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Geochemistry and magnetic sediment distribution at the western boundary upwelling system of southwest Atlantic

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Abstract:

In order to investigate the chemical and magnetic characteristics of sediments of the western boundary upwelling system of Southwest Atlantic we analyzed magnetic susceptibility, grain size distribution, total organic carbon, heavy mineral abundance, Fe associated with Mössbauer spectra, and Fe and Mn of pore water to evaluate the deposition patterns of sediments. Four box-cores were collected along a cross-shelf transect. Brazil Current and coastal plume exert a primary control at the inner and outer shelf cores, which exhibited similar depositional patterns characterized by a high abundance of heavy minerals (mean 0.21% and 0.08%, respectively) and very fine sand, whereas middle shelf cores presented low abundances of heavy minerals (mean 0.03%) and medium silt. The inner shelf was dominated by sub-angular grains, while in middle and outer shelf cores well-rounded grains were found. The increasing Fe^{3+}:Fe^{2+} ratio from the inner to the outer shelf reflects farther distance to the sediment source. The outer shelf presented well-rounded minerals, indicating abrasive processes as a result of transport by the Brazil Current from the source areas. In the middle shelf, cold-water intrusion of the South Atlantic Central Water contributes to the primary productivity, resulting in higher deposition of fine sediment and organic carbon accumulation. The high input of organic carbon and the decreased grain size are indicative of changes in the hydrodynamics and primary productivity fueled by the western boundary upwelling system, which promotes loss of magnetization due to the induction of diagenesis of iron oxide minerals.