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Geochemistry of marine sediments as an indicator of glaciers meltwater runoff in the in fjords and channels of the Chilean Patagonia.

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The Patagonian icefields, and other smaller glaciated areas in southern Chile, are being severely affected by climate change, and the effects are disturbing the hydrological cycle in precipitation and fresh-water run-off. This highlights the need to find proper indicators to understand the mechanisms that will affect the marine ecosystem in a future scenario of increased global temperature.

This work focuses on the geochemistry of surface marine sediments from the region of fjords and channels in southern Chile (~50 – 54ºS), to study the contribution of terrigenous metals (Al, Fe, Ti, K, Ca) and its relationship with fresh-water input.

Samples were taken from the surface of a box core, at 24 stations, during the CIMAR 25 scientific cruise (austral spring 2019). The concentration of metallic elements was determined by Inductively Coupled Plasma Optical Emission Spectrometer (ICP – OES) after total digestion of the sediment samples, and the granulometry of inorganic particles measured by laser diffraction spectrometry. Results were studied through statistical methods, using the software R Studio.

The results show the weight-percentage of finer particles (<4 µm) is greater in glaciomarine environments, and their proportion in the sediment samples is inversely related to the iron (Fe) concentration ($r_{Spearman}$ = -0.41, p = 0.06), unlike for other terrigenous elements.

Inorganic particle size distribution allowed identification of three sediment types: glaciomarine environments (S = 25.3±5.7 psu) were associated to unimodal frequencies between 1 and 10 µm (Sediment type I), whilst localities with greater marine influence (S=30.0±0.9 psu) showed unimodal frequencies centred between 50 and 100 µm (Sediment type III). Other stations (S = 27.2±5.5 psu) showed mixed frequency distribution within a wider range (1 to 100 µm, Sediment type II).

The normalized concentration of terrigenous elements indicates that Ti/Al y K/Al, though highly variable among stations, allow a better distinction of the Type I sediments, with higher values at those stations.

The ratios of Ti/Al and K/Al are potentially useful proxies for glacier meltwater discharges and rivers runoff in the Chilean Patagonia Fjord and Channels system.