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AMSR-E データを用いた南極海の定着氷域の新しい検出方法
A new method to detect landfast sea ice in the Antarctic Ocean using AMSR-E data

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Landfast ice (fast ice) is stationary sea ice attached to coastal features such as the shoreline and grounded icebergs. Antarctic fast ice extent is estimated to be only about 5% (0.8×10^6 km^2) of the entire sea-ice extent, although the spatial distribution and variability of fast ice are not yet well understood. Fast ice exerts a significant influence on the climate system, biogeochemical cycles, biological activity, and ship navigation, despite its relatively small extent. For example, most Antarctic coastal polynyas form on the western side of fast ice, indicating the important role of fast ice in polynya formation. Further, fast ice forms an important interface between the ice sheet/shelves and the moving pack ice zone, and has been shown to influence floating ice tongue/ice shelf stability.

Detection of fast ice has been carried out along the East Antarctic coast based on cloud-free visible and infrared satellite images. However, this method, while providing extremely high resolution, is less suitable for making a circumpolar dataset. By using passive microwave satellite (SSM/I and AMSR-E) data, fast ice is detected based on the characteristic that the brightness temperature fast ice tends to be lower than that of thin ice and are similar to that of ice sheet. However, the only the climatology of fast ice extent can be shown by this method, because the temporal resolution is coarse (three months) and there is some false detection.

In this study, fast ice area is detected based on spatial and temporal matching of brightness temperature of AMSR-E: pixels whose spatial distribution of brightness temperature is similar for a certain period, that is motionless sea-ice pixels, are detected as fast ice. The preliminary results show that this method can detect fast ice area with relatively finer temporal resolution (from a few weeks to one month). Further, false detections caused by the previous method are reduced significantly. This technique will complement the existing high-resolution MODIS fast ice dataset. Further, by applying this technique to AMSR2 and SSMI data, change in the fast ice extent for the longer period of about 30-years could be examined.

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