

Aerosol measurement around the ridge of East Antarctica using Rogallo type UAV

Masahiko Hayashi¹, Naohiko Hirasawa² and Koki Nakata³

¹Fukuoka University, ²National Institute of Polar Research, and ³kkt Innovate Co.Ltd.

Meteorological observations using a UAV in the Antarctica also have been carried out at S17 Air Base (69° 02' S, 40° 06' E, 606m a.s.l.), near Syowa Base by the 48th, 54th, and 56th Japanese Antarctic Research Expedition, (JARE). The JARE 58th perplanned to perform meteorological observations including snow, water vapor and

aerosols budgets at S17 during December 22th, 2016 and February 4th, 2017. One of main mission of the observation focused on aerosol processes using automated UAVs with Rogallo wings, called Kite Planes. Two types of Kite Planes were used for different type observations. One is engine powered Kiteplane for horizontal observations with a condensation particle counter, an optical particle counter, and an aerosol sampler for SEM/EDX analyses (Figure 1). Another is glider Kiteplane supported by electroic motor with an optical particle counter for vertical distribution observations.

Horizontal two ways flights were performed 24 times during the campaign, including 5 flights for checking automated control system, 11 flights for observations between S17 and Totsuki cape (TTK, 39.8°E), 8 flights for observation between S17 and points on the way to TTK . Observation flight was planned to cruise at two different level of 700 m for outgoing and 1200m for return. Figure 2 shows the results of one of horizontal flight performed on January 27, 2017.

Vertical observation until 5 km a.s.l. were performed with special procedure, called Balloon borne Gliding Platform (BalGliP). A Kiteplane of 7 kg including OPC were launched and lifted with a small rubber balloon (800 g) and seperated from the balloon autmatically at certain height. Then, Kitpalne return to a balloon release base automatically by gliding autonatically. Observations were carried out during ascent and descent. Three BalGliP flight were performed during campaign, including one test flight with balloon separation at 1300 m a.s.l. and two observation flight with 5,000 m a.s.l. separation.

The campaign using Kite Planes at S17 was succesfully performed and obtained interesting dataset for distribution of aerosol number concentration, condensation nuclei concentration, aerosol constituent, and meteorological data. We will show detailes of results on transportation and nucleation of aerosol around S17 and Totsuki in January 2017.



Figure 1. Photo just before "Take off" of Kite Plane at S17

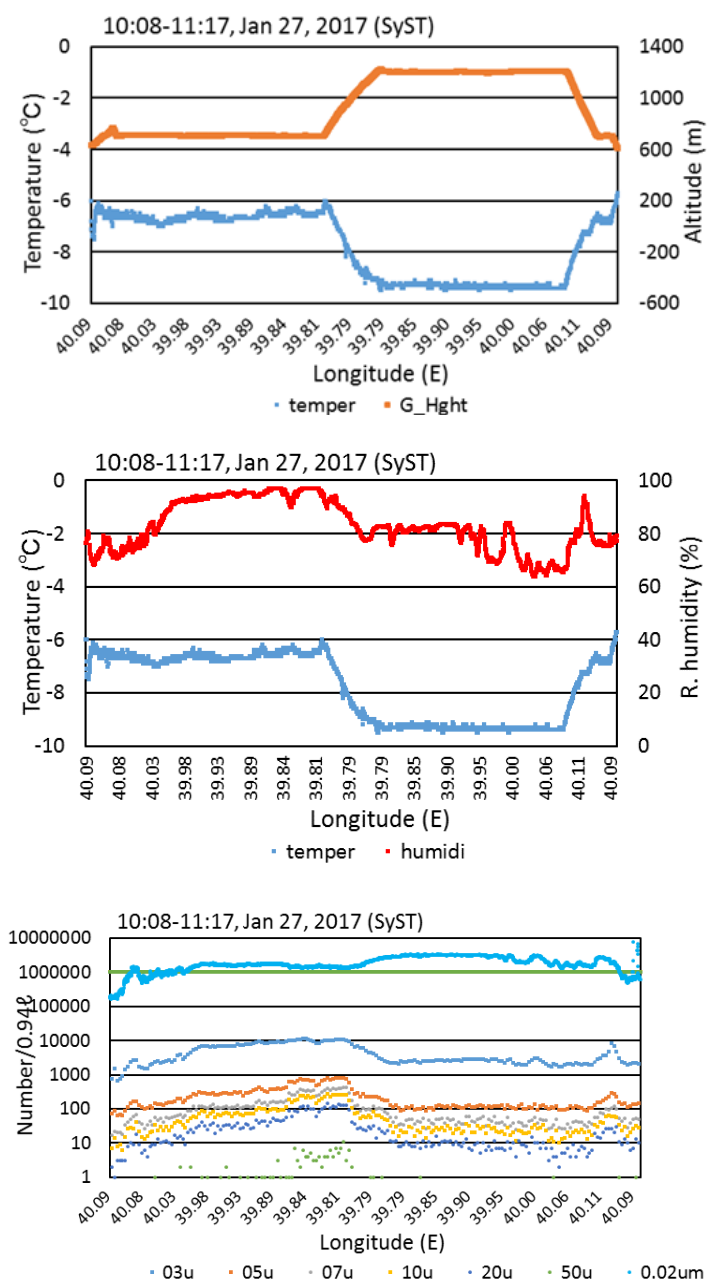


Figure 2. Time series of GPS height and temperature (top), relative humidity and temperature (middle), concentrations of condensation nuclei and Mie particle observed by Automated Kiteplane between S17 and Totsuki cape on January 27th, 2017