

Surface topography survey for bared rock and accumulated snow in Antarctica by Unmanned Aero Vehicle

*Yuichi Aoyama^{1,2,3}, Akihisa Hattori^{2,3}, Hajime Oishi^{3,4}, Koichiro Doi^{1,2,3}, Yoshifumi Nogi^{1,2}

1. National Institute of Polar Research, 2. SOKENDAI, 3. The 59th Japanese Antarctic Research Expedition, 4. NEC Networks & System Integration Corporation

In the last decade, Gravity Recovery and Climate Experiment (GRACE) mission demonstrated an increase of surface mass in the Dronning Maud Land (DML), East Antarctica. Actually, snow accumulation has increased at Syowa Station located in DML, and its effect has been detected by superconducting gravimeter and GNSS measurements. For quantifying this effect, it is necessary to measure the distribution of the snow accumulation.

The distribution of the snow accumulation can be estimated from difference in accurate digital surface models (DSM) between the bared rock and the accumulated snow. These DSMs are derived from aerial photography by unmanned aerial vehicle (UAV) with structure from motion (SfM) analysis. In the activity of the 59th Japanese Antarctic Research Expedition (JARE59) during Dec. 2017 - Dec. 2018, some aerial photography surveys were conducted with the fixed-wing small UAV, senseFly eBee plus, and with the rotary-wing drone, DJI Inspire 2 over Syowa Station. There is a report that the eBee plus, having dual-frequency GNSS receiver, enables to generate DSM precisely without ground control point (GCP). We evaluated the accuracy of such DSM by comparing with DSM computed with GCP. We also compared with the DSM computed from aerial photography by Inspire 2 which has single-frequency GNSS for evaluating the advantage of the dual-frequency GNSS tracking. The DSMs in Langhovde, Akarui Misaki, Rundvagshetta located around Lutzow-Holmbukta are also computed from aerial photography by eBee plus.

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