UNIVERSITY OF GOTHENBURG

**Department of Marine Sciences**

# Inorganic carbon outwelling from a Mediterranean seagrass meadow using radium isotope tracers

Claudia MajténYi Hill



Degree project for Master of Marine Science (120 hp) with a major in Marine Chemistry [MAR703, 60 hp]
Semester: Spring 2022
Supervisor: Isaac Santos & Gloria Reithmaier (Dept. of Marine Sciences)
Examiner: Katarina Abrahamsson (Dept. of Marine Sciences)

# Inorganic carbon outwelling from a Mediterranean seagrass meadow using radium isotopes

---

Claudia Majtényi Hill
Degree project (60hp) for Master of Marine Science. Spring 2022.
Supervisors: Isaac Santos & Gloria Reithmaier (Dept. of Marine Science, University of Gothenburg)
Examiner: Katarina Abrahamsson (Dept. of Marine Science University of Gothenburg)

---

## Table of Contents

## Popular science summary

Seagrass meadows populate near-shore waters all over the world and are known for storing large amounts of carbon in their sediments. They have therefore been recognised as an important tool in the fight against climate change. However, carbon can also be removed from seagrass habitats by horizontal transport to the open ocean. In this study, horizontal transport in a Mediterranean seagrass meadow during early autumn was estimated by using naturally-occurring radium isotopes. Most of the carbon transported was released back to the atmosphere. In total, the amount of carbon released was larger than the amount stored in sediments, meaning the meadow acted as an overall source of $CO_2$ to the atmosphere. It is therefore suggested that horizontal transport is important to consider when developing seagrass schemes and projects. More studies are needed to investigate this further.


## Abstract

Seagrass meadows are widely recognised for their 'blue carbon' capacity and role in climate change mitigation. Previous studies have focused mainly on processes within meadows, and have only recently begun to consider the concept of outwelling (i.e., lateral transport of carbon to the ocean). Here, radium isotopes ($^{223}$Ra & $^{224}$Ra) were used to provide some of the first estimates for DIC and TA outwelling from a Mediterranean seagrass meadow during early autumn. DIC outwelling was 7.0 – 9.3 mmol $m^{-1}$ $day^{-1}$, and exceeded above-meadow $CO_2$ outgassing by > 20-fold. Production of DIC was uncoupled from TA and fueled by net heterotrophy and aerobic processes within the meadow. The negligible export of TA (0.2 – 0.5 mmol $m^{-1}$ $day^{-1}$) implied that 89.7% of outwelled DIC may return to the atmosphere in offshore waters. Combining these emissions with above-meadow outgassing suggested a total carbon loss (106 mmol $m^{-2}$ $day^{-1}$) that exceeded long term burial in sediments. Thus, the meadow acted as an overall carbon source during the early fall season. Further studies quantifying outwelling at multiple spatial and temporal scales are required to better resolve seagrass carbon budgets. Radium isotopes provide a practical and useful tool for application in these future estimations.