CARS OBSERVATION AND ANALYSIS OF THE ν_1 BAND OF $^{32}S^{16}O_3$

ENGELENE t. H. CHRYSOSTOM, TONY MASIELLO, JEFFREY BARBER, NICOLAE VULPANOVICI, JOSEPH W. NIBLER, *Department of Chemistry, Oregon State University, 153 Gilbert Hall, Corvallis, OR 97331-4003*; ALFONS WEBER, *National Science Foundation, 4201 Wilson Boulevard, Arlington, VA 22230*; ARTHUR MAKI, *15012 24 th Ave. S. E. Mill Creek, WA 98012*; THOMAS A. BLAKE, ROBERT L. SAMS, *Pacific Northwest National Laboratory, P. O. Box 999, Mail Stop K8-88, 3020 Q Avenue, Richland, WA 99352*.

Sulfur trioxide is an important participant in reactions in the upper atmosphere and also in a number of industrial processes. It is a D_{3h} planar oblate top whose spectroscopy is incomplete, perhaps in part due to its corrosive properties. We are engaged in a comprehensive investigation of the fundamental and combination-overtone bands of $^{32}S^{16}O_3$ as well as of the $^{34}S^{16}O_3$, $^{32}S^{18}O_3$ and $^{34}S^{18}O_3$ isotopic forms. High resolution (0.001 cm^{-1}) coherent anti-Stokes Raman scattering (CARS) was used at Oregon State University to determine for the first time the Q-branch structure of the IR-inactive ν_1 symmetric stretching mode of $^{32}S^{16}O_3$ and its various isotopomers. The ν_1 spectrum of $^{32}S^{16}O_3$ reveals two intense Q-branch regions, with surprisingly complex vibrational-rotational structure. The modeling of this has involved a subtle combination of Fermi resonance and indirect Coriolis interactions with nearby hidden states; $2\nu_4(\ell = 0, \pm 2)$, $\nu_2 + \nu_4(\ell = \pm 1)$, $2\nu_2(\ell = 0)$. The analysis of the perturbed ν_1 spectrum was made possible by locating some of these states via concurrent infrared hot-band studies at PNNL by T.A. Blake *et al.* The results of this combined effort will be presented for ν_1 of $^{32}S^{16}O_3$.