PhD scholarships in greenhouse gas emissions from dry and flooded drylands in Australia

Drylands (hyper-arid, arid, semi-arid and dry-subhumid regions) cover 40–50% of the Earth's land surface and are expanding as the planet warms (Huang et al. 2017). However, in addition to extended dry periods, drylands also have infrequent short periods of intense rainfall and associated extreme flood events (Tooth 2013). These large slow moving flood pulses are transmitted slowly through low-gradient, multichannel river systems (anabranching) with very large floodplains (Jarihani et al. 2015). Climate change is changing the frequency of these flood events, due to changes in tropical cyclones that drive flooding in some systems (e.g. Lake Eyre Basin) (Donohue et al. 2009). These river systems are found in drylands around the globe (Jarihani et al. 2015), but they are typically in remote, sparsely populated areas with few roads and these roads become impassable during flooding, which combined with the transient nature of floods (McMahon et al. 1992), makes field measurements extremely difficult. During the extended dry periods, large amounts of organic matter accumulate on these very large wide dryland floodplains (Robertson et al. 1999; Burford et al. 2008). When these floodplains are inundated during extended periods of flooding, the decomposing organic matter would be expected to release large amounts of the important greenhouse gases CO_2 and CH_4. However, despite the potential to produce large amounts of CO_2 and CH_4, emission measurements from dryland anabranching river systems, and their wetlands and terminal lakes, during flooding, have never be made. The Lake Eyre is the largest drainage basin in Australia. It covers around one-sixth of the continent Australia and has floods every one or two years during La Nina (wetter) periods.

This Australian Research Council Discovery project will measure CO_2 and CH_4 fluxes from flooded, and dry, dryland Lake Eyre basin anabranching river systems, their wetlands, and terminal lakes. We are currently seeking two PhD students for 1) field measurements of greenhouse gas emissions, and 2) modelling of greenhouse gas emissions from inland water systems. Both PhD students will be based at Southern Cross University in Australia.

PhD Project 1. Field measurements of greenhouse gas emissions
We are currently seeking a PhD student to focus on field measurements of greenhouse gases from the Lake Eyre basin, (central Australia), during wet and dry periods. This project will use a combination of different techniques such as stable isotopes, cavity ring down spectroscopy, process measurements and soil and floating chambers. You will work as part of a multidisciplinary team of post-graduate, post-doctoral and senior biogeochemists.

Applicants must have an Honours or Master degree, undertaken in English, in a related field such as biogeochemistry, environmental chemistry, limnology, or closely related. The project will involve extended periods of intensive field work in very remote harsh areas, laboratory work and data analysis. Experience with remote field work, 4WD, bush camping, helicopters, large data sets, and stable isotopes will be viewed favourably.

PhD Project 2. Modelling of greenhouse gas emissions
The project will involve working with a team developing a process-based carbon cycle model and integrating knowledge gained from the field observations and measurements within this numerical framework. The work will focus on further developing an existing wetland methane model (LPJwsl) to represent the CO_2 and CH_4 fluxes from inland water systems.

Applicants must have an Honours or Master degree, undertaken in English, in a related field such as biogeochemistry, environmental chemistry, or limnology, engineering, remote sensing or closely related. Interest and experience in coding with languages like R, Python, C and with high-performance computing is a benefit but not required as training will be provided through working with a larger team of scientists and coding developers. This position will be based a Southern Cross University in Australia, but will also require spending extended periods working with collaborators at NASA Goddard Space Flight Center in Maryland, USA.

The candidates will be based in the Centre for Coastal Biogeochemistry (https://twitter.com/biogeochemSCU, https://www.scu.edu.au/centre-for-coastal-biogeochemistry/) at Southern Cross University (Australia). The Centre for Coastal Biogeochemistry has a world-class research group including a number of post-graduate, post-doctoral and senior researchers working in similar areas, providing an outstanding environment for intellectual stimulation and opportunities for exchange of ideas. The Centre has world-class infrastructure including access to an extensive stable isotope facility with

full technical support, a membrane inlet mass spectrometer (MIMS), well equipped inorganic and organic chemistry laboratories, and a range of field equipment including benthic chambers, data sondes, and Picarro Cavity Ring-down Spectrometers (see http://scu.edu.au/coastal-biogeochemistry). Southern Cross University received the highest rank of 5.0 (well above world standard) in geochemistry in the most recent national research excellence assessment.

Scholarships provide a tax-free annual stipend of $28,597 for 3 years and 3 months years, and tuition fees will be exempt for 4 years. Interested applicants should send a CV and short (< 1 page) statement highlighting (1) which project they are interested in (2) their research background and interests, with respect to the criteria above, to Prof Bradley Eyre (bradley.eyre@scu.edu.au) and Dr. Judith Rosentreter (judith.rosentreter@scu.edu.au). Only short-listed applicants will be notified. Closing date for applications is January 29, 2023. Preferred starting date is mid 2023.

Southern Cross University is based in Lismore, northern NSW, Australia (near Byron Bay). The region is a great place to live with a perfect sub-tropical climate (not too hot, not too cold), some the best beaches and surfing in the world, plus great fishing, scuba diving and wilderness areas.