Measurements of OH rotational temperature using a Michelson interferometer

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Recently, advances in Fourier transform spectrometry have enabled a number of OH vibration-rotation bands (Meinel bands) to be monitored from the ground. Molecular bands of the Meinel system of the OH radical appear beyond about 5200 Å, and originate from the upper mesospheric region (~87 km) of the Earth (Meinel, 1950). Pioneering efforts such as Lowe (1969) demonstrated the utility of this technique for observing nocturnal terrestrial airglow emissions. Advances in the production of solid state detectors and high speed computers have contributed significantly for the Michelson interferometer to become the choice of instrument for medium resolution infra-red observations of atmospheric emissions (Griffiths and de Haseth, 1986, Lowe et al., 1991). Altitude profiles of the Meinel bands obtained by rocket borne photometers and satellite borne instruments place the peak emission near 87 km, with some variability (Baker and Stair, 1988). Rotational relaxation is sufficiently rapid in this region so that the distribution of rotational lines within a band represents the kinetic temperature of the gas. Polar Research Center, KORDI (Korea Ocean R & D Institute) has recently equipped a Michelson interferometer to study the Earth's upper atmospheric region, specifically mesospheric region as a complement to a Fabry-Perot interferometer which has been already used for thermospheric study (Chung et al, 1998). This system was used to observe terrestrial nightglow (Meinel bands). We have performed two nights of airglow observation at Ansan, Korea during summer of 1998 and retrieved rotational temperatures of OH molecules

as well as their band intensities. In this paper, basic theory and detailed procedure of measuring OH rotational temperatures will be described together with test results.

References

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