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Exploring CO₂ volcanic vents at Vulcano Island, Mediterranean Sea, to study the planktonic calcifier response to long-term changes in carbonate chemistry

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Marine volcanic vents emitting carbon dioxide from the sea floor are responsible for altering the carbonate chemistry and lowering pH in the surrounding waters. They have been used recently as natural laboratories to study the long-term impacts of ocean acidification on marine ecosystems, mainly on benthic organisms. The focus of this study is on calcifying phytoplankton (coccolithophores; key marine calcifiers involved in the marine carbon cycle) in such environments. Changes in seawater carbonate chemistry can affect the rates of calcification and calcification modes, but their effects are still uncertain and there is a growing need for in situ experiments. There are several complications that need to be considered for studying plankton in such environments (e.g. turbulence, water transparency, nutrients).

We performed a pilot study in shallow water volcanic CO₂ vents at the Island of Vulcano, Sicily (Italy) to determine if and how the site could be used for experiments on planktonic calcifiers. Three stations with different pH were identified near the vents. In each of them the carbonate system, the coccosphere density, the biodiversity and the calcification types have been observed. The results are also compared with surface sediments from the same sites representing the long-term response of coccolithophores to the environmental changes.