

GCOM-W1 AMSR2 積雪深プロダクトの検証

1. 衛星フットプリントサイズの検証領域における集中検証観測実験

集中検証観測実験として、シベリア検証領域にて取得されたデータを用いて、AMSR2 レベル2 積雪深プロダクトのデータ値を検証する。

a. 参照データ

シベリア検証領域内には7地点の積雪観測サイトが設置されている。シベリア検証領域のサイト配置を図1-1に、サイトのリストを表1-1に示す。

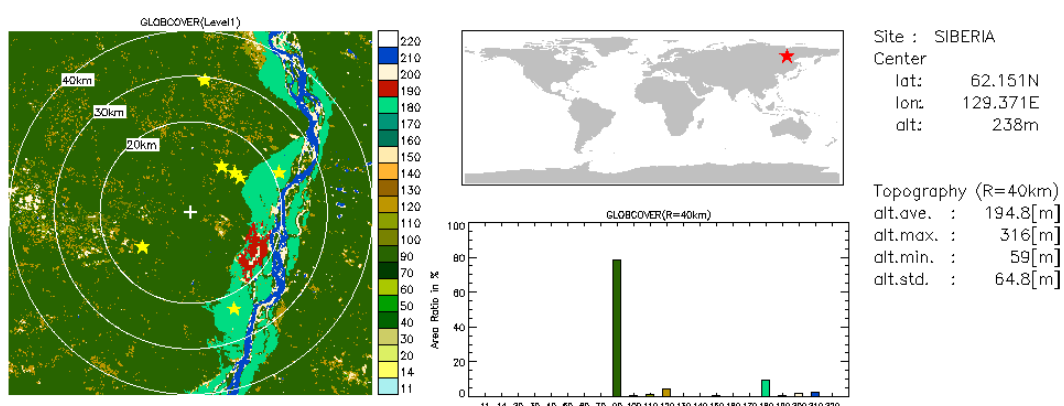


図1-1 シベリア検証領域のサイトマップ

表1-1 シベリア検証領域のサイトリスト

Site No	Site名	緯度	経度
101	Larch	62.15'18"	129.37'08"
102	Pine	62.14'29"	129.39'02"
103	Tulagino	62.15'18"	129.52'12"
202	Molot	62.16'14"	129.32'49"
203	Khatassy	61.54'17"	129.36'58"
204	Viluy	62.03'50"	129.05'57"
205	Namsky	62.29'33"	129.26'56"

b. 検証手法

<検証条件>

- ・ シベリア検証領域のサイト数は7地点である。ここでは領域内の複数地点データを用いた面的な検証を行う。
- ・ シベリア検証領域の中心は以下とする
緯度：N 62. 151°
経度：E 129. 271°
- ・ マッチアップの空間的条件は、地点中心から距離差「7 km以内」でAMS R 2 同一パス内での再近隣データとする。
- ・ マッチアップの時間的条件は、地上観測データが2時間間隔であることから「±1時間以内」とする。
- ・ AMS R 2 データは、Data Quality コードが「0」: Snow possible」のみを検証対象とする。
- ・ シベリア検証領域の観測データは、同一時刻に5地点以上（欠損2割までを許容）で取得されたデータの平均値を検証対象とする。
- ・ AMS R 2 データについて、降交（Descending）および昇交（Ascending）に分けて検証を行う。

2. 多様な気候条件下での長期観測データによる検証

全球に分布した様々な地表面における検証として、WMO（World Meteorological Organization：世界気象機関）に登録された気象官署の地点観測データを用いてAMSR 2 レベル2 積雪深プロダクトのデータ値を検証する。

a. 参照データ

積雪深の参照データとして、WMOに登録された気象官署の地点観測データのうち以下に示す条件を考慮して地点を選定した。

- ・ 北半球に位置する
- ・ 半径40 km以内にある水域が10%以下である
- ・ 冬期にAMSR 2 積雪深データとの比較が100回以上できる

この条件で選定されたWMO地点は1007点である。それぞれの地点位置を図2-1に赤丸印で、地点情報のリストを表2-1に示す。

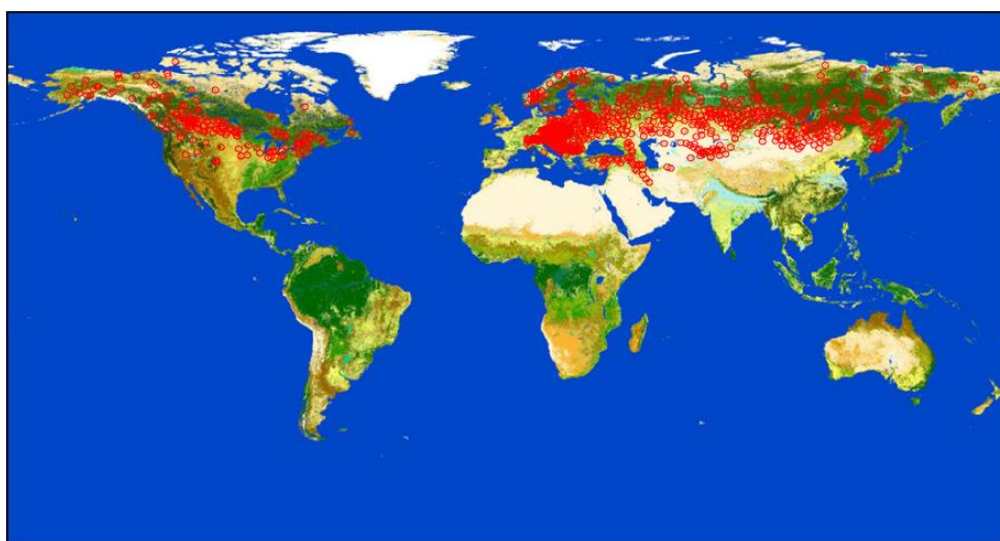


図2-1 検証用WMO地点マップ

表 2－1 検証用WMO地点リスト（1／5）

WMO ID	LAT	LON	Land Type	Coverage(%)	WMO ID	LAT	LON	Land Type	Coverage(%)
gts_010230.99999	69.067	18.533	150	42.354	gts_116430.99999	50.667	15.75	50	24.559
gts_010580.99999	69.567	23.533	150	90.192	gts_116520.99999	50.017	15.733	14	33.889
gts_010650.99999	69.467	25.517	150	86.828	gts_116590.99999	49.583	15.767	14	30.999
gts_011990.99999	68.75	23.533	150	75.409	gts_116790.99999	49.983	16.433	14	24.768
gts_012310.99999	62.233	8.367	150	57.738	gts_116830.99999	49.733	16.033	14	32.243
gts_012380.99999	62.117	9.283	150	71.145	gts_116920.99999	49.167	16.117	14	39.049
gts_012450.99999	62.6	9.667	150	70.726	gts_116930.99999	49.1	16.133	14	39.904
gts_012520.99999	62.817	10.017	150	57.269	gts_116980.99999	48.883	16.082	14	43.538
gts_012880.99999	62.567	11.383	150	68.411	gts_117100.99999	49.65	16.95	14	29.55
gts_013640.99999	60.517	8.217	150	67.8	gts_117230.99999	49.15	16.7	14	31.863
gts_013670.99999	60.983	9.233	150	37.523	gts_117300.99999	50.183	17.117	50	23.274
gts_013720.99999	60.567	9.133	90	44.556	gts_117480.99999	49.417	17.4	14	31.443
gts_013740.99999	60.933	10.033	90	45.928	gts_117660.99999	49.767	17.55	14	30.306
gts_013800.99999	61.65	10.117	150	56.627	gts_117740.99999	49.317	17.567	14	27.991
gts_013890.99999	61.167	11.45	90	53.855	gts_117820.99999	49.683	18.117	14	21.497
gts_013920.99999	60.617	12.017	90	60.959	gts_117870.99999	49.55	18.45	50	25.529
gts_014320.99999	58.883	6.85	150	56.683	gts_118160.99999	48.2	17.2	20	35.519
gts_014730.99999	59.617	9.633	90	51.34	gts_118260.99999	48.617	17.833	14	32.073
gts_014740.99999	59.9	9.533	90	55.549	gts_118410.99999	49.233	18.617	50	31.674
gts_020200.99999	68.417	18.167	150	51.762	gts_118550.99999	48.283	18.133	14	36.63
gts_020800.99999	68.45	22.45	150	43.108	gts_118580.99999	47.867	18.2	20	43.279
gts_020960.99999	67.217	23.4	90	43.23	gts_118670.99999	48.767	18.6	50	42.754
gts_021040.99999	65.8	15.1	150	63.661	gts_118800.99999	48.167	18.867	50	32.963
gts_021280.99999	65.016	17.683	90	48.35	gts_119030.99999	48.65	19.15	50	40.426
gts_021540.99999	65.883	20.15	90	69.248	gts_119160.99999	48.983	19.6	70	35.536
gts_022060.99999	63.3	12.117	150	68.307	gts_119270.99999	48.333	19.733	50	51.042
gts_023240.99999	62.017	14.367	90	56.204	gts_119300.99999	49.2	20.217	70	29.24
gts_025660.99999	57.4	15.817	90	33.33	gts_119330.99999	49.117	20.083	70	34.226
gts_026200.99999	56.967	13.067	90	40.221	gts_119340.99999	49.067	20.25	70	30.961
gts_028050.99999	69.75	27.033	150	93.516	gts_119380.99999	48.85	20.183	50	31.041
gts_028230.99999	67.967	23.683	90	54.44	gts_119680.99999	48.667	21.217	50	38.441
gts_028360.99999	67.367	26.65	90	47.587	gts_119760.99999	49.217	21.65	50	41.505
gts_028440.99999	66.8	24	90	38.291	gts_119780.99999	48.667	21.733	14	31.643
gts_028490.99999	66.833	28.683	100	39.697	gts_119930.99999	48.933	22	50	36.508
gts_028660.99999	65.4	26.967	90	38.509	gts_121850.99999	54.067	21.367	50	24.561
gts_029130.99999	63.1	23.033	150	25.921	gts_121950.99999	54.133	22.95	14	28.627
gts_029420.99999	61.85	22.467	90	37.047	gts_122100.99999	53.767	15.417	14	30.361
gts_029630.99999	60.817	23.5	150	35.052	gts_122120.99999	53.783	15.817	14	28.676
gts_066120.99999	47.083	6.8	50	32.119	gts_122300.99999	53.133	16.75	14	27.114
gts_066310.99999	46.933	7.417	50	29.071	gts_122380.99999	53.117	17.967	14	32.832
gts_066800.99999	47.25	9.35	50	23.258	gts_122500.99999	53.05	18.583	14	34.165
gts_067200.99999	46.217	7.333	150	17.951	gts_122700.99999	53.1	20.35	14	38.797
gts_067350.99999	46.5	7.567	50	20.053	gts_122720.99999	53.767	20.417	50	21.906
gts_067500.99999	46.65	8.617	150	20.473	gts_122950.99999	53.1	23.167	14	25.699
gts_067530.99999	46.517	8.683	150	20.651	gts_123000.99999	52.75	15.283	14	20.144
gts_067820.99999	46.7	8.85	150	21.251	gts_123260.99999	52.333	16.967	14	40.943
gts_067830.99999	46.467	9.183	50	19.518	gts_123300.99999	52.417	16.85	14	39.533
gts_067840.99999	46.817	9.85	150	22.606	gts_123450.99999	52.2	18.667	14	41.336
gts_067860.99999	46.867	9.533	70	17.706	gts_123600.99999	52.583	19.733	14	36.502
gts_067920.99999	46.533	9.883	150	25.16	gts_123750.99999	52.167	20.967	14	31.788
gts_067940.99999	46.35	10.067	150	22.387	gts_123850.99999	52.25	22.25	14	38.808
gts_067980.99999	46.8	10.283	150	26.548	gts_123990.99999	52.067	23.617	14	28.844
gts_074970.99999	45.617	6.767	150	20.357	gts_124000.99999	51.933	15.533	14	23.857
gts_106870.99999	49.7	11.95	50	22.626	gts_124150.99999	51.2	16.2	14	40.74
gts_108530.99999	48.717	11.217	14	36.659	gts_124180.99999	51.833	16.533	14	39.014
gts_110100.99999	48.233	14.183	14	26.162	gts_124240.99999	51.1	16.883	14	43.254
gts_110120.99999	48.05	14.133	14	24.535	gts_124280.99999	51.1	16.883	14	43.254
gts_110150.99999	48.5	14.5	50	29.54	gts_124350.99999	51.783	18.083	14	38.109
gts_110190.99999	48.683	15.367	14	29.43	gts_124540.99999	51.55	19.183	14	35.961
gts_110210.99999	48.95	15.033	14	27.47	gts_124550.99999	51.217	18.567	14	34.693
gts_110300.99999	48.317	16.117	14	35.869	gts_124650.99999	51.733	19.4	14	38.569
gts_110780.99999	48.033	15.583	50	30.287	gts_124690.99999	51.35	19.867	14	28.839
gts_111050.99999	47.267	9.617	50	22.937	gts_124880.99999	51.567	21.55	14	35.125
gts_111100.99999	47.133	10.233	150	20.448	gts_124950.99999	51.217	22.4	14	41.577
gts_111200.99999	47.267	11.35	70	29.749	gts_124970.99999	51.55	23.533	20	26.201
gts_111260.99999	47.217	11.467	70	26.442	gts_125000.99999	50.9	15.8	14	24.176
gts_111270.99999	46.867	11.033	70	20.411	gts_125100.99999	50.733	15.733	50	25.888
gts_111280.99999	47	11.517	70	25.99	gts_125200.99999	50.433	16.617	14	24.823
gts_111360.99999	47.233	12.183	70	20.487	gts_125300.99999	50.8	17.967	14	28.28
gts_111380.99999	47.133	12.633	70	18.859	gts_125400.99999	50.05	18.2	14	31.11
gts_111410.99999	47.4	13.217	70	30.402	gts_125500.99999	50.817	19.1	14	24.683
gts_111420.99999	47.317	13.183	70	27.86	gts_125560.99999	50.083	19.783	14	33.373
gts_111440.99999	47.333	12.8	70	24.394	gts_125600.99999	50.233	19.033	20	21.654
gts_111460.99999	47.05	12.95	70	23.262	gts_125660.99999	50.083	19.8	14	33.614

表 2-1 検証用WMO地点リスト (2/5)

WMO ID	LAT	LON	Land Type	Coverage(%)	WMO ID	LAT	LON	Land Type	Coverage(%)
gts_132850.99999	44.75	21.517	50	30.214	gts_232190.99999	67.083	59.383	150	80.203
gts_132890.99999	44.117	21.95	50	49.769	gts_232260.99999	67.483	64.016	150	94.354
gts_132950.99999	44.233	22.55	50	28.473	gts_234050.99999	65.433	52.267	90	56.787
gts_133610.99999	43.15	19.133	50	26.458	gts_234120.99999	65.967	56.917	90	45.167
gts_133630.99999	43.35	19.35	50	36.526	gts_234180.99999	65.117	57.1	90	46.424
gts_133670.99999	43.733	19.717	50	50.487	gts_234260.99999	65.382	64.717	90	35.145
gts_133690.99999	43.283	20	50	37.914	gts_234720.99999	65.783	87.933	90	68.271
gts_133780.99999	43.283	20.8	50	48.962	gts_235270.99999	64.283	60.883	90	47.638
gts_133840.99999	43.933	21.383	50	37.076	gts_235520.99999	64.917	77.817	150	49.611
gts_133970.99999	43.017	22.75	50	53.027	gts_236060.99999	63.55	53.817	90	64.399
gts_134590.99999	42.767	18.95	30	28.523	gts_236250.99999	63.65	62.1	90	56.471
gts_134650.99999	42.833	19.533	50	23.923	gts_236310.99999	63.933	65.05	150	33.612
gts_135770.99999	41.533	20.7	50	46.271	gts_236780.99999	63.15	87.95	90	80.483
gts_140080.99999	46.383	13.85	50	32.354	gts_237010.99999	62.983	50.9	90	54.546
gts_140150.99999	46.067	14.517	50	48.744	gts_237110.99999	62.7	56.2	90	56.869
gts_140240.99999	46.067	15.283	50	49.634	gts_237240.99999	62.433	60.867	90	58.491
gts_140260.99999	46.483	15.683	50	34.667	gts_237340.99999	62.45	66.05	90	47.817
gts_140310.99999	46.65	16.183	50	31.853	gts_238030.99999	61.683	53.683	90	49.633
gts_142320.99999	45.5	15.567	50	51.22	gts_238040.99999	61.717	50.833	90	43.316
gts_142340.99999	46.133	15.883	50	34.763	gts_238840.99999	61.6	90.017	90	83.024
gts_142350.99999	45.917	15.967	50	34.502	gts_238910.99999	61.667	96.367	90	86.954
gts_142410.99999	45.733	16.067	50	38.826	gts_239090.99999	60.283	54.35	90	48.27
gts_142440.99999	45.5	16.367	50	48.029	gts_239140.99999	60.4	56.517	90	28.161
gts_142460.99999	46.3	16.383	14	31.625	gts_239210.99999	60.683	60.45	90	38.656
gts_142560.99999	45.883	17.2	14	33.625	gts_239330.99999	61.017	69.033	150	47.571
gts_143280.99999	45.267	15.233	50	46.957	gts_239550.99999	60.433	77.867	90	36.126
gts_145420.99999	44.783	17.217	50	42.585	gts_239660.99999	60.35	84.083	90	66.625
gts_145440.99999	44.067	17.467	50	33.484	gts_239730.99999	61.033	89.633	90	80.947
gts_145570.99999	44.55	18.7	50	46.209	gts_239750.99999	60.35	88.367	90	78.569
gts_146400.99999	43.833	17.017	14	33.613	gts_239870.99999	60.25	90.233	90	78.815
gts_146500.99999	43.767	18.033	50	34.097	gts_241250.99999	68.5	112.433	150	45.452
gts_146520.99999	43.717	18.267	50	30.473	gts_241430.99999	68.733	124	90	81.945
gts_146540.99999	43.867	18.433	50	31.822	gts_242660.99999	67.55	133.383	90	79.761
gts_150040.99999	47.933	23.917	50	38.466	gts_243290.99999	66.25	114.283	90	57.388
gts_150150.99999	47.733	23.95	50	39.381	gts_245070.99999	64.266	100.233	90	85.952
gts_150200.99999	47.733	26.65	20	35.256	gts_246390.99999	63.283	118.333	90	92.986
gts_150900.99999	47.167	27.633	14	36.892	gts_246410.99999	63.767	121.617	90	83.504
gts_151200.99999	46.783	23.567	150	26.791	gts_246560.99999	63.517	129.483	90	76.667
gts_151500.99999	46.533	26.917	14	31.042	gts_246710.99999	63.95	135.867	90	70.876
gts_151700.99999	46.367	25.733	50	33.691	gts_246880.99999	63.25	143.15	90	67.874
gts_152000.99999	46.133	21.35	20	33.583	gts_247240.99999	63.033	112.5	90	87.71
gts_152800.99999	45.45	25.45	50	34.468	gts_247380.99999	62.15	117.65	90	96.759
gts_153460.99999	45.1	24.367	50	47.718	gts_247680.99999	62.033	132.6	90	95.562
gts_154200.99999	44.483	26.117	20	40.272	gts_248170.99999	61.267	108.017	90	85.837
gts_154500.99999	44.317	23.867	14	36.671	gts_248560.99999	61.483	129.15	90	78.933
gts_154700.99999	44.1	24.983	20	40.893	gts_249080.99999	60.333	102.267	90	96.164
gts_155010.99999	44.167	22.8	14	28.527	gts_249230.99999	60.717	114.883	90	96.05
gts_155020.99999	43.817	22.883	50	28.969	gts_249440.99999	60.4	120.417	90	83.99
gts_155050.99999	43.2	23.533	50	48.789	gts_249510.99999	60.817	125.317	90	95.293
gts_155110.99999	43.817	23.25	20	38.25	gts_249590.99999	62.017	129.717	90	74.599
gts_155140.99999	43.683	23.967	20	39.711	gts_249620.99999	60.9	131.983	90	93.88
gts_155250.99999	43.133	24.717	50	44.628	gts_249660.99999	60.383	134.45	90	93.816
gts_155280.99999	43.4	24.6	20	32.095	gts_249880.99999	60.083	142.333	90	72.263
gts_155300.99999	43.083	25.65	50	41.912	gts_252480.99999	67.25	167.967	150	45.963
gts_155330.99999	43.617	25.35	20	44.174	gts_253250.99999	66.55	159.417	90	66.184
gts_155350.99999	43.85	25.95	20	40.872	gts_254000.99999	65.733	150.9	90	80.95
gts_155490.99999	43.517	26.533	20	34.915	gts_254280.99999	65.233	160.533	90	52.725
gts_156000.99999	42.833	23.667	50	66.776	gts_255510.99999	64.683	170.417	180	32.397
gts_156050.99999	42.933	22.933	50	52.044	gts_257030.99999	62.917	152.417	90	77.889
gts_156130.99999	42.583	23.267	50	47.41	gts_257440.99999	62.433	166.083	110	36.814
gts_156140.99999	42.65	23.383	50	54.07	gts_260940.99999	59.65	33.55	50	37.317
gts_156270.99999	42.667	24.833	50	55.423	gts_261340.99999	58.967	24.733	50	40.121
gts_160080.99999	46.75	10.533	150	24.025	gts_261350.99999	58.817	25.417	50	36.784
gts_160140.99999	46.883	11.433	70	25.889	gts_261410.99999	59.133	26.233	50	37.655
gts_160210.99999	46.3	11.783	70	32.415	gts_261440.99999	58.75	26.417	50	44.934
gts_160220.99999	46.15	11.033	70	26.488	gts_261670.99999	58.567	29.8	50	56.237
gts_160330.99999	46.733	12.217	70	32.15	gts_262330.99999	58.367	25.6	50	38.757
gts_160400.99999	46.5	13.583	70	31.793	gts_262420.99999	58.3	26.733	50	39.017
gts_161140.99999	44.383	7.817	50	53.005	gts_262470.99999	57.783	26.033	50	37.835
gts_162190.99999	42.467	12.983	50	39.411	gts_262490.99999	57.85	27.017	50	46.253
gts_170840.99999	40.55	34.95	30	44.441	gts_262580.99999	57.817	28.417	50	50.69
gts_170860.99999	40.3	36.567	30	29.306	gts_262980.99999	57.9	34.05	100	39.094
gts_170880.99999	40.467	39.467	30	37.613	gts_263480.99999	57.133	26.717	50	49.5
gts_170900.99999	39.75	37.017	30	49.413	gts_263590.99999	57.017	28.9	50	64.699

表 2-1 検証用WMO地点リスト (3/5)

WMO ID	LAT	LON	Land Type	Coverage(%)	WMO ID	LAT	LON	Land Type	Coverage(%)
gts_268780_99999	53.45	31.017	20	30.049	gts_292820_99999	58.383	97.45	90	47.744
gts_268820_99999	53.933	32.833	50	28.512	gts_293130_99999	57.533	79.367	90	60.798
gts_268870_99999	53.35	32.067	50	27.469	gts_293280_99999	57.083	81.917	90	35.27
gts_268980_99999	53.25	34.317	50	25.52	gts_293480_99999	57.067	86.217	150	56.648
gts_269410_99999	53.117	26	20	24.386	gts_294050_99999	56.6	76.567	50	36.07
gts_269510_99999	53.033	27.55	20	33.737	gts_294180_99999	56.35	78.35	20	32.695
gts_269610_99999	53.217	29.183	20	23.598	gts_294300_99999	56.5	84.917	150	41.832
gts_269660_99999	52.9	30.033	20	33.437	gts_294670_99999	56.283	90.5	150	58.185
gts_269970_99999	52.583	33.767	50	30.839	gts_294710_99999	56.9	93.133	50	39.476
gts_270370_99999	59.317	39.917	50	38.199	gts_294810_99999	56.85	95.217	90	26.031
gts_270510_99999	59.883	42.75	50	51.754	gts_295240_99999	55.85	80.033	20	39.293
gts_270660_99999	59.533	45.467	100	48.516	gts_295510_99999	56.217	87.75	150	73.002
gts_270830_99999	59.85	48.283	50	51.195	gts_295530_99999	56.233	89.583	150	69.913
gts_271990_99999	58.6	49.633	150	38.073	gts_295570_99999	55.75	88.317	150	69.812
gts_272080_99999	57.8	35.883	50	41.374	gts_295620_99999	56.1	91.667	50	31.089
gts_272420_99999	58.483	41.533	50	58.084	gts_295700_99999	56.033	92.75	90	39.488
gts_272520_99999	58.35	43.383	50	41.771	gts_295810_99999	56.2	95.633	110	26.15
gts_272710_99999	58.367	45.533	50	55.689	gts_295940_99999	55.95	98	90	44.516
gts_273290_99999	57.2	39.417	50	25.382	gts_296020_99999	55.283	76.6	20	60.018
gts_273690_99999	57.133	45.167	50	33.432	gts_296050_99999	55.2	75.967	20	62.176
gts_273730_99999	57.667	46.633	50	49.219	gts_296120_99999	55.333	78.367	20	46.612
gts_273930_99999	57.55	49.95	20	26.736	gts_296250_99999	55.1	80.967	20	48.514
gts_274020_99999	56.9	35.883	20	19.506	gts_296310_99999	55.3	82.75	20	32.215
gts_274590_99999	56.267	44	20	21.11	gts_296360_99999	55.233	84.4	20	42.715
gts_275320_99999	56.117	40.35	50	26.975	gts_296420_99999	55.233	86.117	50	36.187
gts_276120_99999	55.833	37.617	190	27.319	gts_296530_99999	55.3	89.817	150	92.981
gts_276480_99999	54.95	41.767	50	29.423	gts_296540_99999	55.217	87.65	50	48.775
gts_276650_99999	55.033	44.5	20	33.994	gts_296750_99999	55.083	93.367	90	60.337
gts_276790_99999	54.817	46.583	20	29.224	gts_296760_99999	55.25	94.883	50	29.976
gts_277030_99999	54.567	36.4	20	38.768	gts_296980_99999	54.883	99.033	90	45.051
gts_277070_99999	54.1	35.583	20	36.6	gts_297060_99999	54.367	77.283	30	47.772
gts_277190_99999	54.233	37.617	20	46.578	gts_297240_99999	54.3	80.5	20	52.281
gts_277300_99999	54.633	39.7	20	34.333	gts_297360_99999	54.333	84.217	50	61.454
gts_278230_99999	53.783	39.25	20	50.332	gts_297590_99999	54.333	89.283	150	56.982
gts_278570_99999	53.483	42.633	20	44.951	gts_297660_99999	54.367	92.133	110	35.041
gts_279060_99999	52.933	36	20	48.107	gts_297890_99999	54.217	96.967	90	60.02
gts_279280_99999	52.633	38.517	20	50.172	gts_298020_99999	53.817	76.533	30	60.156
gts_279470_99999	52.8	41.333	20	44.291	gts_298070_99999	53.35	75.45	30	56.11
gts_280090_99999	59.367	52.217	100	47.446	gts_298130_99999	53.967	79.233	20	46.234
gts_280440_99999	59.6	60.533	90	35.21	gts_298140_99999	53.7	78.067	30	53.552
gts_280490_99999	59.433	62.333	50	34.892	gts_298270_99999	53.267	80.767	20	40.199
gts_280760_99999	59.6	69.283	90	29.503	gts_298380_99999	53.433	83.517	20	28.355
gts_281160_99999	58.983	54.65	150	43.844	gts_298460_99999	53.817	86.883	50	42.745
gts_281440_99999	58.867	60.783	50	41.482	gts_298640_99999	53.717	90.367	150	86.48
gts_282140_99999	58.133	52.583	50	30.356	gts_298690_99999	53.3	92.417	90	34.875
gts_282160_99999	58.083	54.683	20	24.327	gts_299230_99999	53.067	82.3	20	44.721
gts_282400_99999	57.883	60.067	50	30.935	gts_299370_99999	52.517	82.767	30	38.396
gts_282550_99999	58.05	63.683	50	49.359	gts_299390_99999	52.683	84.95	20	32.433
gts_282750_99999	58.15	68.25	150	41.741	gts_299560_99999	52.8	89.917	150	34.486
gts_283340_99999	57.35	58.217	50	58.681	gts_300540_99999	59.45	112.583	90	90.639
gts_283670_99999	57.117	65.433	150	48.787	gts_301570_99999	58.317	112.867	90	86.752
gts_283820_99999	57.717	57.683	50	51.234	gts_302300_99999	57.767	108.067	90	84.631
gts_283830_99999	57.517	72.4	50	30.777	gts_302520_99999	57.817	114.167	90	87.627
gts_284110_99999	56.833	53.45	20	27.113	gts_302530_99999	57.85	114.233	90	88.152
gts_284190_99999	56.267	54.9	20	33.587	gts_303280_99999	56.05	105.833	90	87.314
gts_284280_99999	56.5	56.133	50	46.738	gts_303370_99999	56.317	107.617	90	78.47
gts_284340_99999	56.65	57.783	150	43.632	gts_303720_99999	56.9	118.267	90	68.373
gts_284400_99999	56.833	60.633	90	28.161	gts_303850_99999	56.583	121.483	90	90.732
gts_284510_99999	56.85	62.717	20	31.466	gts_303930_99999	56.833	124.867	90	94.044
gts_284810_99999	56.817	70.617	20	40.995	gts_304550_99999	55.467	113.617	90	64.536
gts_284910_99999	56.933	72.667	20	31.225	gts_304690_99999	55.117	116.767	90	98.029
gts_284930_99999	56.9	74.383	50	45.792	gts_304930_99999	55.967	124.883	90	85.22
gts_285220_99999	56.083	56.583	50	47.932	gts_304990_99999	55.183	124.667	90	95.579
gts_285410_99999	56.083	60.3	50	53.661	gts_305040_99999	54.6	100.633	90	46.248
gts_285520_99999	56.067	63.65	20	42.754	gts_305210_99999	54.8	105.217	90	76.021
gts_285860_99999	55.867	72.2	20	56.55	gts_305540_99999	54.467	113.583	90	78.09
gts_285930_99999	56.1	74.633	20	56.999	gts_306030_99999	53.933	102.05	90	37.209
gts_285980_99999	55.6	73.483	20	58.704	gts_306220_99999	53.967	105.9	90	66.855
gts_286150_99999	55.183	53.8	20	35.852	gts_306270_99999	53.1	105.533	90	49.378
gts_286210_99999	55.417	55.533	20	35.606	gts_306500_99999	53.2	112.783	90	90.629
gts_286550_99999	55.233	63.317	20	46.564	gts_306730_99999	53.75	119.733	90	94.013
gts_286610_99999	55.467	65.4	20	38.356	gts_306830_99999	53.967	121.933	90	87.958
gts_286660_99999	55.25	67.3	20	48.01	gts_306860_99999	53.467	122.4	90	84.346
gts_286790_99999	54.833	69.15	20	47.471	gts_306920_99999	54	123.967	90	81.232

表 2-1 検証用WMO地点リスト (4/5)

WMO ID	LAT	LON	Land Type	Coverage(%)	WMO ID	LAT	LON	Land Type	Coverage(%)
gts_311370_99999	56.283	131.133	90	81.577	gts_354260_99999	49.15	57.117	150	88.689
gts_312950_99999	53.467	125.817	90	55.283	gts_354970_99999	48.85	72.867	30	37.311
gts_313000_99999	53.7	127.3	90	52.943	gts_355320_99999	48.633	58.5	150	86.407
gts_313290_99999	53.067	132.983	90	94.873	gts_355760_99999	48.3	69.65	150	89.327
gts_313480_99999	53.05	136.033	90	73.944	gts_356710_99999	47.8	67.717	150	50.585
gts_313710_99999	52.783	126	90	57.271	gts_356990_99999	47.45	74.817	200	72.822
gts_313880_99999	52.35	129.917	90	54.58	gts_358490_99999	45.767	62.117	200	58.962
gts_314160_99999	52.417	136.5	90	69.545	gts_359250_99999	45.4	56.117	200	92.446
gts_314390_99999	52.383	140.467	90	50.255	gts_359530_99999	45.5	64.083	200	70.627
gts_314420_99999	51.983	127.65	90	56.349	gts_359690_99999	45.25	67.067	200	95.285
gts_314450_99999	51.45	128.116	110	34.52	gts_360030_99999	52.3	76.933	30	48.174
gts_314740_99999	51.633	133.317	90	67.899	gts_360200_99999	52.5	80.2	14	36.638
gts_314780_99999	52.267	133.983	90	78.198	gts_360210_99999	52.25	79.133	30	34.517
gts_314840_99999	51.417	135.083	90	57.319	gts_360220_99999	52.017	80.367	30	28.984
gts_314890_99999	51.2	136.8	90	40.705	gts_360340_99999	51.5	81.217	30	28.361
gts_315270_99999	50.117	129.467	110	29.2	gts_360380_99999	51.15	82.2	20	27.047
gts_315320_99999	50.867	132.25	90	58.731	gts_360580_99999	51.433	86	50	49.672
gts_315870_99999	49.617	128.65	30	31.981	gts_360610_99999	52.267	87.167	50	61.825
gts_315940_99999	49.417	130.083	110	42.001	gts_360960_99999	51.717	94.5	30	33.46
gts_316240_99999	49.4	133.233	90	45.077	gts_361520_99999	50.867	78.35	150	48.136
gts_317020_99999	49	131.083	90	46.279	gts_361770_99999	50.417	80.3	30	38.378
gts_317070_99999	47.733	130.967	150	35.499	gts_362080_99999	50.333	83.55	50	42.454
gts_317130_99999	48.733	132.95	50	44.335	gts_363970_99999	49.217	81.217	150	87.162
gts_317250_99999	48.617	133.833	110	31.163	gts_365350_99999	48.75	82.367	150	69.815
gts_318320_99999	46.8	134.267	50	34.301	gts_366390_99999	47.117	81.617	140	35.368
gts_318450_99999	46.533	135.317	90	54.04	gts_368210_99999	44.833	76.267	200	85.883
gts_318730_99999	45.867	133.733	110	28.727	gts_368590_99999	44.167	80.067	200	40.002
gts_318780_99999	45.083	133.533	110	26.993	gts_368640_99999	43.533	75.25	150	42.541
gts_319150_99999	44.4	131.383	110	32.703	gts_368700_99999	43.233	76.933	140	29.525
gts_319170_99999	44.033	131.317	110	36.491	gts_369110_99999	42.833	75.283	140	40.43
gts_319390_99999	44.15	133.867	90	33.562	gts_369740_99999	41.433	76	140	28.82
gts_319810_99999	43.967	133.067	90	32.16	gts_369820_99999	41.883	78.233	200	56.688
gts_319870_99999	43.15	133.017	90	39.341	gts_370540_99999	44.233	43.067	20	54.893
gts_330080_99999	52.117	23.683	14	29.238	gts_370610_99999	44.783	44.133	150	42.576
gts_330190_99999	52.117	26.117	50	28.764	gts_372280_99999	43.05	44.65	50	29.296
gts_330270_99999	52.217	27.867	50	17.789	gts_374320_99999	42.35	44.7	50	50.627
gts_330360_99999	51.95	29.167	20	22.783	gts_376820_99999	40.783	43.833	30	40.516
gts_330380_99999	52.25	29.833	50	26.557	gts_377880_99999	40.15	44.383	30	35.812
gts_330410_99999	52.4	30.95	20	29.225	gts_380620_99999	44.85	65.5	200	54.07
gts_330880_99999	51.283	26.617	50	21.58	gts_380690_99999	44.167	66.75	11	56.576
gts_331240_99999	51.817	30.3	20	28.416	gts_381960_99999	43.55	68.9	200	44.092
gts_331350_99999	51.467	31.25	20	38.115	gts_381980_99999	43.267	68.217	200	45.351
gts_331770_99999	50.833	24.317	14	38.565	gts_382220_99999	43.7	73.783	150	41.862
gts_332460_99999	51.05	31.9	20	42.734	gts_383280_99999	42.317	69.7	140	54.347
gts_332610_99999	51.233	33.2	20	43.243	gts_383340_99999	42.483	70.3	140	48.286
gts_332750_99999	50.85	34.667	20	37.668	gts_383410_99999	42.85	71.383	11	63.98
gts_333010_99999	50.583	26.133	20	33.121	gts_383430_99999	42.95	72.75	140	35.276
gts_333170_99999	50.167	27.033	20	37.783	gts_383450_99999	42.517	72.217	140	20.547
gts_333250_99999	50.233	28.733	20	34.633	gts_383530_99999	42.85	74.533	11	44.041
gts_333450_99999	50.4	30.567	20	28.977	gts_384570_99999	41.267	69.267	11	74.16
gts_333770_99999	50	33.017	20	36.066	gts_384620_99999	41.9	70.367	140	35.921
gts_333930_99999	49.817	23.95	20	28.912	gts_385650_99999	40.55	65.683	200	86.019
gts_334150_99999	49.533	25.667	20	43.777	gts_386130_99999	40.917	72.95	11	64.598
gts_334290_99999	49.433	26.983	20	41.22	gts_386160_99999	40.7	72.9	11	63.751
gts_334660_99999	49.667	31	20	36.485	gts_407010_99999	39.333	44.433	30	30.666
gts_335060_99999	49.6	34.55	20	37.402	gts_407030_99999	38.55	44.967	150	39.85
gts_335260_99999	48.967	24.7	14	28.3	gts_407040_99999	38.433	47.067	30	40.417
gts_335620_99999	49.233	28.6	20	38.684	gts_407060_99999	38.083	46.283	150	43.647
gts_335870_99999	48.767	30.233	20	42.358	gts_407080_99999	38.25	48.283	30	30.649
gts_336310_99999	48.633	22.267	14	28.577	gts_407100_99999	37.933	47.533	30	41.937
gts_336580_99999	48.367	25.9	20	28.947	gts_407230_99999	37.467	57.333	200	63.35
gts_336630_99999	48.45	27.783	14	38.617	gts_407260_99999	36.767	45.717	20	28.611
gts_337110_99999	48.517	32.2	20	50.904	gts_407270_99999	36.25	46.267	30	35.832
gts_337610_99999	47.85	30.267	20	43.278	gts_407290_99999	36.683	48.483	150	41.132
gts_337910_99999	48.033	33.217	20	44.298	gts_407400_99999	37.067	58.5	200	60.894
gts_338150_99999	47.017	28.983	20	30.472	gts_407680_99999	34.85	48.533	150	52.009
gts_340090_99999	51.767	36.167	20	44.057	gts_407830_99999	33.4	49.683	150	43.734
gts_340470_99999	51.833	41.483	20	61.496	gts_407980_99999	32.283	50.85	150	51.415
gts_341230_99999	51.7	39.217	20	44.236	gts_442030_99999	51.117	99.667	140	25.849
gts_341520_99999	51.55	43.15	20	57.506	gts_442120_99999	49.8	92.083	200	72.687
gts_341860_99999	51.367	48.3	150	36.561	gts_442130_99999	49.65	94.4	150	31.335
gts_342470_99999	50.417	41.05	20	55.953	gts_442140_99999	48.933	89.933	200	86.05
gts_343000_99999	49.967	36.133	20	34.18	gts_442150_99999	49.017	91.717	200	78.094
gts_343360_99999	49.933	40.567	20	49.311	gts_442180_99999	48.017	91.567	200	91.377

表 2-1 検証用WMO地点リスト (5/5)

WMO ID	LAT	LON	Land Type	Coverage(%)	WMO ID	LAT	LON	Land Type	Coverage(%)
gts_443020.99999	47.783	112.117	30	62.28	gts_714580.99999	53.517	-112.1	140	29.197
gts_443040.99999	47.317	110.633	150	65.564	gts_714800.99999	65.283	-126.75	90	30.882
gts_443050.99999	46.683	113.283	150	71.566	gts_714860.99999	52.933	-118.033	150	37.182
gts_443130.99999	47.617	118.617	30	47.239	gts_714910.99999	66.233	-128.65	150	25.471
gts_443140.99999	47.167	115.633	150	55.026	gts_714920.99999	69.183	-122.35	150	98.273
gts_443170.99999	45.9	115.367	30	52.267	gts_715140.99999	50.433	-104.667	140	42.374
gts_443290.99999	44.617	98.7	200	99.977	gts_715150.99999	50.55	-103.65	140	34.624
gts_443360.99999	45.45	103.9	200	99.7	gts_715510.99999	51.483	-107.05	140	32.759
gts_443380.99999	44.65	102.167	200	99.059	gts_715640.99999	49.183	-98.083	70	22.993
gts_443410.99999	45.767	106.283	200	97.116	gts_715690.99999	50.2	-104.7	140	45.382
gts_443470.99999	44.417	105.317	200	99.24	gts_715830.99999	68.25	-122.1	150	99.056
gts_443520.99999	45.733	112.367	200	59.982	gts_715850.99999	56.65	-111.217	90	81.31
gts_443540.99999	44.9	110.117	200	99.917	gts_715900.99999	47.417	-68.317	50	70.53
gts_443580.99999	43.733	111.9	200	99.257	gts_716110.99999	45.367	-71.817	50	75.808
gts_443730.99999	43.583	104.417	200	98.78	gts_716140.99999	45.167	-73.683	50	40.314
gts_701740.26533	66.917	-151.517	90	29.505	gts_716220.99999	43.017	-81.15	140	34.088
gts_701780.26529	65.167	-152.1	90	40.338	gts_716280.99999	45.317	-75.667	50	44.721
gts_702220.99999	64.733	-156.933	110	34.094	gts_716420.99999	47.817	-83.35	100	47.737
gts_702310.26510	62.95	-155.6	90	41.187	gts_716680.99999	45.917	-66.6	100	46.471
gts_702312.99999	62.5	-153.9	150	30.098	gts_716800.99999	63.6	-113.85	90	21.413
gts_702550.99999	61.967	-151.183	90	33.467	gts_716840.99999	50.067	-122.933	90	26.453
gts_702615.99999	64.833	-147.617	90	42.123	gts_717000.99999	45.867	-66.533	100	44.53
gts_702647.99999	63.883	-149.017	110	34.799	gts_717030.99999	47.15	-67.833	50	58.608
gts_702650.99999	64.65	-147.067	90	50.558	gts_717140.99999	46.783	-71.367	50	59.776
gts_702711.99999	61.817	-158.383	110	38.337	gts_717260.99999	47.917	-74.617	90	47.119
gts_702745.99999	61.75	-150.05	90	60.955	gts_717270.99999	48.333	-71	100	39.879
gts_702910.26412	62.967	-141.933	90	46.108	gts_717350.99999	47.7	-79.85	90	24.057
gts_702913.99999	62.4	-143	150	46.499	gts_717390.99999	48.567	-81.367	90	39.552
gts_710200.99999	61.25	-123.75	90	41.248	gts_717430.99999	57.917	-72.983	150	52.338
gts_710210.99999	61.25	-124.467	150	32.232	gts_717540.99999	52.767	-108.25	140	30.164
gts_710240.99999	58.383	-116.033	110	27.037	gts_718310.99999	49.417	-82.467	100	35.123
gts_710260.99999	50.017	-110.717	140	30.95	gts_718320.99999	49.75	-84.167	100	47.583
gts_710280.99999	51.667	-124.4	90	39.843	gts_718400.99999	49.4	-98.317	140	26.906
gts_710430.99999	65.283	-126.8	90	31.636	gts_718490.99999	49.917	-97.233	70	51.58
gts_710440.99999	67.567	-139.833	110	21.848	gts_718600.99999	51.1	-114.367	140	22.37
gts_710600.99999	52.467	-116.067	70	46.871	gts_718610.99999	50.383	-102.683	140	35.416
gts_710610.99999	54.1	-114.45	30	25.198	gts_718620.99999	49.217	-102.967	140	42.578
gts_710620.99999	53	-115.117	90	30.623	gts_718680.99999	52.817	-102.317	70	35.172
gts_710630.99999	45.383	-75.717	50	47.238	gts_718690.99999	53.217	-105.667	70	24.429
gts_710660.99999	58.617	-117.167	90	52.026	gts_718710.99999	53.317	-110.067	140	32.777
gts_710680.99999	56.233	-117.433	120	40.395	gts_718720.99999	50.017	-110.717	140	30.95
gts_711040.99999	52.183	-122.05	90	60.954	gts_718760.99999	52.767	-108.25	140	30.164
gts_711180.99999	52.817	-111.1	140	36.18	gts_718770.99999	51.117	-114.017	140	29.164
gts_711220.99999	51.2	-115.55	150	42.329	gts_718780.99999	52.183	-113.9	30	29.705
gts_711230.99999	53.317	-113.583	30	29.717	gts_718800.99999	49.617	-115.783	90	48.361
gts_711240.99999	53.55	-114.1	140	26.038	gts_718870.99999	50.7	-120.45	90	46.912
gts_711250.99999	54.133	-108.517	70	32.366	gts_718960.99999	53.883	-122.667	90	48.693
gts_711290.99999	51.517	-109.167	140	29.744	gts_719160.99999	73.217	-119.533	150	94.708
gts_711300.99999	53.333	-104	140	21.817	gts_719280.99999	52.433	-114.917	90	30.595
gts_711310.99999	49.433	-108.983	110	41.511	gts_719300.99999	54.15	-115.783	90	41.06
gts_711350.99999	49.167	-105.983	140	49.079	gts_719340.99999	60.017	-111.967	90	38.818
gts_711380.99999	51.267	-102.467	140	34.288	gts_719400.99999	55.183	-118.883	120	32.315
gts_711390.99999	49.65	-109.517	140	40.59	gts_719430.99999	56.233	-120.733	120	38.888
gts_711400.99999	49.917	-99.95	140	31.949	gts_719450.99999	58.833	-122.6	90	61.677
gts_711490.99999	50.717	-99.533	50	39.554	gts_719460.99999	61.767	-121.233	90	72.974
gts_711550.99999	53.3	-113.6	30	29.961	gts_719500.99999	54.817	-127.183	90	35.47
gts_711560.99999	53.567	-116.467	90	61.783	gts_719510.99999	54.467	-128.583	100	33.217
gts_711570.99999	53.567	-113.517	140	26.75	gts_719630.99999	63.583	-105.15	150	56.041
gts_711830.99999	52.65	-56.867	90	44.29	gts_719640.99999	60.7	-135.067	90	37.947
gts_711990.99999	60.117	-128.817	90	75.063	gts_719660.99999	64.05	-139.133	90	48.376
gts_712120.99999	47.317	-71.15	100	46.339	gts_719770.99999	68.8	-140.083	150	64.542
gts_712220.99999	58.417	-130	90	37.336	gts_719780.99999	69.15	-140.15	150	69.544
gts_712290.99999	56.967	-117.45	90	29.36	gts_719790.99999	53.783	-118.433	90	44.242
gts_712300.99999	55.2	-119.4	120	30.065	gts_719800.99999	61.967	-127.217	150	54.083
gts_712330.99999	53.083	-114.433	50	25.322	gts_724290.93815	39.9	-84.217	14	26.63
gts_712340.99999	50	-113.633	140	31.268	gts_724666.99999	39.567	-104.85	110	20.224
gts_712380.99999	53.683	-112.867	30	22.721	gts_724695.99999	39.717	-104.75	110	22.279
gts_712420.99999	52.45	-113.75	30	30.345	gts_725145.99999	41.7	-74.8	50	38.293
gts_712460.99999	56.533	-115.267	90	65.665	gts_725156.99999	42.167	-76.9	50	36.528
gts_712480.99999	51.767	-114.683	90	21.58	gts_725180.14735	42.75	-73.8	50	76.99
gts_712490.99999	51.7	-113.217	14	37.944	gts_725210.14895	40.917	-81.433	50	29.312
gts_712540.99999	53.033	-112.817	140	29.71	gts_725250.14852	41.25	-80.667	50	52.975
gts_712550.99999	57.033	-111.55	90	72.993	gts_725330.14827	41	-85.2	14	44.078
gts_712870.99999	54.767	-112.817	50	18.288	gts_725335.99999	40.65	-86.15	14	54.163

ここで、WMO地点における積雪深データとして以下の2種類を取得した。

- ・ G T S (Global Telecommunication System) により配信されるWMOに登録された気象官署の地点観測データについて、気象庁においてデコードされ提供されるD C D F (観測報デコードデータファイル) データ
- ・ N O A A / N C D C (National Oceanic and Atmospheric Administration : 米国海洋大気庁 / National Climatic Data Center : 米国気象データセンター) で公開されているG S O D (Global Surface Summary of the Day) データ

このうち、実際の検証作業では選定されたWMO地点において冬期のデータが揃っているG S O Dデータを使用する。

b. 検証方法

<検証条件>

- ・ WMO地点は、予め選定された1007地点である。ここではポイントデータを用いた様々な場所での適用性の確認を行う。
- ・ マッチアップの空間的条件は、地点中心から距離差「7 km以内」でAMS R 2 同一パス内での再近隣データとする。
- ・ マッチアップの時間的条件は、G S O Dデータが1日単位であることから「1日以内」とする。
- ・ AMS R 2データは、Data Quality コードが「0」: Snow possible」のみを検証対象とする。

G S O Dデータの積雪深は「inch」から「cm」に単位変換する。

$$cm = inch \times 2.54$$

- ・ G S O Dデータには積雪深「0 cm」は存在しない。
- ・ G S O Dデータは、積雪深「100 cm」を超える値は検証の対象外とする (AMS R 2 積雪深データの計測範囲が0～100 cmであるため)。
- ・ AMS R 2データについて、降交 (Descending) および昇交 (Ascending) に分けて検証を行う。
- ・ 検証結果として、1年を3シーズン (夏季: 6-9月、厳冬期: 10-2月、融雪期: 3-5月) に分けて統計計算を行う。
- ・ 検証結果として、土地被覆分類に分けて統計計算を行う。ここでは、G L O B C O V E R (Globcover global land cover map) データを使用する。本データの全体図を図2-2に、土地被覆分類の詳細を表2-2に示す。

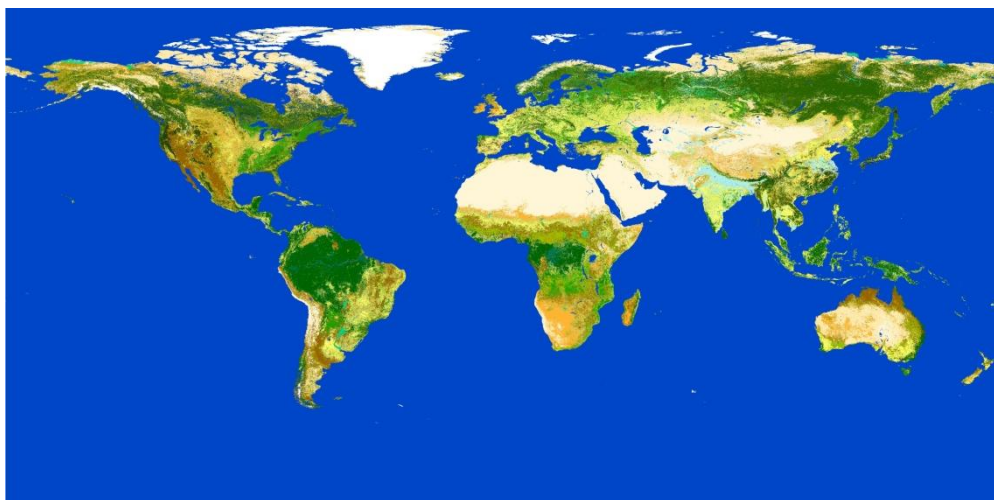


图 2-2 土地被覆分類 (GLOBCOVER)

表 2－2 土地被覆分類リスト（GLOBCOVER）

Value	Label
11	Post-flooding or irrigated croplands (or aquatic)
14	Rainfed croplands
20	Mosaic cropland (50-70%) / vegetation (grassland/shrubland/forest) (20-50%)
30	Mosaic vegetation (grassland/shrubland/forest) (50-70%) / cropland (20-50%)
40	Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)
50	Closed (>40%) broadleaved deciduous forest (>5m)
60	Open (15-40%) broadleaved deciduous forest/woodland (>5m)
70	Closed (>40%) needleleaved evergreen forest (>5m)
90	Open (15-40%) needleleaved deciduous or evergreen forest (>5m)
100	Closed to open (>15%) mixed broadleaved and needleleaved forest (>5m)
110	Mosaic forest or shrubland (50-70%) / grassland (20-50%)
120	Mosaic grassland (50-70%) / forest or shrubland (20-50%)
130	Closed to open (>15%) (broadleaved or needleleaved, evergreen or deciduous) shrubland (<5m)
140	Closed to open (>15%) herbaceous vegetation (grassland, savannas or lichens/mosses)
150	Sparse (<15%) vegetation
160	Closed to open (>15%) broadleaved forest regularly flooded (semi-permanently or temporarily) - Fresh or brackish water
170	Closed (>40%) broadleaved forest or shrubland permanently flooded - Saline or brackish water
180	Closed to open (>15%) grassland or woody vegetation on regularly flooded or waterlogged soil - Fresh, brackish or saline water
190	Artificial surfaces and associated areas (Urban areas >50%)
200	Bare areas
210	Water bodies
220	Permanent snow and ice
230	No data (burnt areas, clouds,...)