NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE | Graduate College

1. Reconstructing carbon biogeochemistry of Southeast Asian coastal waters using coral cores

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Project Description (200-300 words)	Southeast Asia's Sunda Shelf Sea receives some of the world's highest rates of organic carbon input from land, chiefly from blackwater rivers that drain the region's extensive tropical peatlands. Previous research has shown that this terrestrial organic carbon (tOC) has two major environmental impacts: firstly, it absorbs sunlight and thereby reduces the light availability for marine organisms such as corals and phytoplankton. Secondly, a large fraction of the tOC decomposes to CO2 within the shelf sea, thereby acidifying the seawater. The input and decomposition of tOC is thus a major control over the regional marine ecology of Southeast Asia. A key question that remains unresolved is how the tOC input has changed over the last half century: during this time, most of the peatlands in Southeast Asia have been drained and converted to plantations. Site-scale studies suggest that this has considerably increased the tOC outflow via rivers to sea, but we have virtually no historical ocean chemistry data to test whether this really is the case and how it has affected marine ecosystems. This PhD project will use geochemical proxy measurements in coral skeleton cores collected along the Malacca Strait to provide the first long-term reconstruction of tOC inputs into coastal waters and identify their drivers. We will use multiple proxies, including coral luminescence (proxy for tOC concentration), boron isotopes (proxy for pH), and stable carbon and oxygen isotopes (proxies for tOC decomposition and for salinity) to produce a comprehensive understanding of the coastal carbon cycle and how this has affected rates of seawater acidification and underwater light availability. The student will learn how to collect and sample coral skeleton cores, how to measure each of the geochemical proxies, and how to calibrate coral core proxy data using direct measurements of seawater chemistry. Boron isotopes will be analysed at IISc.	
Program/Center Website(s)	NA	
Additional Information (e.g., files with project details)	NA	