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Volcanic Eruptions as Drivers of Coastal Iron Fertilization

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Volcanic eruptions represent a variable source of trace metals to the ocean. This study focuses on the 2021 Tajogaite volcano eruption in La Palma (Canary Islands, Spain) and its significant impact on coastal iron (Fe) dynamics. Over 85 days of activity, the eruption contributed vast amounts of volcanic ash and lava to the ocean, resulting in elevated Fe concentrations. Measurements revealed that Fe levels in seawater reached over 1900 nmol L⁻¹, with 99% of the Fe in particulate form. Soluble Fe concentrations were approximately ten times higher than typical values in the open Atlantic Ocean, demonstrating the eruption's role in enhancing bioavailable Fe.

This poster explores Fe size fractionation during the eruption, observing a transition from large particulate dominance to increased colloidal and soluble Fe over time. Lava-seawater interactions produced hydrothermal plumes, characterized by increased temperatures, low pH, and elevated turbidity, significantly altering the local marine environment. Spatial and temporal variability in Fe concentrations highlight the dynamic nature of these coastal systems during volcanic events.

Our findings underscore the potential of volcanic activity as a natural iron fertilization mechanism in nutrient-limited regions, with implications for primary productivity and carbon cycling. The episodic nature of these interactions necessitates refined models to incorporate volcanic contributions to ocean biogeochemistry models.