PhD Scholarship in coral reef biogeochemistry in Australia

Biogenic volatile organic compound (BVOC) emissions from coral reefs under stress

Biogenic volatile organic compounds (BVOCs) are trace gases of biological origin that play a key role in earth system processes. There are two principal aspects relating to climate change and BVOCs: (1) the potential influence of BVOC's on regional and global climate, and (2) the potential influence of a changing climate on the production of BVOCs, an inter-reliance which is well illustrated on the Great Barrier Reef (GBR).

Coral reefs are considered potential hotspots for BVOC emissions due to their high biological productivity, temperature and light, but little is known about the amount or forms of BVOCs emitted, and the mechanisms underlying their production. BVOCs can all act as precursors of secondary organic aerosols, essential for particle nucleation and the production of cloud condensation nuclei, which seed cloud droplets and influence the properties including the albedo (reflectivity) of low-level clouds, potentially playing a role in regulating climate.

The production of BVOCs by coral reefs is also a poorly understood potential feedback mechanism in coral bleaching episodes. Some studies have suggested that production of BVOCs by the GBR may help to down-regulate solar irradiance and sea surface temperatures, mitigating against bleaching, while others argue this effect may not be significant, or exist at all. Compounding this ongoing debate, changes to BVOCs production as a result of warming and associated coral bleaching (and other stressors such as light and ocean acidification) in the Great Barrier Reef remain almost completely unquantified.

One of the major problems with BVOC research on coral reefs to-date is that seawater BVOC samples are collected in a bottle and then analysed back in the laboratory. This limits the number of BVOCs measured, and the quality, and temporal resolution, of the data. This project will overcome these previous limitations by using a transportable Equilibrator Inlet Proton Transfer Reaction Mass Spectrometer to make in situ, high-precision, high-temporal-resolution measurements of the full spectrum of BVOCs in coral reef systems. As such, it will make significant advances in quantifying and understanding the mechanisms of BVOCs release from coral reefs and their influence on the regional and global climate system.

This project is part of the Reef Restoration and Adaptation Program (RRAP), a large-scale collaborative research and development program to develop, test and assess innovative interventions to enhance reef resilience and sustain ecological functions and values. The Cooling and Shading sub-program is focused on evaluation and development of interventions to reduce coral bleaching stress across multiple scales, ranging from individual high-value reefs right up to the scale of the entire GBR ecosystem. This program incorporates fundamental science on atmospheric – radiation – ocean – coral interactions as well as applied science and engineering in the development and testing of innovative coral conservation approaches.

Applicants will need to have an Honours or Master degree, undertaken in English, in a related field such as biogeochemistry, environmental chemistry, or closely related. The project will involve extended periods in the field, including on boats, sometimes in remote areas. The PhD scholarship will provide a tax-free stipend of $28,082 per annum (3 years) and tuition fees will be exempt for 4 years. Interested applicants should send their CV highlighting their research background and interests in this area to Prof. Bradley Eyre – (bradley.eyre@scu.edu.au). Only short-listed applicants will be notified. Closing date July 11, 2021 although it may be extended longer if position is not filled. Starting date is November 2021 (for overseas applicants this will depend on Australian boarders and getting appropriate visas).

The project will be undertaken in the Centre for Coastal Biogeochemistry at Southern Cross University which received the highest rank of 5.0, well above world average, in geochemistry in the most recent assessment of research excellence by the Australian government.

This position is based at Southern Cross University's Lismore campus, northern NSW, Australia (near Byron Bay). The region is a great place to live with a sub-tropical climate, some of the best beaches and surfing in the world, plus great fishing, scuba diving and wilderness areas. The quality of life is high and the cost of living relatively low compared to many cities.