

# リモートセンシングによる白瀬氷河の質量収支の算出

中村和樹<sup>1</sup>、山之口勤<sup>2</sup>、土井浩一郎<sup>3</sup>、澁谷和雄<sup>3</sup>

<sup>1</sup> 日本大学

<sup>2</sup> リモート・センシング技術センター

<sup>3</sup> 国立極地研究所

## Mass balance calculations for the Shirase Drainage Basin, East Antarctica derived from remote sensing technique

Kazuki Nakamura<sup>1</sup>, Tsutomu Yamanokuchi<sup>2</sup>, Koichiro Doi<sup>3</sup> and Kazuo Shibuya<sup>3</sup>

<sup>1</sup>*Nihon University*

<sup>2</sup>*Remote Sensing Technology Center of Japan*

<sup>3</sup>*National Institute of Polar Research*

Several studies have used a variety of data sources to perform mass balance calculations for the Shirase Drainage Basin (e.g. Fujii, 1981; Pattyn and Derauw, 2002; Rignot and Thomas, 2002; Rignot, 2002; Nakamura et al., 2010), however, much of the basic information regarding the areal extent and surface mass balance contains uncertainties. Therefore we recalculated the surface mass balance using recent data for the region based on the output of a regional atmospheric climate model (Lenaerts et al., 2012a, b, c) and the 1 km-grid Digital Elevation Model (DEM) by Bamber et al. (2009).

To estimate ice mass discharge, we examined the asymmetric flow velocity patterns along an east–west transect at the grounding line (GL); flow at the western part of this transect is more rapid than at the eastern part (Nakamura et al., 2007, 2010). To address this asymmetric pattern, we attempted to delineate surface height profiles of ice at the GL at about 1 km intervals using topographic data from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) aboard the Terra Satellite (we call them ASTER DEM) as ice thickness is a key parameter for reliably estimating ice discharge. Comparison of the ASTER DEM with the Bamber DEM was also undertaken to corroborate the error estimates obtained for the discharge measurements. By comparing the refined ice thickness and DEM height at the GL, we updated the ice mass discharge from the mainstream of Shirase Glacier, and discuss the resultant mass balance in relation to previous estimates in the literature.

これまで、白瀬氷河の質量収支の算出に関する研究が、様々なデータを用いてなされてきたが（例えば、Fujii, 1981; Pattyn and Derauw, 2002; Rignot and Thomas, 2002; Rignot, 2002; Nakamura et al., 2010）、積雪涵養量とその広がりについて多くの不確実性が残されている。このことから、本研究では積雪涵養量について、局所的大気気象モデル（Lenaerts et al., 2012a, b, c）と Bamber et al. (2009) による 1 km グリッドの数値標高モデル（Digital Elevation Model: DEM）といった最近のデータを用いることにより再計算した。

白瀬氷河による氷の流出量を推定するため、接地線（Grounding line: GL）の東西を横断する流動速度を求めた結果、東部よりも西部の流動速度が速い傾向が見られた（Nakamura et al., 2007, 2010）。また、氷の流出量を推定する上で氷厚は重要なパラメータであり、Terra 衛星に搭載された ASTER（Advanced Spaceborne Thermal Emission and Reflection Radiometer）による DEM から表面高プロファイルを導出することにより流動速度の非対称な傾向を調べた。さらに、氷の流出量の精度について、ASTER と Bamber による DEM を比較検証することにより、誤差推定を実施した。

以上の、GL における DEM の高さ精度を高めた上で氷厚を導出することにより、最新の白瀬氷河における氷の流出量および質量収支を算出した。

## References

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