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TITLE: Ice Flow and Strain Rate over Campbell Glacier in East Antarctica Observed from COSMO-SkyMed InSAR Images

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ABSTRACT BODY: Campbell Glacier (74°25'S 164°22'E), originated from the end of Mesa Range in Victoria Land, East Antarctica, is a fast-flowing outlet glacier with length of about 110 km approximately. Campbell Glacier flows into northern Terra Nova Bay in Ross Sea and forms a seaward extension of the glacier named as Campbell Glacier Tongue. Campbell Glacier Tongue experiences gravitational ice flow as well as the vertical tidal deflection responding to tide variations. The ice beyond the hinge zone of Campbell Glacier Tongue is not free-floating but in a partially hydrostatic equilibrium state by 96%.

In this study, we extracted surface displacement of Campbell Glacier from the 14 COSMO-SkyMed one-day tandem InSAR pairs obtained from January to November 2011. The topographic phases were removed by using ASTER Global Digital Elevation Model. As the DInSAR signals of Campbell Glacier Tongue contain both gravitational ice flow and the vertical tidal deflection, we removed the signals of tidal deflection by using the map of tide deflection rate of the glacier that was generated by Double-differential InSAR images. We then extracted one-day ice flow velocity and strain rate of Campbell Glacier.

Campbell Glacier showed steady ice flow during the DInSAR observations. The maximum ice flow velocity was 0.7 m/day at the seaward edge of Campbell Glacier Tongue, while minimum ice flow velocity of 0.2 m/day was observed over the upper grounded part of the glacier. The crevasses on the grounded part of Campbell Glacier appeared near the tensile zone, while that disappeared at the compression zone. The moraines of the glacier migrated downstream along the shear zone. Campbell Glacier Tongue showed shear strain in general, from which we could investigate the nonlinear rotation of the glacier tongue.

As a conclusion, we could accurately analyze the ice flow velocity and strain rate of Campbell Glacier from COSMO-SkyMed one-day tandem InSAR images by removing the signals of tidal deflection of the glacier. The glacier showed different flow velocity and strain rate along the streamline. By this research, we could conclude that the ice flow of outlet glacier from InSAR images should be estimated after removing the signals of tidal deflection of the glacier.

KEYWORDS: 0776 CRYOSPHERE Glaciology, 0758 CRYOSPHERE Remote sensing, 0933 EXPLORATION GEOPHYSICS Remote sensing.

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Additional Details

Previously Presented Material:

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