A Big Earth Data Platform for Three Poles

**Surface elevation time series of Antarctic ice sheet (2002-2019)**

1、Description

The surface elevation of the ice sheet is very sensitive to climate change, so the elevation change of the ice sheet is considered as an important variable to evaluate climate change. The time series of long-term ice sheet surface elevation change has become a fundamental data for understanding climate change. The longest time series of ice sheet surface elevation can be established by combining the observation records of radar satellite altimetry missions. However, the previous methods for correcting the intermission bias still have error residue when cross-calibrating different missions. Therefore，we modify the commonly used plane-fitting least-squares regression model by restricting the correction of intermission bias and the ascending–descending bias at the same time to ensure the self-consistency and coherence of surface elevation time series across different missions. Based on this method, we use Envisat and CryoSat-2 data to construct the time series of Antarctic ice sheet elevation change from 2002 to 2019. The time series is the monthly grid data, and the spatial grid resolution is 5 km×5 km. Using airborne and satellite laser altimetry data to evaluate the results, it is found that compared with the traditional method, this method can improve the accuracy of intermission bias correction by 40%. Using the merged elevation time series, combining with firn densification-modeled volume changes due to surface processes, we find that ice dynamic processes make the ice sheet along the Amundsen Sea sector the largest volume loss of the Antarctic ice sheet. The surface processes dominate the volume changes in Totten Glacier sector, Dronning Maud Land, Princess Elizabeth Land, and the Bellingshausen Sea sector. Overall, accelerated volume loss in the West Antarctic continues to outpace the gains observed in the East Antarctic. The total volume change during 2002–2019 for the AIS was −68.7 ± 8.1 km3/y, with an acceleration of −5.5 ± 0.9 km3/y2.

2、Keywords

Theme：Marine Remote Sensing,Surface elevation changes,Satellite radar altimetry,Glacier(Ice Sheet),Surface elevation time series
Discipline：Ocean,Cryosphere
Places：Antarctic ice sheet
Time：2002–2019

3、Data details

1.Scale：None

2.Projection：South\_Pole\_Stereographic

3.Filesize：2890.0MB

4.Data format：None

4、Space scope

|  |  |  |
| --- | --- | --- |
| - | north：-60.0 | - |
| west：-180.0 | - | east：180.0 |
| - | south：-82.0 | - |

5、Time frame:2002-03-14 16:00:00+00:00--2019-04-15 03:59:59+00:00

6、Reference method

References to data:

LIU Jingbin, GENG Hong, AN Jiachun, LI Fei, WANG Zemin, ZHANG Baojun, YANG Quanming. Surface elevation time series of Antarctic ice sheet (2002-2019). A Big Earth Data Platform for Three Poles, doi:10.11888/Glacio.tpdc.2716652021

References to articles:

Zhang, B., Wang, Z., Yang, Q., Liu, J., An, J., Li, F., Liu, T., & Geng, H. (2020). Elevation Changes of the Antarctic Ice Sheet from Joint Envisat and CryoSat-2 Radar Altimetry. Remote Sensing,12(22), 3746.

7、Supporting project information

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Strategic Priority Research Program of the Chinese Academy of Sciences
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8、Data resource provider

name: ZHANG Baojun
unit:
email: bjzhang@whu.edu.cn

name: WANG Zemin
unit:
email: zmwang@whu.edu.cn

name: AN Jiachun
unit:
email: jcan@whu.edu.cn

name: GENG Hong
unit:
email: genghong@whu.edu.cn

name: YANG Quanming
unit:
email: yangquanming@whu.edu.cn

name: LIU Jingbin
unit:
email: jingbin.liu@whu.edu.cn

name: LI Fei
unit:
email: fli@whu.edu.cn