

# SO<sub>2</sub> SPECTROSCOPY WITH A TUNABLE UV LASER

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## ABSTRACT

A portion of the fluorescence spectrum of SO<sub>2</sub> has been studied using a narrow wavelength doubled dye laser as the exciting source. One purpose of this study is to evaluate the use of SO<sub>2</sub> resonance re-emission as a probe of SO<sub>2</sub> in the atmosphere.

When the SO<sub>2</sub> is excited by light at 300.2 nm, for example, a strong re-emission peak is observed which is Stokes-shifted from the incident light wavelength by the usual Raman shift (the  $\nu_1$  symmetric vibration frequency 1150.5 cm<sup>-1</sup>).

The intensity of this peak is sensitive to small changes (.01 nm) in the incident wavelength. Measurements of the N<sub>2</sub> quenching and self quenching of this re-emission have been obtained. Preliminary analysis of this data indicates that the quenching is weak but not negligible.

The dye laser in our system is pumped by a pulsed N<sub>2</sub> laser. Tuning and spectral narrowing are accomplished using a telescope-echelle grating combination. In a high power configuration the resulting pulses have a spectral width of about  $5 \times 10^{-3}$  nm and a time duration of about 6 nsec. The echelle grating is rotated by a digital stepping motor, such that each step shifts the wavelength by  $6 \times 10^{-4}$  nm.

In addition to the tunable, narrow wavelength uv source and spectral analysis of the consequent re-emission, the system also provides time resolution of the re-emitted light to 6 nsec resolution. This capability is being used to study the lifetime of low pressure SO<sub>2</sub> fluorescence at different wavelengths and pressures.

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