A Big Earth Data Platform for Three Poles

**Snow depth product over Antarctic sea ice from 2002 to 2020**

1、Description

Snow over sea ice controls the energy budgets, affects the sea ice growth/melting, and thus has essential climatic effects. Snow depth, one of the fundamental properties of snow cover, is essential for understanding of the rapid change in Antarctic climate and for sea ice thickness estimation. Passive microwave radiometer can be used for basin-scale snow depth estimation in daily scale, however, previous published methods applied for Antarctic snow depth shows clear underestimation, which limits their further application. Here, we construct a new and robust linear regression equation for snow depth retrieval using microwave radiometers by including lower frequencies, and we produce the snow depth product over Antarctic sea ice from 2002 to 2020 from AMSR-E, AMSR-2, SSMIS based on this method. A regression analysis using 7 years of Operation IceBridge (OIB) airborne snow depth measurements shows that the gradient ratio (GR) calculated using brightness temperatures in vertical polarized 37 and 19 GHz, i.e., GR(37/7), is the optimal one for deriving Antarctic snow depth with an root mean square deviation (RMSD) of 8.92 cm and a correlation coefficient of -0.64, the related equation coefficients are then derived. GR(37/19) is used to retrieve snow depth from SSMIS data to fill the observation gaps between AMSR-E and AMSR-2, and the estimated snow depth is corrected for the consistence with these from AMSR-E/2. An averaged uncertainty of 3.81 cm is found based on a Gaussian error propagation, which accounts for 12% of the estimated mean snow depth. The evaluation of proposed method with in-situ measurements from Australian Antarctic Data Centre shows that the proposed method outperforms the previous available method, with a mean difference of 5.64 cm and an RMSD of 13.79 cm, comparing to -14.47 cm and 19.49 cm. Comparison to shipborne observations from Antarctic Sea Ice Processes and Climate indicates that the proposed method shows slight better performance than previous method (RMSDs of 16.85 cm and 17.61 cm, respectively); and comparable performances in growth and melting seasons suggests that the proposed method can still be used in the melting season. We generate a complete snow depth product over Antarctic sea ice from 2002 to 2020 in daily scale, and negative trends can be found in all sea sectors and seasons. This dataset can be further used in the reanalysis data evaluation, sea ice thickness estimation, climate model and other aspects.

2、Keywords

Theme：Snow on sea ice,Sea Ice  
Discipline：Cryosphere  
Places：Antarctic  
Time：daily, 2002-2020

3、Data details

1.Scale：None

2.Projection：

3.Filesize：13312.0MB

4.Data format：None

4、Space scope

|  |  |  |
| --- | --- | --- |
| - | north：-50.0 | - |
| west：-180.0 | - | east：180.0 |
| - | south：-90.0 | - |

5、Time frame:2002-05-31 16:00:00+00:00--2020-05-30 16:00:00+00:00

6、Reference method

References to data:

SHEN Xiaoyi, KE Changqing. Snow depth product over Antarctic sea ice from 2002 to 2020. A Big Earth Data Platform for Three Poles, doi:10.11888/Snow.tpdc.2716532021

References to articles:

7、Supporting project information

8、Data resource provider

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