

Integrated Geodetic monitoring observation

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Several geodetic observations have been continued for more than fifteen years in and around Syowa Station, Antarctica. We implement these geodetic observations in a framework of the monitoring observation named “Integrated Geodetic monitoring observation” in IXth phase of the Japanese Antarctic Research Expedition (JARE).

Observations using three space geodetic techniques carried out in the station such as Very Long Baseline Interferometry (VLBI), Global Navigation Satellite System (GNSS), Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS) have been providing significant geodetic coordinate data to improve and maintain International Terrestrial Reference Frame (ITRF) (Altamimi et al. 2016) as well as crustal movement data induced by tectonic motion and Glacial Isostatic Adjustment (GIA). Gravity observations by superconducting gravimeters and absolute gravimeters since early 1990s have also provided reference gravity values in Antarctica (Kazama et al. 2013, Doi et al. 2013) and temporal gravity changes induced by recent ice mass changes (Aoyama et al. 2016). Tidal observation with bottom pressure gauges has been continuing since 1976 at Nisi-no-ura Cove to observe ocean tides and to monitor sea level change.

The geodetic data acquired at Syowa Station are opened by international services with respect to each observation technique. As for exhibit of the acquired VLBI data, International VLBI service (IVS) releases results derived from accumulated data of VLBI sessions including Syowa’s antenna, and International GNSS Service (IGS) exhibits time series of each IGS GNSS station position. Time series of Syowa’s DORIS antenna position can be seen in the website of International DORIS Service (IDS) (<http://apps.ids-doris.org/apps/stcdtool.html>). Raw data observed by the superconducting gravimeter are opened from web site of National Institute of Polar Research (http://geo.nipr.ac.jp/SG/SG_at_SYOWA.html). Archived tide gauge data at Nisi-no-ura Cove is released at a site of the Japan Oceanographic Data Center (JODC) (http://jdoss1.jodc.go.jp/cgi-bin/1997/tide_data).

References

- Altamimi, Z., P. Rebischung, L. Métivier and X. Collilieux, ITRF2014: A new release of the International Terrestrial Reference Frame modeling nonlinear station motions, *J. Geophys. Res. Solid Earth*, 121, doi:10.1002/2016JB013098, 2016.
- Aoyama Y., K. Doi, H. Ikeda, H. Hayakawa and K. Shibuya, Five years’ gravity observation with the superconducting gravimeter OSG#058 at Syowa Station, East Antarctica: gravitational effects of accumulated snow mass, *Geophys. J. Int.*, 205, 1290–1304, 2016.
- Doi, K., H. Hayakawa, T. Kazama, T. Higashi, S. Osono, Y. Fukuda, J. Nishijima, Y. Aoyama and J. Ueda, Field Measurements of Absolute Gravity in East Antarctica, *Advances in Polar Science*, 24, 4, 339-343, 2013.
- Kazama, T., H. Hayakawa, T. Higashi, S. Osono, S. Iwanami, T. Hanyu, H. Ohta, K. Doi, Y. Aoyama, Y. Fukuda, J. Nishijima and K. Shibuya, Gravity measurements with a portable absolute gravimeter A10 in Syowa Station and Langhovde, East Antarctica, *Polar Science*, 7, 260-277, doi:10.1016/j.polar.2013.07.001, 2013.