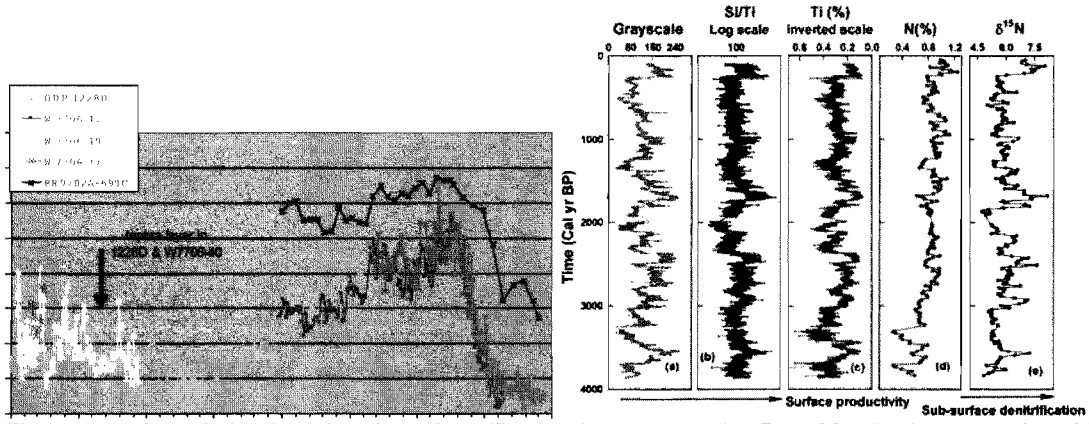

Figure 1. Left, variation in subsurface denitrification intensity on the Peru Margin during the last 20,000 years monitored by sediment N isotope ratio. Notable are the very rapid early deglacial rise, the mid-Holocene and LGM minima, as well as the centennial scale variability in the late Holocene. Right, Surface productivity variations on the mid-Peru margin during the last ~4000 years monitored by sediment density (x-radiograph grayscale, XRF Si/Ti, XRF %Ti, and % N (a-d). Panel 'e' shows sediment N isotopic ratio, a poxy for sub-surface denitrification, showing it to be controlled by surface productivity during this time interval.

HCS185 - High resolution diatom biostratigraphy and paleoproductivity for the past 300 years from the Lima and West Pisco basins, Peru

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Keywords: core sediments, diatoms, high resolution biostratigraphy, paleoproductivity, Peruvian upwelling, phytoplankton

Introduction- High Primary Productivity, distributed in discrete cells, is one of the most notable features of the Humboldt Current System along the Peruvian margin. Diatoms compose the dominant algal group in the modern phytoplankton followed by dinoflagellates, silicoflagellates, coccolithophorids and phytoflagellates. Continuous flux of dead organic matter to the seafloor in this nutrient-rich environment helps maintain anoxic conditions and results in the preservation of relatively undisturbed sedimentary sequences. The biogenic remains in these sediments, therefore, may reflect past fluctuations in productivity and elucidate the main species composition of primary productivity over the past few centuries. Thus, we investigate the paleoproductivity and variability in diatom species in 2 cores from Pisco and Callao, off central Peru that are taken in dysoxic sediments underlying upwelling regions of the coastline.

Methods- Two box cores were retrieved from the shelf off Pisco (14°07.9'S, 76°30.1'W, 73 cm length) and Callao (12°00.8'S, 77°42.64'W, 78 cm) at 299 m and 185 m of water depth respectively. They contain good sedimentary records with mm to cm-scale sedimentary laminations. An age model of core B0405-6 based on excess ^{210}Pb activities, bomb-derived ^{241}Am signals, and sediment structures derived from historically well-known seismic events, suggests a sedimentary record of approximately 300-yrs. The Age model from core B0406-13 is still in progress although we don't expect major deviations from that of the Pisco core. Samples for siliceous microfossils analysis were taken continuously every 3 to 8 mm following the main sedimentary structure. Mean sedimentation rate is 2.2 mm x yr^{-1} in the upper section of the Pisco core, which indicates that each of our sampled intervals may represent from 1.3 to 3.6 yr. Phytoplankton samples taken across the annual cycle from 2000-2005 at two different locations served as modern observations to interpret the diatom distribution and dominance. These phytoplankton samples were taken around the area of core retrievals at 20 n.m. from the coast and 10 m of water depth.

Results and conclusions- High-resolution records from box-cores B0405-6-IV (off Pisco,) and B0405-13-IV (off Callao) show important diatom species changes during the periods of deposition. Four diatom species dominated the relative abundance throughout the cores (Fig. 1). Following the Pisco core age model, we were able to discern 4 different sequences of diatom assemblages, which are present in both cores. The *Chaetoceros* resting spore group dominates the lower half of the core sediments and defines the first

diatom assemblage. This assemblage is present in the bottom half of the core from about 73 cm (around 1750 AD) to 33 cm and contains *Actinopthychus senarius, Cocconeis* sp., *Fragilariopsis doliolus* and *Thalassiosira eccentrica* as subordinated species. A second assemblage is found from about 33 cm (1850 AD) to 26 cm, and is dominated by the centric diatom *Skeletonema costatum,* with *Pseudo-nitzschia pungens*, *Pseudo-nitzschia australis* and *Prosbocia alata* as subdominant species. The third assemblage extends from about 26 cm (1880 AD) to 10 cm and contains abundant *Thalassionema frauenfeldii* and *T. bacillare* and a presence of *Coscinodiscus argus*. Finally, the fourth diatom assemblage represents the past 50 years with an important increase in *Thalassionema nitzschiodes,* coupled with the presence of *Actinocyclus octonarius* as a less dominant species.

Chaetoceros resting spores dominate the whole sequence, reflecting the active coastal upwelling system that overlies the sites. This group contains several morphotypes, all of which are present in the modern day upwelling coastal waters of Peru. Modern water column samples indicate high abundances of *Chaetoceros* spp. throughout the year with maxima during the summer. *Skeletonema costatum* follows a seasonal pattern with higher abundances in summer and fall. This species dominates the assemblage in eutrophic waters. Occurence of *Thalassionema frauenfeldii* generally peaks during winter. *Thalassionema nitzschiodes* is present throughout the year although with lower abundances than the aforementioned species. Although these 4 diatom assemblages characterize the Pisco and Callao cores, water column samples show a different characterization of the dominant diatom species. Species such as *Guinardia delicatula, G. striata, Leptocylindrus danicus* and *L. mediterraneus* were abundant in the water column but were not observed in the sediment cores. We hypothesize that the diatom assemblage suffers an active dissolution in the water column and on the seafloor before sedimentary burial. On the other hand, rare occurrences of freshwater diatoms were found downcore from the 25 cm level to the bottom of the Pisco core, which suggests that some valves reach the sedimentary site via pulses of riverine discharge originated in the Andes. Only a few freshwater diatom individuals were encountered in the Callao core. Total diatom concentrations are diminished in the lower half of the core (around 33 cm or 1850 AD) relative to the upper part and then decrease towards the top one. However, this decrease on diatom concentration near the core top is accompanied by a significant increase of the abundance of silicoflagellates, which may account for an important part of the paleoproductivity. The cause of the inferred increase in ocean productivity and shift in species composition in the middle of the XIX century is still unknown although it might be influenced by higher nutrient levels due to greater upwelling. Moreover, the increase of primary productivity is also supported by sustained increases in Total Organic Carbon, and preservation of calcite and benthic foraminifera by diminished oxygen levels. These combined evidences suggest a centennial-scale regime shift in the upwelling environment of the Humboldt Current off Peru

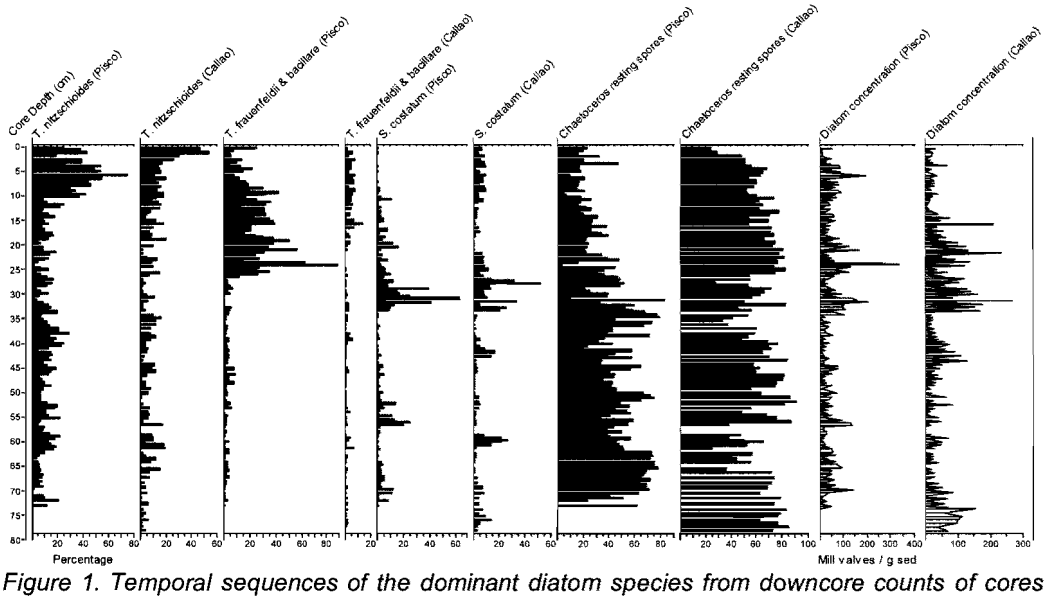

Figure 1. Temporal sequences of the dominant diatom species from downcore counts of cores B0405-6 (Pisco) and B0405-13 (Callao). Note that there are no data after the 73 cm level in the Pisco core.

HCS169 - Decadal to centennial variability of the Peruvian upwelling ecosystem during the last centuries as inferred from fish scale deposition rates of anchovy and other marine sediment records

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Keywords: anchovy, fish scale fluxes, Peru upwelling, marine sediment records

Tapia P.M., Chang F., Sanchez S., Gutierrez D., Vargas G., Sifeddine Abdelfettah, Ortlieb Luc, Field D., Salvatteci R., Velazco F. (2006)

High resolution diatom biostratigraphy and paleoproductivity for the past 300 years from the Lima and west Pisco basins, Peru

In : *Climate ocean dynamics, ecosystem processes and fisheries : the Humbolt current system : book of extended abstracts*

La Paz (BOL) ; La Paz : IMARPE ; IRD, p. 23-24

International Conference on The Humboldt Current System : Climate, Ocean Dynamics, Ecosystem Processes and Fisheries, Lima (PER), 27/11/2006-01/12/2006