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ANALYSIS OF THE IMPACT OF VOLCANIC ERUPTIONS ON FISHERY RESOURCES USING EARTH OBSERVATION DATA

Abstract

In recent years several volcanic eruptions have made headlines for their significant economic and humanitarian costs. Notably these include the eruptions of Cumbre Vieja (La Palma, Spain) and Hunga Tonga (Fonuafo'ou, Tonga). Both eruptions disturbed not only the human population living around them but also the natural ecosystem, leading to health consequences for marine life due to the change in habitat conditions. In cases such as Tonga, where an estimated 82% of families survive on subsistence fishing, it is necessary to investigate not only damage to property caused by the eruptions but also the impact of the eruptions on marine biodiversity and consequently the impact on local livelihoods.

The aim of this paper is to analyze and perform a comparative study of the effect of several volcanic eruptions on aquatic ecosystems using available Earth Observation data. The methodology of this research considers the study of four eruptions of different volcanoes from which lava flowed to the sea. The four eruptions are: Kilauea in 2018, Stromboli in 2019, Cumbre Vieja in 2021, and Hunga Tonga 2021/22. Marine parameters derived from Earth Observation and GNSS-R data used in this analysis include sea surface temperature (SST), altimetry, acidity (pH), turbidity (TUR), iron (FE), chlorophyll (CHL), and nitrates (NO3) levels. The research involves the evaluation of the evolution and correlations between these parameters.

The results of this study allow for a modeled characterization of volcanic eruptions through prediction of their socio-economic impact in communities dependent on fishing, while improving the understanding of the impact of these events on marine ecosystems. The findings from this research prove that Earth Observation satellite data parameters are essential for an in-depth analysis of the repercussions of volcanic eruptions.