Comparative Study on Snow Depth Algorithms Using AMSR-E Passive Microwave Remote Sensing in China

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Abstract.

Using the brightness temperature data measured by an advanced microwave scanning radiometer (AMSR-E) and the actually measured snow depth data obtained by meteorological stations during the three days from Feb. 10 to Feb. 12, 2010, the paper compared and analyzed the accuracy and applicability of five snow-depth inverse algorithms (Chang algorithm, GSFC 96 algorithm, AMSR-E SWE algorithm, the improved algorithm for Qinghai-Tibet Plateau and Savoie algorithm) in the regions of Xinjiang, Qinghai-Tibet Plateau, Inner Mongolia, Northeast China, Northwest China and the North China Plain. Results of the study show that, in overall verification, the improved algorithm for Qinghai-Tibet Plateau (hereinafter "the QTP algorithm" for short) is better than the other algorithms, with a root-mean-square error (RMSE) of 9.16, 9.96 and 9.63 and a mean relative error (MRE) of 59.77%, 52.79% and 48.47% for the above-mentioned three days respectively. According to regional verification, the best algorithm for Xinjiang region is the GSFC 96 algorithm, the RMSE of which is 6.85cm~7.48cm; the best algorithm for Inner Mongolia is the QTP algorithm, the RMSE of which is 5.9cm, 6.11cm and 5.46cm; and the best algorithm for Northeast China is also the QTP algorithm, the RMSE of which is 6.21cm~7.83cm. Applicability of none of the five algorithms is good for Northwest China and the North China plain regions. In the Qinghai-Tibetan plateau region, the author is not able to obtain the results of statistical verification due to a lack of actually measured data.

Keywords: Snow Depth Retrieval Algorithm, Comparative Study, Passive Microwave Remote Sensing, AMSR-E, China.
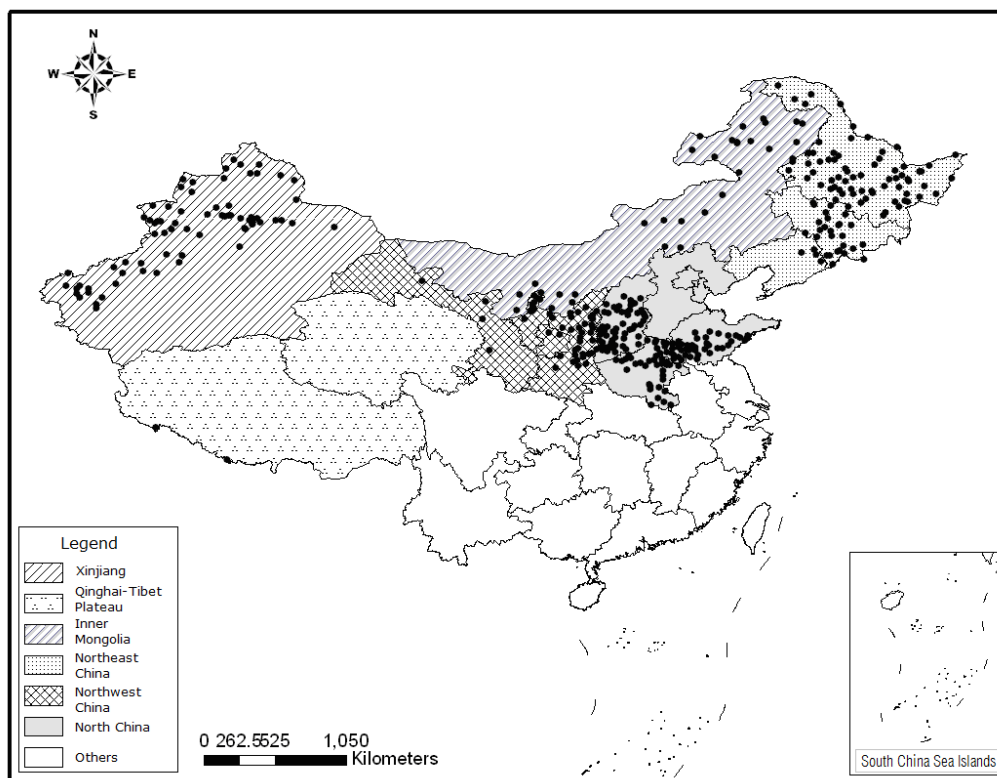
Fig. 1 Study areas and distribution of Meteorological stations

Table 1 The overall validation statistics of snow algorithms in China

	2010.02.10		N=357	2010.02.11		N=229	2010.02.12		N=154
	R^2	RMSE (cm)	MRE (%)	R^2	RMSE (cm)	MRE (%)	R^2	RMSE (cm)	MRE (%)
Chang algorithm	0.36	20.03	101.37	0.32	21.91	123.17	0.34	21.02	92.22
GSFC 96Algortihm	0.30	12.18	66.67	0.26	13.09	65.87	0.27	12.41	53.18
AMSR-E SWE Algorithm	0.34	16.72	86.34	0.30	16.51	96.49	0.31	16.46	73.27
Improved Algorithm for Qinghai-Tibet Pleteau	0.36	9.16	59.77	0.32	9.96	52.79	0.35	9.63	48.47
Savoie algorithm	0.36	15.46	78.28	0.32	17.03	85.91	0.34	16.49	66.98