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## **Biogeochemical Processes**

### **The natural ocean acidification and fertilization event caused by the submarine eruption of El Hierro**

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### **Abstract**

The shallow submarine eruption which took place in October 10th 2011, 1.8 km south of the island of El Hierro (Canary Islands) allowed the study of the abrupt changes in the physical-chemical properties of seawater caused by volcanic discharges. In order to monitor the evolution of these changes, seven oceanographic surveys were carried out over six months (November 2011-April 2012) from the beginning of the eruptive stage to the post-eruptive phase. The pH in total scale at 25°C ( $\text{pH}_T$ ), total dissolved inorganic carbon ( $C_T$ ), and total alkalinity ( $A_T$ ), were measured together with temperature, salinity, dissolved oxygen and total sulfur reduced species. Nutrients, ferrous iron and  $\text{pCO}_2$  were also analysed on most of the cruises.

Important changes in the water column chemistry including large decreases in pH, striking effects on the carbonate system, decreases in the oxygen concentrations and enrichment of Fe(II) and nutrients were produced. As a result of the ongoing magmatic activity, the submarine eruption produced an unprecedented episode of severe acidification and fertilization.

The findings highlight that the same volcano which was responsible for the creation of a highly corrosive environment, affecting marine biota, has also provided the nutrients required for the rapid recuperation of the marine ecosystem.

In January 2013, the Spanish Government approved the project VULCANO in order to study the post-eruptive phase in the submarine volcano of El Hierro. Three cruises were planned (March and October 2013 and March 2014). Physical-chemical anomalies are still being observed close to the volcano area.

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