EGU25-8284
EGU General Assembly 2025

Fe RESPONSE IN AN ACIDIFIED OCEAN. FeRIA PROJECT

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Acidification and warming in the ocean and their effect on the biogeochemical cycles of trace metals can be studied from both an anthropogenic climate change perspective or natural perspective. The former is a consequence of anthropogenic CO_2 emissions into the atmosphere and their subsequent transfer to the ocean, while the latter is driven by volcanic and hydrothermal gas emissions. Both phenomena occur in the ocean, making it a natural laboratory where the effect of these processes can be investigated.

In the FeRIA project, the behaviour of iron (Fe) under conditions of acidification and warming was studied at different sites affected by volcanic CO_2 emissions (Fuencaliente and Tazacorte, La Palma) and anthropogenic CO_2 emissions (El Hierro, Gran Canaria). Although both processes lead to ocean acidification, volcanic emissions contribute other chemical components that can modify Fe behaviour. Since each oceanic region has specific properties, Fe(II) oxidation processes are not uniform. These processes are affected by not only the physical-chemical properties (pH, T, S, O_2) of the environment but also by the biogeochemical conditions (dissolved and particulate organic matter). Ocean acidification contributes to reducing the rate of Fe(II) oxidation in the ocean, therefore favouring the availability of Fe(II) for longer periods. In contrast, higher temperatures accelerate Fe(II) oxidation. Organic matter, depending on its characteristics and functional groups, can contribute to speed up or slow down the oxidation process.

These studies will make it possible to address two key questions: (1) whether regions affected by volcanic emissions can serve as models for regions where acidification and warming are caused only by anthropogenic climatic effects, and (2) whether the persistence of Fe (II) in the marine environment is controlled by the same factors.

Key words: Iron, kinetics, ocean acidification, warming, volcanic emissions

Acknowledgments: This work has been funded by FeRIA (PID2021-123997NB-I00) project given by the Ministerio de Ciencia e Inovación from Spain. LSB participation was funded by the PhD grant (PRE 2022-101456) associated to FeRIA project. A. Bullón-Téllez participation was funded by the PhD grant (ULPGC2023-2-01).