

Comparison of a water vapor observation with GPS and high sensitivity microwave radiometer, KUMODeS

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GPS is one of the useful technique which is using electromagnetic waves in the atmosphere. However, radio waves through the atmosphere and have a delay due to water vapor then. It is a major factor of indeterminacy in some measurement. On the other hand, as a device for identifying the amount of water vapor is a microwave radiometer.

We have developed a new microwave radiometer "KUMODeS" to detect local and sudden natural disasters such as tornadoes. This system observes radiation from water molecules present in the atmosphere (20-30 GHz band) and the emission line from the oxygen molecule (50-60 GHz band) are measured at the same time. As a result, the amount of water vapor in the atmosphere is estimated with high accuracy. As a characteristic of KUMODeS, high sensitivity (low noise) was employed as a cooling receiver by application of radio astronomical observation technology. In order to improve convenience, we employed a low-temperature(45K) calibration source in the cryostat and can be operated by remote control. And we are able to select a higher spatial resolution. We conducted long-term observations for more than half a year in Tsukuba city using KUMODeS. At the same point, we measured the amount of water vapor by GPS antenna and confirmed the validity of the observation result. In addition, we have also developed the second device that aimed at a smaller size and lower power consumption as a development of KUMODeS. In this presentation, we report the outline of the system and the results of atmospheric observation in Tsukuba City.

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