

Examination of drone operational stability for geoscientific research at Longyearbyen, Svalbard

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Compact quadcopter drones are light and inexpensive. Therefore, they have been used for collecting various spatial information including images and numerical data. However, the application of drones in polar research is limited because of factors such as the maximum weight of measuring components that can be mounted, limited capability of equipment, harsh climatic conditions to lower the durability of drones, and environmental restrictions for controlling drones. The polar environment has been considered challenging for drone usage due to various constraints such as the weak reception of GNSS signals and large error of digital compasses. Therefore, even drone manufacturers do not recommend flight in polar regions. However, for polar research, GNSS devices have been widely used for positioning without problems.

Based on the field work at Longyearbyen, Svalbard in the Arctic, we examined the limits of the operation of drones in polar regions from the viewpoint of GNSS environmental constraints, compass error, and weather conditions. Through hovering tests at Longyearbyen and Kashiwanoha in Japan, we measured the error of maintaining posture including the flight stability of drones, and examined whether a stable operation is possible or not. We also produced a manual to cope with various adverse conditions for drone flight in polar regions.

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