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## Microbiota (archaea, bacteria and foraminifera), geochemical composition of sediments and methane fluxes in fumaroles, Deception Island, Western Antarctica

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Deception Island (DI) is an active volcano located in Bransfield Strait. Fumaroles are common at DI and at low tide, steam rises from seawater and beach sediments in Fumarole Bay (FB) and Whalers Bay (WB). In FB and WB, a sampling campaign was carried out in January 2013 and 2014.

Geophysical datasets were acquired by a single beam (Kongsberg EA400) and multibeam (EM302) echosounders and sub-bottom profiler (SBP120). Videos of seafloor and ebullitive activity in shallow waters have also been captured. Sediment samples from supratidal (background sample - BG), intertidal and subtidal zones were collected for grain size, geochemical and microbiota analyses. CH<sub>4</sub> flux was measured using static chamber and headspace techniques. CH<sub>4</sub> concentrations were quantified by gas chromatography.

Gravelly sand occurred in FB (65 to 92%) whereas gravelly mud prevailed in deeper zones of FB (55 to 82%) and WB (65 to 80%). Sediments were mainly composed of basaltic-andesitic fragments. High concentrations of C (0.5%) and CaCO<sub>3</sub> (41%) were observed only in the deepest zone, located in FB. In others areas C (0.01-0.17%) and CaCO<sub>3</sub> (<25%) concentrations were low. Except for samples from WB intertidal zone (0.3-0.2%), total S concentrations in all zones of FB and WB were low (0.01-0.09%).

Cluster analysis identified 2 groups based on major and trace elements and rare earth elements: a) one station in WB at 29m depth with the highest values of As, Au, Cr, Co, Mn, Mo, Ti, Y and b) a group with 4 subgroups of stations located in intertidal and supratidal zones; shallow zones (9-13m); stations distant from the shore (40-90m); and the deepest zone (120m). This last subgroup is separated from the others due to high concentrations of Cu, Rb, Sc, Sr, V, Zn.

Assemblages of foraminifera are restricted to deeper areas, being dominated by agglutinated and calcareous species. Anaerobic cultures of FB and WB sediment under methane atmosphere incubated at 4°C showed methane consumption of up to 94% (FB) and 58% (WB) after 374 days of enrichment with one addition of CH<sub>4</sub> at day 311. Comparison with control tube indicated biological consumption of CH<sub>4</sub>. Microscopic analysis revealed cell aggregates autofluorescent under UV light, characteristic of methanotrophic archaea. The average CH<sub>4</sub> flux on the fumaroles of FB intertidal zone (68mg m<sup>-2</sup>d<sup>-1</sup>) is significantly higher than in BG (1mg m<sup>-2</sup>d<sup>-1</sup>).

Flux measurement in shallow water is higher (17mg m<sup>-2</sup>d<sup>-1</sup>) than in areas located far from the shore (1.4mg m<sup>-2</sup>d<sup>-1</sup>). Regarding to dissolved CH<sub>4</sub> in water, the highest values were observed in deeper zones (0.11µg/l) and the lowest in subaerial fumaroles (0.05µg/l). These results suggest that the methane in the deeper zone is transported in water column by diffusion from biogenic production, possibly being subjected to microbial anaerobic oxidation. In fumaroles of the intertidal zone, the flux is ebullitive due to local geothermal activity. PROANTAR (557036-2009-7)



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**ABSTRACTS**