Geophysical Research Abstracts
Vol. 20, EGU2018-5163, 2018
EGU General Assembly 2018

Rotational Raman Lidar to measure the Atmospheric Temperature in the upper troposphere and lower stratosphere

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Measurement of the vertical temperature profile within the UTLS presents a major challenge in geophysics to study microphysical phenomena and dynamic processes in particular to detect gravity waves between 2 km and 30 km of altitude. Theoretically, a Lidar method using the anti-Stokes rotational lines of N_2 and 0_2 Raman spectrum should enable the validity range for the temperature profile to be extended to below 30 km by eliminating the particle contribution. In practice, this method uses the variation with the temperature of the envelop of the intensities of the backscattered rotational Raman spectrum, or more precisely the variations of the ratio of the intensities at two lines close-by wavelengths. For each temperature of the gas, the ratio of the fluxes through two narrow and close-by filters takes a definite value directly related to the temperature. The difficulty of eliminating the near-by contribution of the Mie backscattering was solved by adding a Notch filter to produce a rejection factor of 10^8 at the central wavelength. The theoretical calculation of the method led to an analytic calibration function which, once adjusted, can provide the temperature profile in the upper troposphere and lower stratosphere. We will also consider the technical evolutions of this optical device with a Fabry-Perot interferometer, a diffraction grating and a new detector.