Supplementary Materials: A New Operational Snow Retrieval Algorithm Applied to Historical AMSR-E Brightness Temperatures

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Table S1. Coefficients used in Equation (17) to calculate the daily values of snow density for the different snow classes, from Sturm et al. (2010) [1].

Snow Class	ρ_{max}	ρ_0	k_1	k_2
Alpine	0.5975	0.2237	0.0012	0.0038
Maritime	0.5979	0.2578	0.0010	0.0038
Prairie	0.5940	0.2332	0.0016	0.0031
Tundra	0.3630	0.2425	0.0029	0.0049
Taiga	0.2170	0.2170	0.0000	0.0000

Table S2. Root Mean Squared Error (cm) of the comparison between the monthly New Algorithm and CMC Snow Depth (cm) from 2002 to 2011.

Month	Forest Fraction									
	0%–10%	11%–20%	22%–30%	31%–40%	41%–50%	51%–60%	61%–70%	71%–80%	81%–90%	91%–100%
October	14.31	8.84	5.79	13.23	6.67	4.85	3.83	3.70	3.66	3.14
November	16.99	11.68	8.78	15.13	11.43	11.41	8.11	11.18	7.86	7.16
December	18.73	16.00	12.93	18.84	15.55	13.92	13.57	14.22	13.24	11.82
January	28.99	25.91	24.08	30.19	27.78	25.90	25.10	25.28	22.94	20.84
February	29.51	28.43	26.11	32.73	29.75	28.62	27.65	27.72	25.88	23.59
March	35.69	33.79	30.73	38.51	33.98	33.50	31.57	32.05	29.41	28.10
April	32.58	29.11	24.61	30.85	26.96	25.09	22.91	23.09	20.27	16.83

Table S3. Correlation Coefficient of the comparison between the monthly New Algorithm and CMC Snow Depth (cm) from 2002 to 2011.

Month	Forest Fraction									
	0%–10%	11%–20%	22%–30%	31%–40%	41%–50%	51%–60%	61%–70%	71%–80%	81%–90%	91%–100%
October	0.24	0.34	0.46	0.24	0.41	0.53	0.63	0.64	0.64	0.66
November	0.36	0.49	0.58	0.39	0.49	0.39	0.61	0.40	0.62	0.66
December	0.46	0.53	0.60	0.46	0.52	0.56	0.57	0.55	0.58	0.66
January	0.39	0.43	0.45	0.36	0.36	0.37	0.37	0.36	0.39	0.48
February	0.48	0.50	0.53	0.43	0.46	0.47	0.48	0.49	0.51	0.59
March	0.43	0.43	0.47	0.37	0.42	0.41	0.43	0.43	0.45	0.49
April	0.43	0.44	0.49	0.40	0.43	0.45	0.47	0.45	0.47	0.52

Table S4. Bias (cm) of the comparison between the monthly New Algorithm and CMC Snow Depth (cm) from 2002 to 2011.

Month	Forest Fraction									
	0%–10%	11%–20%	22%–30%	31%–40%	41%–50%	51%–60%	61%–70%	71%–80%	81%–90%	91%–100%
October	0.66	0.54	0.56	0.67	0.56	0.59	0.55	0.56	0.54	0.34
November	1.70	1.56	1.49	1.93	1.75	4.33	2.25	4.62	2.61	2.06
December	2.28	2.41	2.41	3.21	3.18	3.86	4.26	4.79	5.10	3.95
January	6.25	6.90	6.80	9.27	9.88	11.64	12.56	13.83	13.97	12.18
February	4.73	5.56	5.26	7.52	7.60	8.84	9.34	10.20	10.62	9.36
March	6.88	7.82	7.11	10.24	8.97	11.21	11.21	12.56	12.86	12.82
April	4.27	4.28	3.58	4.59	4.00	4.55	4.24	4.46	4.38	3.81

Table S5. Root Mean Squared Error (cm) of the comparison between the monthly Old Algorithm and CMC Snow Depth (cm) from 2002 to 2011.

Month	Forest Fraction									
	0%–10%	11%–20%	22%–30%	31%–40%	41%–50%	51%–60%	61%–70%	71%–80%	81%–90%	91%–100%
October	15.66	10.75	5.46	10.90	5.00	4.88	4.95	4.97	4.85	4.98
November	18.21	16.06	11.78	15.22	11.49	11.76	12.64	11.43	10.96	10.73
December	22.57	21.54	18.55	22.28	18.93	20.07	20.27	19.36	18.42	17.66
January	29.48	28.66	26.10	32.93	28.10	28.41	28.55	27.84	25.98	24.29
February	30.48	30.81	28.99	34.57	30.78	32.02	31.78	31.39	30.02	27.98
March	35.90	35.74	33.20	38.89	34.64	36.20	35.32	35.23	33.10	31.18
April	31.51	29.61	24.55	29.08	24.63	24.49	22.69	22.45	19.75	16.37

Table S6. Correlation Coefficient of the comparison between the monthly Old Algorithm and CMC Snow Depth (cm) from 2002 to 2011.

Month	Forest Fraction									
	0%–10%	11%–20%	22%–30%	31%–40%	41%–50%	51%–60%	61%–70%	71%–80%	81%–90%	91%–100%
October	0.08	0.12	0.25	0.15	0.30	0.27	0.25	0.23	0.20	0.12
November	0.19	0.21	0.33	0.26	0.35	0.31	0.25	0.31	0.32	0.30
December	0.24	0.27	0.32	0.24	0.28	0.22	0.18	0.20	0.20	0.19
January	0.34	0.34	0.36	0.27	0.31	0.28	0.26	0.28	0.28	0.35
February	0.43	0.42	0.43	0.35	0.39	0.37	0.37	0.38	0.39	0.48
March	0.40	0.40	0.41	0.34	0.37	0.35	0.35	0.36	0.37	0.43
April	0.41	0.41	0.45	0.38	0.42	0.40	0.41	0.40	0.42	0.47

Table S7. Bias (cm) of the comparison between the monthly Old Algorithm and CMC Snow Depth (cm) from 2002 to 2011.

Month	Forest Fraction									
	0%–10%	11%–20%	22%–30%	31%–40%	41%–50%	51%–60%	61%–70%	71%–80%	81%–90%	91%–100%
October	5.38	4.40	3.79	3.60	3.29	3.53	3.54	3.81	3.88	4.15
November	8.47	8.53	6.83	7.27	6.83	7.90	8.33	8.34	8.21	8.26
December	11.48	11.24	10.36	12.02	11.67	14.21	15.14	15.77	16.15	16.80
January	9.53	10.23	10.21	12.79	12.27	14.72	15.87	16.62	17.33	16.29
February	7.53	8.56	8.56	11.01	10.56	12.53	13.34	13.90	14.71	12.92
March	8.44	9.42	9.24	11.69	11.06	13.33	13.93	14.66	15.10	14.20
April	5.17	5.10	4.34	5.18	4.53	5.37	5.30	5.41	5.22	4.63

Table S8. Mean (Mu) and standard deviation (S) of the Gaussian distribution fitting the differences between snow depth obtained with new and old algorithms and GlobSnow between 2003 and 2011.

Month	MU_{New} (cm)	S_{New} (cm)	MU_{Old} (cm)	S_{Old} (cm)
October	9.35	1.20	10.07	0.96
November	12.69	1.91	12.61	1.56
December	16.28	1.79	16.89	1.49
January	17.38	1.49	19.10	0.95
February	18.97	1.26	20.56	0.98
March	22.23	1.01	22.87	1.32
April	20.87	1.43	25.43	1.75

Table S9. Mean (Mu) and standard deviation (S) of the Gaussian distribution fitting the differences between SWE obtained with new and old algorithms and GlobSnow between 2003 and 2011.

Month	MU_{New} (mm)	S_{New} (mm)	MU_{Old} (mm)	S_{Old} (mm)
October	20.24	3.47	23.73	2.33
November	30.77	5.44	30.16	3.99
December	40.48	4.52	40.74	3.81
January	45.28	4.57	48.08	3.12
February	53.06	4.06	53.82	3.17
March	63.29	3.70	61.49	4.40
April	59.39	4.44	66.04	3.93

References

1. Sturm, M.; Taras, B.; Liston, G.E.; Derksen, C.; Jonas, T.; Lea, J. Estimating snow water equivalent using snow depth data and climate classes. *J. Hydrometeorol.* **2010**, *11*, 1380–1394.