

SPARC Water Vapor Assessment: A new direct absorption instrument for high precision and accurate measurement of water vapor in the UT/LS

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We present a new instrument for measurement of water vapor in the UT/LS that was first flown in conjunction with the well established Harvard Water Vapor (HWV) Lyman-alpha hygrometer during the MACPEX mission out of Houston, TX. While several TDL absorption instruments have flown in the UT/LS in the past, the Harvard Herriott Hygrometer (HHH) employs a fiber coupled near-IR laser with state-of-the-art electronics to create an instrument utilizing the direct absorption technique in a spherical Herriott cell of 10 cm length. The instrument demonstrated in-flight precision of 0.1 ppmv (1-sec, 1-sigma) at mixing ratios as low as 5 ppmv with accuracies of 10% based on careful laboratory calibrations and in-flight performance. We present a description of the measurement technique along with our methodology for calibration and details of the measurement uncertainties.