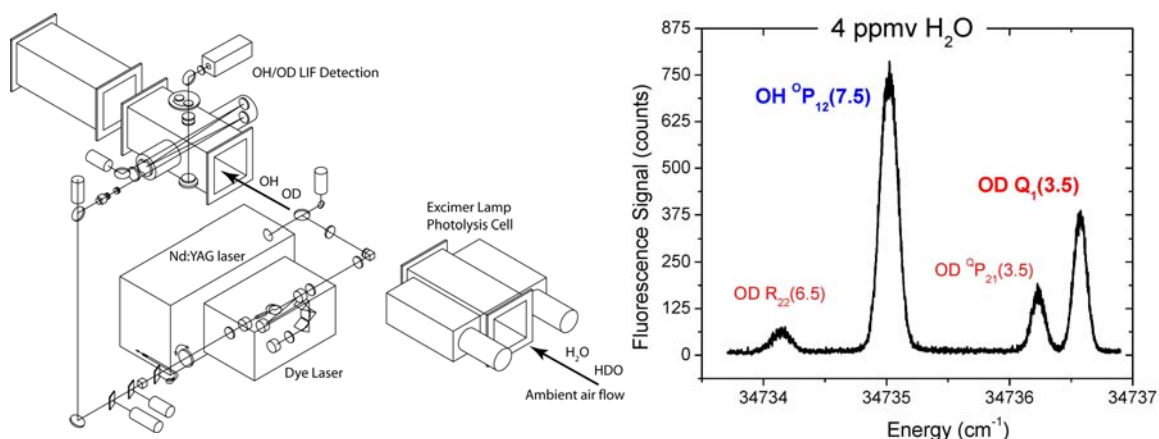


## Hoxotope: Total water isotopes

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The Hoxotope instrument uses a combination of photolysis and laser induced fluorescence (LIF) to detect H<sub>2</sub>O and HDO in the condensed and vapor phases (total water isotopes). Vapor and condensed water are sampled with an isokinetic inlet similar to that used in the Harvard Total Water instrument [Weinstock, et al., 2006]. The sampled air is heated to evaporate condensed water prior to detection. A small portion of the heated flow is diverted to the photolysis cell that converts H<sub>2</sub>O and HDO to OH and OD. The OH and OD radicals are detected by LIF using a tunable laser at 287 nm. The LIF detection provides high sensitivity and fast time response. The small detection volume (0.5 l) and fast flow (8 l/s) reduces the susceptibility of the instrument to wall contamination effects.



**Figure 1:** The HOxotope detection system is shown on the left. The photolysis cell in front of the detection axis converts H<sub>2</sub>O and HDO to OH and OD that are subsequently detected by LIF. An example spectrum is shown on the right.

The data products are H<sub>2</sub>O and HDO in the condensed and vapor phase. The data can be used in conjunction with vapor phase instruments to determine the isotopic composition of ice particles. For 4 ppmv H<sub>2</sub>O and 10 s acquisition time the precision for H<sub>2</sub>O is  $\pm 0.15$  ppmv and for HDO  $\pm 40$  pptv, each with 5% calibration uncertainty. The isotope ratio of water is expressed as  $\delta D(\text{‰}) = 1000 \times ([\text{HDO}]/[\text{H}_2\text{O}]/3.115 \times 10^{-4} - 1)$ , where  $3.115 \times 10^{-4}$  is the ratio of HDO/H<sub>2</sub>O in Vienna standard mean ocean water (VSMOW). The precision for  $\delta D$  is  $\pm 30\text{‰}$  with an accuracy of 50%.

## References

A detailed description of the instrument design, principle of operation, and calibration is presented in St. Clair *et al.* Scientific interpretation of data obtained with Hoxotope and ICOS is presented in Hanisco *et al.*

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