A preliminary study for the development of the Long-IR camera onboard Planet-C

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In order to understand a planetary atmosphere, it is important to measure the temperature distribution of the atmosphere and clouds. Especially, for the measurement of the temperature distribution of clouds, the remote sensing technique using mid-infrared (~10 um) window is appropriate.

There are two kinds of infrared detectors. One is quantum detector and the other is thermal one. The quantum detector needs a cryogenic cooling and therefore the system becomes large. But in recent years, the uncooled infrared detector arrays (bolometer) have been developed. So we have started the development of the infrared camera, which uses a bolometer. Future application will be the Planet-C Venus mission, observations of planets by using ground-based telescopes and imaging observations of tropospheric clouds.

As the first step of the development, we have studied the characteristics of the noise of a bolometer. The results are as follows: 1) Temporal or spatial averaging is an effective method, which reduces the NETD (Noise Equivalent Temperature Difference) by about 50%. 2) The noise level of the bolometer is as low as 20-30 mK (F/0.8, 300K). 3) The temporal drift of the output level does not have a large effect on the imaging quality.

In this report, we discuss how to reduce the noise by image processing and verify its usefulness by imaging observation of tropospheric clouds.