

CO₂ ISOTOPOLOGUES FROM THE ACE SATELLITE

DYLAN ENGLISH, *Department of Physics, Old Dominion University, Norfolk, VA, USA*; PETER F. BERNATH, *Department of Chemistry and Biochemistry, Old Dominion University, Norfolk, VA, USA*; CHRIS BOONE, *Department of Chemistry, University of Waterloo, Waterloo, ON, Canada*.

Carbon dioxide isotopologues have been studied thoroughly in the troposphere. In the stratosphere, the minor isotopologues have anomalous abundances due to their exchange reactions with isotopically fractionated ozone, differentiating them from tropospheric CO₂[1]. This anomalous abundance continues into the mesosphere but with no experimental observations, just model predictions[2]. The Atmospheric Chemistry Experiment Fourier Transform Spectrometer (ACE-FTS) is recording infrared transmittance spectra of the Earth's limb from low Earth orbit (solar occultation). These infrared spectra provide accurate measurements of global CO₂ isotopologue volume mixing ratios (VMRs) from the upper troposphere to the lower thermosphere. Data for the O¹³CO, OC¹⁷O and OC¹⁸O isotopologues will be presented, including seasonal altitude-latitude VMR distributions. The role of photolysis in the upper atmosphere for OC¹⁷O and OC¹⁸O fractionation has been analyzed and found to be "mass independent".

References

- [1] Thieme MH, Jackson T, Mauersberger K, Schueler B, Morton J. Oxygen isotope fractionation in stratospheric CO₂. *Geophys. Res. Lett.* 1991; 18, 4, <https://doi.org/10.1029/91GL00121>
- [2] Liang M, Blake GA, Lewis BR, Yung YL. Oxygen isotopic composition of carbon dioxide in the middle atmosphere. *Proceedings of the National Academy of Sciences* 2007; 104. <https://doi.org/10.1073/pnas.0610009104>.