



A 3 yr PhD studentship in France at INRA, Bordeaux and Dijon

Identifying the drivers of carbonic anhydrase activity in soils and its impact on soil-atmosphere exchanges of CO¹⁸O and COS, two complementary tracers of the global carbon cycle

Rationale: Rising CO₂ and temperature combined with changes in water availability will modify terrestrial ecosystem photosynthetic uptake and respiratory losses in the near future, but it still remains unclear to what extent. Complementary tracers of the carbon cycle, such as the oxygen isotope composition of CO₂ and carbonyl sulfide (COS) can provide novel insights on ecosystem processes and help constrain large-scale CO₂ budgets. However, mechanistic understanding of how environmental and ecological conditions regulate the exchange rates of these tracers between soils and the atmosphere is currently unknown.

Methodology: Soils collected from several biomes across Europe will be investigated by the PhD student in Bordeaux using a climate-controlled experiment designed to measure variations in an important enzyme, carbonic anhydrase (CA) and to identify the drivers of its activity. This enzyme catalyses the oxygen isotope exchange of CO₂ in water and generally promotes the uptake of COS in soil microorganisms. The student will use state-of-the-art DNA pyrosequencing techniques to determine whether changes in the composition of the soil community responding to environmental manipulation underlie the observed changes in CA activity. The student will also develop molecular tools with the INRA GenoSol Platform in Dijon to identify whether changes in the expression of CA genes can be detected as CA activity varies.

Training: The successful candidate will obtain specialist training in the measurement of environmentally important trace gases (CO₂, H₂O & COS) and their natural stable isotope variations using state-of-the-art laser spectroscopy techniques. In addition the student will be trained on a suite of transferable genetic tools at the INRA GenoSol platform based in Dijon. The student will also be exposed to the latest modelling and bioinformatic tools developed by the supervisors for interpreting the results collected during the experiments.

Wider Context: The studentship is embedded within a broader programme of research funded by national (ANR) and European projects (ERC) that will contribute to a quantitative description of CA activity in ecosystems and at the global scale. This interdisciplinary PhD position offers exciting opportunities to generate unique and comprehensive datasets at the interface of atmospheric science and soil microbiology, that will lead to a greater understanding of carbon cycling on Earth. This PhD offers an experience to work within two dynamic and internationally recognised teams working on isotope biogeochemistry and functional microbiology and an opportunity to network with many international collaborators.

Application: Please send your application (CV, letter of motivation and the names and contact information of two referees) to Lisa Wingate (see below). The position is available immediately and will remain open until filled. Candidates are sought with an interdisciplinary background linking either environmental microbiology, soil physics and atmospheric chemistry. The candidate will have a MSc diploma and a strong interest in process-oriented research. In addition skills in bioinformatic data analysis are desirable as well as proven communication skills in both spoken and written English.

For further information please contact:

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