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Using Eddy-Covariance to understand CO2 and CH4 flux dynamics within a temperate, coastal wetland on French Island, Victoria, Australia

Matthew Peck[1], Ruth Reef[1], Nigel Tapper[1], Edoardo Daly[2], Leigh Burgess[1], and Adrien Guyot[2]
[1]Monash University, School of Earth, Atmosphere & Environment, Clayton, Victoria, Australia
[2]Monash University, School of Civil Engineering, Clayton, Victoria, Australia

Coastal wetlands play a pivotal role in regulating both carbon (CO_2) and methane (CH_4) concentrations across the globe. The amount of CO_2 and CH_4 stored and released by these ecosystems is becoming more understood, in particular, within each aspect of the ecosystem. However, how the dynamics of the ecosystem affect CO_2 and CH_4 fluxes on a microclimate level is poorly understood, as well as the overall flux of these Greenhouse Gases (GHGs) within temperate, coastal wetlands. Current research primarily focuses on inland wetlands and coastal wetlands in sub-tropical and tropical regions. Thus, this research aims to investigate CO_2 and CH_4 fluxes within coastal, temperate wetlands, and improve the understanding of how environmental dynamics impact the flux of these critically important Greenhouse Gases (GHGs).

To satisfy this aim, the use of the Eddy-Covariance (EC) method was employed. An EC station was installed on the South-West tip of French Island, Victoria, Australia in late February 2018. The collected data demonstrates the challenges with collecting micro-climate data in an ecosystem with ever-changing environmental conditions. The preliminary results indicate how sensitive flux dynamics are within coastal, temperate wetlands, in particular, to factors such as: tidal and seasonal inundation, seasonal vegetation dynamics, and shifting ecological gradients. The data obtained by the EC station provides a preliminary indication of the complexities of accounting for, and understanding, carbon and methane movement through coastal wetlands in general. The full dataset will aid in improving this understanding, specifically for rare, temperate wetland environments, increasing the knowledge base on how flux dynamics of carbon and methane are affected when collected via open-source methods in dynamic environments.