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Using a fourth-generation cavity enhanced spectrometer to isotopically investigate nitrous oxide emissions from biochar amended soils.

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Research into the impacts of biochar on key processes in the nitrogen cycle is important to understand biochar's potential role in sustainable agriculture. There is conflicting evidence that biochar can reduce globally significant greenhouse gas emissions, especially N2O, one of the most important greenhouse gases in agriculture. However to date there is little information on the mechanisms involved. The source of N2O is dependent on the physical, chemical and biological status of the soil at a microbial scale and we need to understand how biochar influences it. Using the 15N2O gas flux method combined with gross rate measurements of nitrification and modelling, it should be possible to determine the parameters which drive N2O emissions and to evaluate the specific impact of biochar on these important N loss processes. To date the scope of isotopic studies on nitrous oxide emissions have been limited, due in part to technical and infrastructural access to complex and expensive mass spectrometry. With the advent of laser based systems these logistical and analytical constraints could be overcome and allow for a deeper and geographically more representative, understanding and assessment of the role of biochar in reducing nitrous oxide emissions from soil. In this study we have developed a simple method for investigated nitrous oxide emissions from soils amended with biochar, employing state of the art stable isotope techniques, using a fourth-generation cavity enhanced absorption technique a variant of conventional Cavity Ringdown Spectroscopy (CRDS) for measurement of isotopes of nitrous oxide. We will present methodologies used and results from these experiments, techniques that should path the way for a greater global understand nitrous oxide emissions from soils.