The Chicago Water Isotope Spectrometer (ChiWIS)

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The Chicago Water Isotope Spectrometer (ChiWIS) is a mid-infrared tunable diode laser off-axis integrated cavity output absorption spectrometer that measures H_2O and HDO to high precision using 6 km of effective path length. As part of the StratoClim campaign in Summer 2017, ChiWIS made water vapor measurements from the mid-troposphere through the lower stratosphere (up to 20 km altitude). During flight, ChiWIS made in-situ measurements to a precision of 0.03 ppm for H_2O (1 s averaging) and 0.08 ppb for HDO (10 s averaging). We compare multiple in-situ measurements and remote sensing observations to validate measurements. ChiWIS has also been reconfigured for ground-based operation to make high-frequency, simultaneous measurements of multiple isotopologues in water vapor, including H_2O, $H_2{}^{17}O$, $H_2{}^{18}O$, HDO, and $HD^{18}O$. We discuss deployment of the instrument in Spring 2018 and results quantifying variability in vapor-phase isotopic ratios and use of multi-isotope systematics for identifying sources of water vapor.