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Seawater dissolved gases associated with hydrothermal fluids in convergent margins (Brandsfield-South Shetland, Antarctica) and mid-ocean ridge and intraplate settings (Azores, Portugal)

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The occurrence of hydrothermal emissions implies the existence of heat sources related to magma reservoirs both in convergent margins (Bransfield-South Shetland) and in mid-ocean ridge and intra-plate settings (Azores). The importance of these systems lies in (a) producing important mineralizations, (b) favouring extremophilic ecosystems, (c) being precursors of underwater volcanic eruptions, (d) playing a major role they play in the matter and energy exchange between the geosphere and the hydrosphere and (d) their impact on the geochemistry of the oceans. In subduction margins, rifts, transforming faults or volcanic buildings in hot spots, emissions of hot fluids related to magmas and/or circulation in hydrothermal systems can occur. The fluids associated with magmas are fundamentally gases (CO_2, H_2O, H_2, SO_2, H_2S, He, etc.). Hydrothermal fluids constitute a complex system where seawater percolates through fissures and fractures in sediments and rocks at different depths and heats up upon contact with magmas and hot volcanic rocks, leaching a large amount of chemical elements. The identification of acoustic plumes in the water column is the first step in the exploration of unknown underwater emissions. The new acoustic detection technologies, which operate with a wide frequency range, are one of the most innovative tools for detecting gas plumes and other fluids in the water column, especially in deep waters. Once detected, physical-chemical parameters (temperature, salinity, turbidity, cations, anions, dissolved gases, isotopic signature, etc.) that allow their characterization and classification will be determined. This type of studies is particularly useful when it is not possible to collect free gases, fumarolic and/or bubbling gases, as in the case of submarine activity. In this work, we show the results obtained regarding the chemical composition of dissolved gases (He, H_2, CO_2 (aq), O_2, N_2, CH_4 and He) and isotopic signature of the dissolved CO_2 ($\delta^{13}C$-CO_2) in sea water sampled in sites of hydrothermal interest. With this purpose, we carried out two oceanographic surveys (EXPLOSEA1 and EXPLOSEA2) in 2019: the first in Antarctica aboard the Spanish Research Vessel (RV) Hespérides and the second in North Atlantic Ocean aboard the Spanish RV Sarmiento de Gamboa. To do so, 13 and 10 water vertical profiles were studied in the RV Hespérides and the RV

Sarmiento de Gamboa, respectively, using a SBE 911plus CTD system where there was evidence of acoustic plumes or where appropriate, emission buildings of fluids were present. Water samples were kept in glass bottles for subsequent analysis. The establishment of the physicochemical characteristics of volcanic hydrothermal fluids and the characterization of the nature and origin of the different types of fluid emissions will help to classify the hydrothermal fluids in order to understand the phenomena that take place in them and their surroundings.