

Dr. Liz Moyer
Dept. of Chemistry and Chemical Biology
Harvard University
12 Oxford St.
Cambridge, MA 02138
USA
Tel: 617-495-5922
Fax: 617-495-4902
Email: moyer@huarp.harvard.edu

First in-situ measurements of water vapor isotopic composition across the tropical tropopause: implications for transport of water by tropical deep convection

E.J. Moyer¹, T.F. Hanisco¹, D.S. Sayres¹, J. St. Clair¹, F.N. Keutsch², N.T. Allen¹, G.S. Engel³, L.R. Lapson¹, J.B. Smith¹, R.A. Lockwood¹, J.R. Spackman¹, E.M. Weinstock¹, S.C. Wofsy⁴, B.C. Daube⁴, S.Y. Park⁴, E.W. Gottlieb⁴, L. Pfister⁵, J.G. Anderson¹

- ¹ Dept. of Chemistry and Chemical Biology, Harvard University
- ² Dept. of Chemistry, University of Wisconsin-Madison
- ³ Dept. of Chemistry, University of California, Berkeley
- ⁴ Earth and Planetary Sciences Dept., Harvard University
- ⁵ NASA-Ames Research Center

Deep convective systems can bring significant fluxes of water to the near-tropopause region in the form of lofted ice. That ice carries a characteristic isotopic signature. For this reason in-situ measurements of water vapor isotopic composition can be used to trace convective detrainment and convective influence on upper tropospheric and stratospheric humidity. We report here on the first in-situ measurements of water vapor isotopic composition in the tropical near-tropopause region. The Harvard ICOS Isotope Instrument flew on NASA's WB-57 high-altitude research aircraft during the CR-AVE (Costa Rica Aura Validation Experiment) mission in January-February 2006, making a total of 14 flights in the tropics. The aircraft flew through remnants of deep convective systems that produced sharp isotopic perturbations of over 50% in local isotopic ratios (200 per mil relative to standard mean ocean water). The isotopic measurements imply little significant convective detrainment below 13 km but significant convective influence within the tropopause transition region (13-17 km). We discuss the implications of the mean isotopic profile for convective water fluxes to the tropical upper troposphere and lower stratosphere.