

Long-term vegetation, climate, ocean dynamics as well as relationships between southern Brazil continent and the adjacent South Atlantic Ocean, the 770 cm-long marine sediment core GeoB2107-3 off southern Brazil has been studied to reconstruct past environmental changes. Pollen, spores and organic-walled dinoflagellate cysts analysis was applied to reconstruct terrestrial and marine environmental changes during the last glacial and Holocene periods. The 73 kyr BP pollen record indicates that grasslands were frequent in the landscapes of southern Brazil during glacial periods, reflecting relatively cold and dry climatic conditions. In the lowland occurred patches of forest and probably as well on the exposed continental shelf, which in general was dominated by salt marsh vegetation due to low eustatic sea levels. Interestingly, *Araucaria* trees were frequent in the highland until 65 kyr BP, similar to the late Holocene, and were rare during the remaining last glacial period. Tropical Atlantic rainforest existed in the northern lowlands of southern Brazil during glacial times, but was strongly reduced, in particular during pre-Last Glacial Maximum (LGM) and LGM, reflecting very cold and dry climatic conditions. Tropical Atlantic rainforest expanded to the South since the Late-glacial period. The *Araucaria* forests expanded on the highland only since the late Holocene. The eutrophic environment dinocyst taxa reflect the nutrient input transported mainly by the Brazil Coastal Current (BCC) and Rio Itajaí which is well related to the last glacial and Holocene eustatic sea level changes. Dinoflagellate cysts data indicate that the study area was in general influenced by the Brazil Current (BC) with warm tropical water. A stronger influence of the BCC, with nutrient rich fresh water occurred during MIS 4 and in particular during the late MIS 3 and MIS 2 period. Evidence of *Nothofagus* pollen grains from southern South America during late MIS 3 and MIS 2 (pre-LGM and LGM), suggests that the Malvinas Currents (MC) shifted to the North allowing the transportation by the BCC to the study site. The data analysis shows that major changes in the pollen/spore and dinocyst assemblages occurred at similar time periods, indicating a strong relationship between continental and marine environmental changes. The proxy comparisons suggest that the

changes occurred under similar overarching factors, of which the most important was the orbital obliquity.

Session 2.6: Integrated studies derived from dinocysts: recent past to modern scales. Oral presentation

### A new centennial scale Holocene dinoflagellate cyst record from Vancouver Island (British Columbia, Canada)

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Organic-walled microfossils were retrieved from sediments in a core from the Kyoquot Sound, a fjord on the west coast of Vancouver Island (Canada), using standard palynological processing. Radiocarbon dating of five pieces of plant macrodebris shows that the sediments were deposited over the last ~12 kyr, and that sedimentation rates have been uniform. The sampling resolution is centennial and it is the first continuous marine geological record of this time span and resolution that is presented for this region. Dinoflagellate cyst assemblages are dominated by cysts of autotrophic taxa (mainly by *Operculodinium centrocarpum* sensu Wall & Dale 1966 = cysts of *Protoceratium reticulatum*) from 11.1 to 10.7 14C ka BP. After this, *O. centrocarpum* ss. Wall & Dale 1966 declines in abundance and cysts produced by heterotrophic taxa drastically increase in relative and absolute abundances. Thus, since 10.7 14C ka BP, cyst assemblages were dominated by *Dubridinium caperatum* and round brown cysts, with a notable contribution by *Selenopemphix quanta*, *Quinquecuspis concreta* and a number of *Brigantedinium* and

*Echinidinium* species. Total cyst concentrations reach up to 184,330 cysts g<sup>-1</sup>. The genus *Spiniferites* contributes up to 6% of the assemblages (~30,000 cysts g<sup>-1</sup>) and it includes morphotypes (type A and B) that have not been previously observed in surface sediments around Vancouver Island. Type A resembles *Spiniferites solidago*, described from the Miocene of Maryland, but not observed in modern sediments. At ~7.5 14C ka BP, *O. centrocarpum* var. *truncatum* abruptly increased relative to the abundance of *O. centrocarpum* with normal processes, to more gradually decrease back to previous levels. Process lengths of *O. centrocarpum* were measured for quantitative assessment of salinity variations.

Session 2.1: Neogene to modern dinocysts in palaeoceanographic studies. Oral presentation.

#### **Last Glacial-Holocene productivity reconstructions off Congo River from the revised tropical dinocyst-based modern database**

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In order to refine the relevance of quantitative reconstructions of net primary productivity conditions through the dinocyst-based transfer function method, we deeply revised the tropical Atlantic modern database n=208 (Marret et al., 2008). 84 new surface sediment samples have been added to provide a better geographical coverage of the South Atlantic Ocean, while 55 have been removed due to low dinocyst concentrations and/or ages older than 1,000 years BP. We also have updated the environmental

dataset, using the World Ocean Atlas 2013v2 for SST and SSS data as well as for 1978-2015 mean values of net primary productivity recorded during CZCS, SeaWiFS and Modis spatial programs, and calculated with chlorophyll-based VGPM and Eppley models, as well as carbon-based CBPM model. We also have experimented new environmental datasets in order to track past upwelling activity, using SST/SSS-based water density and SST anomalies regarding mean latitudinal SST. Finally, preindustrial net primary productivity values, simulated with IPSL-CM5A-LR model developed at the IPSL (le Mézo et al., 2016), have also been added in the dinocyst transfer function so as to provide more relevant modern values for each modern analogue available in the dinocyst database. Our results argue for an obvious orbital forcing, with higher net primary productivity values reconstructed during minima of precession (MIS 3 and the last deglaciation). Higher productivities appear mainly led by the Congo River activity, with maximal terrigenous inputs also occurring during these periods, and probably generating powerful river-induced upwelling cells during the last deglaciation.

Session 2.6: Integrated studies derived from dinocysts: recent past to modern scales. Oral presentation

#### **Dual taxonomy and nomenclature in dinoflagellate cysts: history, present status, and challenges of molecular phylogeny**

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Two separate taxonomic traditions have arisen in dinoflagellates at the generic level and below: one centred on the living motile cell but potentially incorporating all aspects of the biology, and the other