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Development of semi centimeter-wave atmosphere observation system for stratospheric water vapor distribution

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For better understandings of the mechanism of long-term changes of the stratospheric water vapor distribution and the relation with the global warming, it is important to monitor variations of the stratospheric water vapor continuously. Observations of the stratospheric water vapor are mainly made with a technique of UV and infrared spectroscopy. These can be observed only in daytime because these require the sunlight. On the other hand, an observation of the stratospheric water vapor with a microwave spectroscopy technique can be made in daytime and nighttime, because they observe an emission spectrum of the water vapor at 22 GHz band and do not require any light sources. In addition, a microwave observation is expected to be obtained an accurate dataset, because the atmospheric attenuation in this region is relatively smaller than that in the UV and infrared region. However, at present, ground-based microwave observations of the stratospheric water vapor are carried out only in 5 sites in the world because there are difficulties of the size of the instrument and lack of sensitivity of the receiver system. To improve these situations, we have newly developed a microwave observation system for the stratospheric water vapor which is equipped with low noise detector consisting of microwave MMIC amplifiers and a cooling system. The size of this instrument is expected to be much reduced than any other ones. In this presentation, we show hardware features, results of evaluation of the system as well as measurement results of the stratospheric water vapor.