

# Comparison of cloud fractions from whole-sky camera observations around Syowa Station during JARE 60

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Cloud has opposite effects on the earth climate system: warming and cooling. Their magnitudes depend on cloud fraction, height, and so on. They influence the radiation balance on the earth and cloud is one of the greatest error sources for the climate prediction [IPCC, 2013]. Nevertheless, it is not easy to make a detailed observation due to their spatial and temporal variability. Furthermore, we do not have enough observation sites, especially over the ocean. It is also difficult to identify clouds using satellite images in polar regions because of the long polar nights and the similar optical characteristics between clouds and snow/ice [Yamanouchi, 2009]. Therefore, ground-based observations are necessary.

Cloud has been observed by different instruments onboard R/V *Shirase* and at Syowa Station in Antarctica. By comparing these observations, we can confirm the consistency of the analysis methods of previous studies. Furthermore, it will allow us to elucidate cloud behavior in detail. In this study, we investigated cloud fractions around Syowa Station based on the whole-sky camera observations.

Shipboard observations were carried out onboard R/V *Shirase* (AGB-5003) [Kuji et al., 2016]. The whole-sky camera system mainly consists of a digital camera (NIKON D7000, NIKON Corporation) and a circular fisheye lens (4.5 mm F2.8 EX DC Circular Fisheye HSM, SIGMA Corporation) to take a photo of a whole sky. The observation interval is 5 min. We analyzed 10,703 images from 26 December 2018 to 2 February 2019 during the berth period of 60th Japanese Antarctic Research Expedition (JARE 60) around Syowa Station. We estimated cloud fraction from whole-sky camera images based on a cloud detection method [Yoshimura and Yamashita, 2013]. Furthermore, we analyzed the whole-sky images over sea ice region as a function of solar height because sea surface albedo over sea ice regions is very different from that over open ocean [Kuji et al., 2018]. Meanwhile, the whole-sky camera system (PSV-100, PREDE Corporation) installed at Syowa Station observes at 10 min intervals. We analyzed 4,523 images during the berth period of JARE 60. From these whole-sky color images, we estimated cloud fraction based on the cloud detection method [Yabuki et al., 2014; Hirasawa et al., 2023].

We investigated the temporal variation of the cloud fractions from the whole-sky camera observations during the berth period of JARE 60. As a result, it is found that the variation of cloud fractions is generally consistent and the correlation coefficient is very high of 0.99.

Furthermore, we are going to compare the cloud fractions estimated from Micro Pulse LIDAR, visual and satellite observations during JARE 55 to 61 as a whole and discuss the characteristics of the cloud fractions around Syowa Station.

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