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Diatom transfer functions for sea surface temperature and productivity in upwelling regimes: a canonical correspondence analysis approach

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The study of upwelling regimes, associated with the eastern boundary currents, is very important to understand past climate variability. The high productivity present in these areas can play an important role in the regulation of CO_2 fluxes into the ocean. Blooms of diatoms can cause this high productivity, and the preservation of their opaline silica shells in the sediments can provide an excellent tool to reconstruct past oceanic properties.

The relationship between diatom species and water surface properties was investigated for the Northeast Pacific Ocean using Canonical Correspondence Analysis (CCA). Results reveal four axes (flora dimensions) correlated with Sea Surface Temperature (SST), Productivity and nutrient concentrations (silica and nitrogen). These analyses corroborate the good results obtained from the previous development of the Imbrie and Kipp type Transfer Functions for this area. Downcore application of such Transfer Functions will be presented for site MD02-2499.

The same approach is being applied to the other major upwelling areas (Southeast Pacific Ocean, Northeast and Southeast Atlantic Ocean and Northwest Indian Ocean) for which the traditional Imbrie and Kipp approach already shows good results for SST and Productivity.

This approach brings an important contribution for quantitative reconstructions of past environmental variables (SST and Productivity) that are related with climate variability and CO_2 fluctuations in the particular and important coastal upwelling regions.