in think azul ANDALUCÍA

DEveloping rePOsitories for CARBON export quantification in the ocean

Acrónimo: DEPOCARBON | **Referencia/Nº de expediente: PCM_00063**

LÍNEA 1
Observación y monitorización del medio marino y litoral

A.1.3. Desarrollo de nuevas tecnologías de monitorización ambiental
A.1.6. Técnicas analíticas avanzadas de datos complejos
A.1.8. Desarrollo de productos y servicios para la toma de decisiones

Institución/Organización:
Universidad de Sevilla

Área/Departamento
Física Aplicada II

Otras entidades involucradas en el proyecto
Universidad de Cádiz

PARTICIPANTES

IP
Maria Villa Alfageme
Universidad de Sevilla

CO-IP
Maria Villa Alfageme
Universidad de Sevilla

Otros participantes

María Elena Ceballos Romer
Universidad de Sevilla

José María López Gutiérrez
Universidad de Sevilla

José Luis Más Balbuena
Universidad de Sevilla

Ignacio Vioque Romero
Universidad de Sevilla

Jorge Rivera Silva
Universidad de Sevilla

Beatriz González González
Universidad de Sevilla

Más información del proyecto

RESUMEN DEL PROYECTO

A significant challenge facing mankind is climate change driven by CO_2 emissions from human activities. CO_2 concentrations would be 50% higher than they already are if it was not for the ocean's Biological Pump (BP), an important component of Earth's carbon cycle. The BP starts with the production of organic matter by unicellular plants in the surface ocean. A fraction of this carbon sinks into the dark ocean below 1000 m depth, where it can be stored for 1000 years, contributing significantly to maintaining the air-sea balance of CO_2. However, the current global estimates of the BP storage have a large uncertainty and vary up from 5 to 20 Gt C yr-1. The problem of CO_2 emissions is a global problem, and understanding the role of the oceans in sequestering part of that CO_2 is crucial to society's understanding of the problem and in political decision-making. In Andalucía we must take a leading role in the world scenario, considering that due to its geographical location it will specially suffer the climate global changes.

POC flux, i.e. carbon export below the productive zone, is a key parameter in the study and quantification of the BP and climate predictions and models, and we will be presenting the first platform sharing global POC flux data, that will allow the community to have a systematic approach to the collection and use of these crucial data. For that, we will also build an observation platform of 234Th data in Andalucía coastal and marine environment. This is a well-established technique that has been used for more than 30 years to estimate POC fluxes, however, DEPOCARBON approach proposes the application of state-of-the-art, innovative new marine techniques.

It will include, for the first time, the automatization of the processes and calculations that lead to POC flux calculation from 234Th measurements: collecting the data, storing them into a universally usable format and analysing automatically the available large amount of data, through big data techniques. Our final aim is digitalize the results from more than 56 600 data points to create an open access platform of global carbon export data. Furthermore, the dense collection of data made available in the new platform would be re-worked using artificial intelligence, machine learning algorithms, to build a predictive tool for carbon export. We finally aim to convert this carbon export platform in a focal point for the scientific community, not only for sharing but also contributing with data, coordinated with other platforms in the most proficient way.

## OBJETIVOS GENERALES Y ESPECÍFICOS DEL PROYECTO

O.1. Creation of the first observatory of carbon export in the Gulf of Cádiz. Measuring radioactive pairs, 210Po-210Pb and 234Th -238U and calculating POC flux using parent and daughter disequilibrium.
O.2. Update the Sea of Thorium 234Th compilation (www.seaofthorium.com) with the new data from DEPOCARBON cruises. with novel data from new publications and unpublished works from the latest years
O.3. Creation of compilation 210Po-210Pb. To obtain complementary information and a larger number of data points to build the POC fluxes repository
O.4. Creation of an Integrated Platform for Carbon Flux data collection. A global, comprehensive, accurate, integrated open acces dataset and/or repository of carbon fluxes derived from different techniques, disequilibrium 210Po-210Pb and 234Th-238U, and images from UVP cameras. A comprehensive and accurate data repository open to all the community and general public. Usability must be taken into account, to facilitate an easy uploading of the data and to improve the visibility of the data in the scientific and marine community.
O.5. To retrieve globally C flux measurement and additional variables from at least 1500 234Th and 210Po profiles previously compiled and geo-location and physical parameters through an Artificial Neural Network-based method (ML).
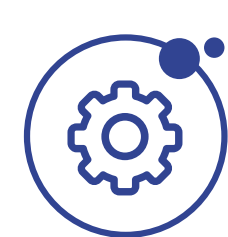
ACCIONES PREVISTAS

First observatory of carbon export in the Gulf of Cádiz. Implementing the 210Po-210Pb, 234Th -238U method for POC evaluation and other radionuclides.

Advanced analytical techniques using Phyton for the calculation of C flux variables using 210Po-210Pb and 234Th-238U disequilibria.

Creation of an Integrated Platform for Carbon Flux data.

Database oriented for AI and development of AI algorithms to predict carbon export.

RESULTADOS ESPERADOS

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