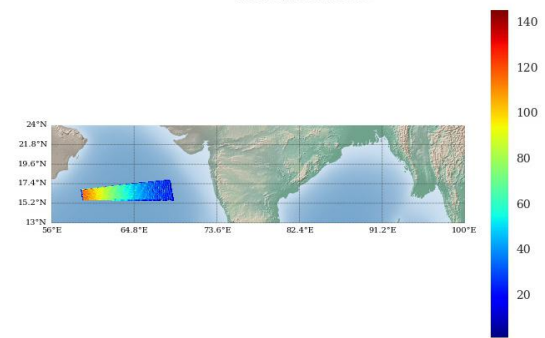
Modis Cloud Mask on
02 March, 2016 09:30 UTC



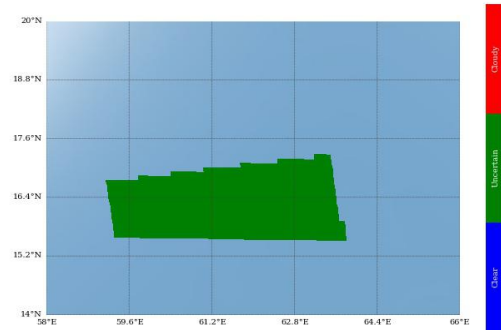
MODIS pass over INSAT-3D Sounder on
02 March, 2016 09:30 UTC



Number of Modis Pixels per Sounder Pixels on a
spatially and Temporally Collocated Domain on
02 March, 2016 09:30 UTC



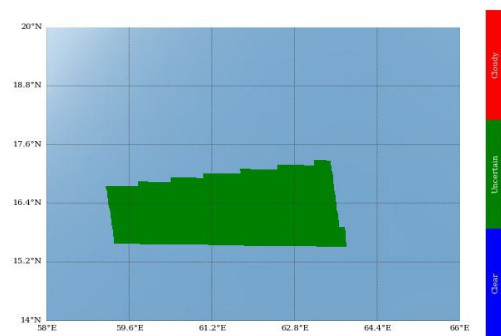
Modis Cloud Mask on Sounder Grid
Method 1 : Mode of Modis pixels



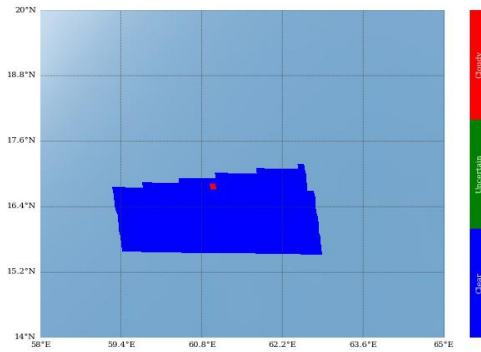
Modis Cloud Mask on Sounder Grid
Method 2 : Weighted Average



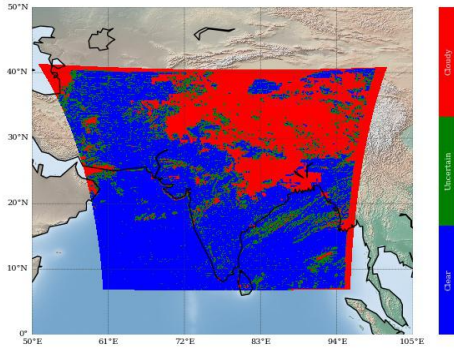
Modis Cloud Mask on Sounder Grid
Method 3 : Weighted Product Average



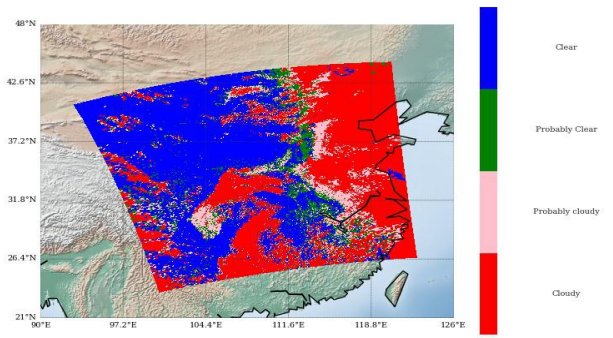
Sounder Cloud Flag on Collocated Area



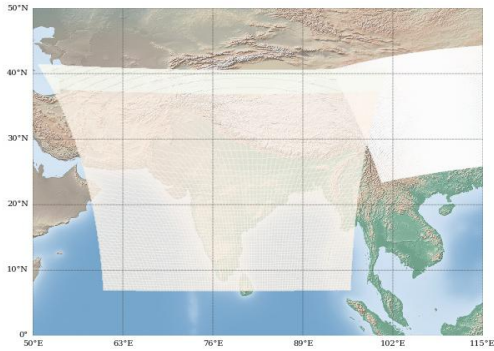
INSAT-3D Sounder Cloud Mask on
06 March, 2016 06:00 UTC



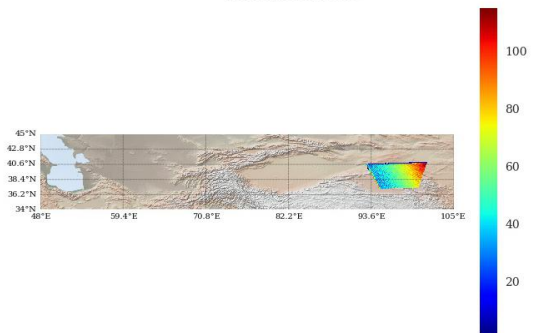
Modis Cloud Mask on
06 March, 2016 05:55 UTC



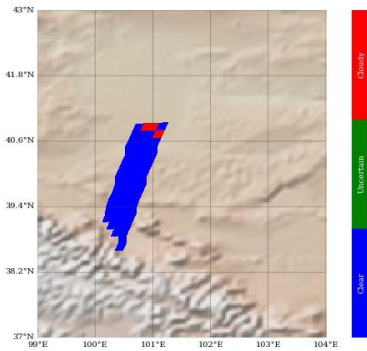
MODIS pass over INSAT-3D Sounder on
06 March, 2016 05:55 UTC



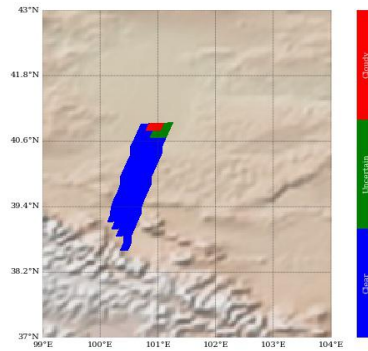
Number of Modis Pixels per Sounder Pixels on a
spatially and Temporally Collocated Domain on
06 March, 2016 05:55 UTC



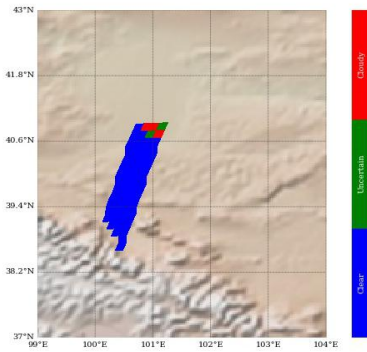
Modis Cloud Mask on Sounder Grid
Method 1 : Mode of Modis pixels



Modis Cloud Mask on Sounder Grid
Method 2 : Weighted Average



Modis Cloud Mask on Sounder Grid
Method 3 : Weighted Product Average



Sounder Cloud Flag on Collocated Area

