C53B-0776: Dynamics of landfast sea ice near Jangbogo Antarctic Research Station observed by SAR interferometry

ABSTRACT

Friday, 18 December 2015
13:40 - 18:00
Moscone South - Poster Hall

Landfast sea ice is a type of sea ice adjacent to the coast and immobile for a certain period of time. It is important to analyze the temporal and spatial variation of landfast ice because it has significant influences on marine ecosystem and the safe operation of icebreaker vessels. However, it has been a difficult task for both remote sensing and *in situ* observation to discriminate landfast ice from other types of sea ice, such as pack ice, and also to understand the dynamics and internal strss-strain of fast ice. In this study, we identify landfast ice and its annual variation in Terra Nova Bay (74° 37′ 4"S, 164° 13′ 7"E), East Antarctica, where Jangbogo Antarctic Research Station has recently been constructed in 2014, by using Interferometric Synthetic Aperture Radar (InSAR) technology. We generated 38 interferograms having temporal baselines of 1-9 days out of 62 COSMO–SkyMed SAR images over Terra Nova Bay obtained from December 2010 to January 2012. Landfast ice began to melt in November 2011 when air temperature raised above freezing point but lasted more than two month to the end of the study period in January 2012. No meaningful relationship was found between sea ice extent and wind and current. Glacial strain (~67cm/day) is similar to tidal strain (~40 cm) so that they appear similar in one-day InSAR. As glacial stress is cumulative while tidal stress is oscillatory, InSAR images with weekly temporal baseline (7~9 days) revealed that a consistent motion of Campbell Glacier Tongue (CGT) is pushing the sea ice continuously to make interferometric fringes parallel to the glacier-sea ice contacts. Glacial interferometric fringe is parallel to the glacier-sea ice contact lines while tidal strain should be parallel to the coastlines defined by sea shore and glacier tongue. DDInSAR operation removed the consistent glacial strain leaving tidal strain alone so that the response of fast ice to tide can be used to deduce physical properties of sea ice in various ice stages. One-day InSAR images revealed that fast ice is not attached to CGT in the early ice formation stages while they began to couple with each other so that the entire glacial motion of up to 67cm/day is transferred directly to fast ice. In the final thawing stage just before ice breakage, ocean wave travelling through the fast ice is also observed by one-day InSAR.

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