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Changes of coastal upwelling systems in the Atlantic, Indian and Pacific oceans recorded from alkenone-derived sea surface temperatures and other multiproxy information

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Upwelling regions have received limited attention in paleoceanography, particularly for what concerns their changes at high temporal resolution. Furthermore, they have generally been considered independently. The lack of integrated studies of the evolution of the main coastal upwelling systems has limited the present degree of understanding of the links between global ocean dynamics and intensity and geographic distribution of these highly productive sites. In the present study, an integrated assessment of sea surface temperature (SST) records based on literature available alkenone-data on the upwelling regions of North-West Africa, North-West Arabian Sea, Namibia and Peru encompassing the last 25 kyr is reported. Additionally, in order to consider the complex effects of regional processes literature-available multiproxy data (marine, ice cores and speleothems records; PIG2LIG-4FUTURE database; Geophysical Research Abstracts Vol. 14, EGU2012-13825) has also been used to constrain upwelling features. This approach has allowed the description of high resolution temporal and spatial upwelling patterns and the interdependences between ocean dynamics and upwelling shifts.

The spatio-temporal SST-upwelling patterns during the deglaciation-Holocene stage have been discussed. Suitable proxies for the upwelling and advection processes, such as $CaCO_3$, TOC and Opal, Nd and carbon isotopes, respectively have been studied. Temporal snapshots at approximately at 22 ka, 15 ka, 12 ka, 8 ka, and 5 ka BP have been identified. These transitions illustrate flips between contrasting states. Major environmental and climatic changes have been observed before and after this type of transition, e.g. the one at 5 ka BP. These observations provide interesting clues on mechanisms, location of forcings and sustainers. The high temporal resolution records examined provide good constraints on the timing and magnitude of oceanic processes related with upwelling change and therefore an assessment of the climate sensitivity of these systems.