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# Specifics of temperature retrievals in the polar summer mesosphere and lower thermosphere: application to TIMED SABER

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The SABER instrument on board the TIMED Satellite is a limb scanning infrared radiometer designed to measure temperature and minor constituent vertical profiles and energetics parameters in the mesosphere and lower thermosphere (MLT). Temperatures in the MLT are retrieved from the 15 $\mu$m radiance of $CO_2$, which requires a detailed accounting of the non-LTE effects in $CO_2$. Non-LTE processes are more pronounced in the polar summer MLT than in other regions due to the cold mesopause and high vertical temperature gradients both below and above the mesopause region. The retrieved temperature profiles under these conditions are especially sensitive to the vibration-translational (V-T) and vibration-vibrational (V-V) collisional energy exchange rates; varying these rates can alter the position and shape of the retrieved mesopause.

We demonstrate that the improved model of the $\nu_2$ quanta V-V exchange between $CO_2$ isotopes applied to the TIMED/SABER 15 $\mu$m broadband polar summer radiance data provides better agreement between retrieved temperatures in the MLT with the available in situ measurements.