



Comparison of water vapor sampling techniques for stable isotope analysis

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Recent developments in laser spectroscopy enabled to carry out direct measurements of $\delta^{2}\text{H}$ and $\delta^{18}\text{O}$ of air water vapor in the field. However, certain experimental sites or project budgets do not ease the deployment of this technology to obtain the needed measurements. We carried out two consecutive experiments to test different air sample bags for their suitability for laser spectroscopy. Aiming to provide information about the consistency in water vapor sampling techniques and their suitability for laser spectroscopy. The first experiment determined the minimum air sample volume required to obtain reliable measurements of $\delta^{2}\text{H}$ and $\delta^{18}\text{O}$ with a laser spectrometer. The second one determined the ability to retrieve similar air sample isotope signatures collected with different sampling methods for water vapor. We investigate the performance of methalized polyethylene (MPE) bags, polyvinyl fluoride (PVF) bags, low density polyethylene (LDPE) bags and cryogenic samples when compared against direct measurements with a laser spectrometer (benchmark). Stable isotope measurements of water vapor by laser spectroscopy can be obtained with a sample volume of 450 mL of air. This allows measuring each sample during a period of 300 s, obtaining isotope signatures with standard deviations lower than 0.1 ‰ and 0.5 ‰ for $\delta^{2}\text{H}$ and $\delta^{18}\text{O}$, respectively. The second experiment determined that MPE bags provide a more reliable measurement of water vapor stable isotopes than LDPE bags, PVF bags and the cryogenic samples.