

# Tidal strain of landfast sea ice around Campbell Glacier Tongue in East Antarctica analyzed by DDInSAR images

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Landfast sea ice is a type of sea ice that is attached to the coast. Accurate measurement of strain of landfast sea ice is very important because it plays an important role in the variabilities of polynya, marine ecosystem and logistics for research stations near the coast. In this study, we analyzed tidal strain of landfast sea ice near Campbell Glacier Tongue (CGT) in Terra Nova Bay (TNB), East Antarctica and its annual variation using COSMO-SkyMED one-day Interferometric Synthetic Aperture Radar (InSAR) pairs obtained from December 2010 to January 2012. As the landfast sea ice is attached to both the coast and CGT, the strains caused by sea surface tilt and glacial flow would be mixed in the one-day InSAR signals. The glacial strain caused by the steady flow of CGT (~67 cm/day) is similar to the tidal strain by tide variation in TNB (~60 cm). Therefore, it is very difficult to extract the tidal strain from the one-day InSAR images. If the glacial strain of the landfast sea ice is steady over time, the tidal strain can be observed by Double-Differential InSAR (DDInSAR) technique that differentiates two InSAR images. We generated DDInSAR images from the one-day InSAR images and extracted tidal displacement of the landfast sea ice. The tidal displacement was compared with tide variation predicted by Ross\_Inv tide model. We found that the tidal strain of landfast sea ice near the coastline is steady throughout the year because it was isolated from CGT by cracks and leads. Meanwhile, the landfast sea ice attached to CGT showed irregular tidal strain with time, which might be caused by the variation of glacial strain resulting from the change of ice thickness.