The change of terminus and ice velocity field and grounding line estimation in Langhovde Glacier, Antarctica.

Takehiro Fukuda[1,2], Shin Sugiyama[2], Takanobu Sawagaki[3], Kazuki Nakamura[4,5]
1 Graduate School of Environmental Science, Hokkaido University
2 Institute of Low Temperature Science, Hokkaido University
3 Faculty of Environmental Earth Science, Hokkaido University
4 Department of Computer Science College of Engineering, Nihon University
5 National Institute of Advanced Industrial Science and Technology

Many of outlet glaciers and ice shelves in Antarctic coastal margins are shrinking and accelerating over the last decades and impact on global environmental changes. We extract that a basal melting is the primary control of the changes on the ice shelves and the outlet glaciers floating on the ocean. To understand the mechanism of these changes, studying a time series of the terminus position and ice velocity field and knowing the position of grounding line are very important. In this study, we report the results of field data obtained in the JARE53 campaign and satellite data analyses over the last decades in Langhovde Glacier, East Antarctica.

We analyzed surface elevations by stereo photogrammetric technique using Advanced Land Observing Satellite / Panchromatic Remote-sensing Instrument for Stereo Mapping (ALOS/PRISM) images captured in 2006, 2007 and 2010. Then, using the orthorectificated PRISM images, surface ice velocities were measured by tracking displacements of supraglacial features (e.g. crevasses, bumps and lakes). Comparing the GPS measurement data in 2012 with satellite data between 2006 and 2010, thinning rate was reduced in recent years and the ice velocity field was changed since 2007. Moreover, the terminus position has advanced by about 300 m over the same period. Comparing the GPS measurement data in 2012 with satellite data between 2006 and 2010 (Fig. 1), thinning rate of the surface elevation was reduced since 2007, which might be caused by a change of the ice velocity field.

The grounding line positions were estimated by the surface elevation and ice thickness data which were obtained by GPS and ice radar measurement. We assumed that the glacier is afloat to estimate glacier bed elevations. By comparing the estimated basal elevations with the measured ice thickness, we determine if the measured point was grounded. The result showed that the structure of grounding line is more complex and the position is more inland (~1 km) than that estimated from satellite data. Our results provided insights into the mechanism of these changes of glaciers and ice shelves in Antarctica.

References

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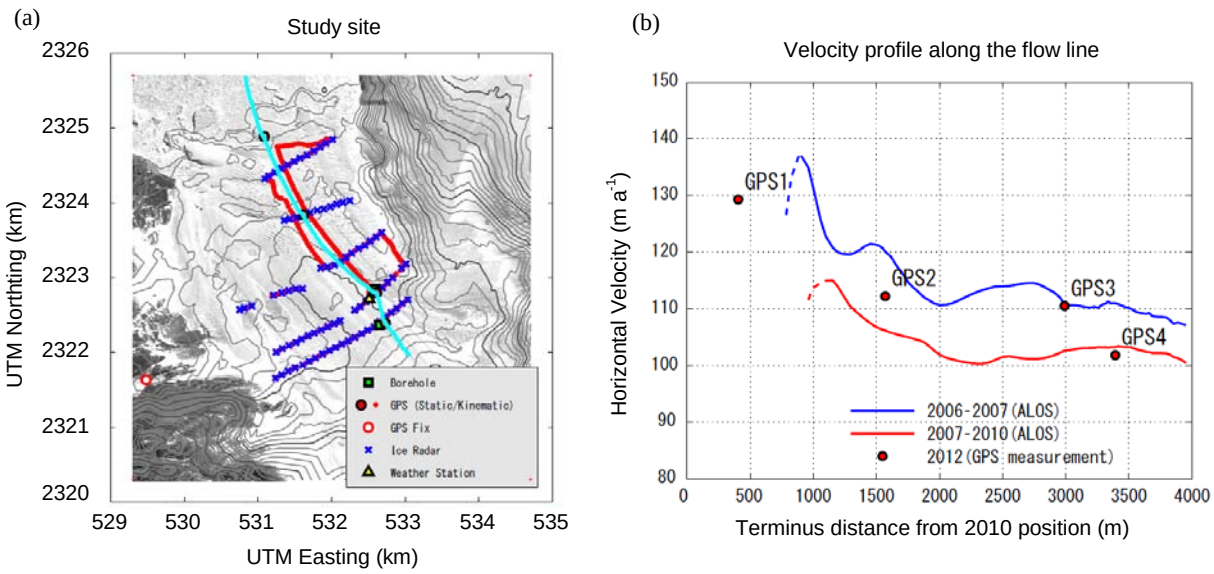

Figure 1 (a) Study site. Horizontal velocities were extracted along the flow line (cyan solid line). (b) Verocity profiles along the flow line in 2006-07, 2007-10 and 2012.