Plio-Pleistocene changes in SE trade wind strength and South American rainfall – Implications for ITCZ movements and long-term El Niño behavior

F. LAMY[1], D. RINCON-MARTINEZ[1], C. SAUKEL[1], S. STEPH[1], A. STURM[1], J. ETOURNEAU[2] AND R. TIEDEMANN[1]

[1]Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany (frank.lamy@awi.de)
[2]Institute of Geosciences, University of Kiel, Germany

We examined two ODP Sites from offshore subtropical and tropical South America to reconstruct Plio-Pleistocene continent-ocean-atmosphere climate linkages on orbital and tectonic time-scales. We analysed a variety of proxies indicative of changes in dust input and wind strength, river discharge, sea-surface temperature, and productivity.

At subtropical Site 1237, long-term changes in eolian sediment supply, SST, and productivity suggest a strong relationship to major intensifications of northern hemisphere glaciations. On orbital time-scales, maxima in iron input and siliciclastic grain-size are generally related to SST minima and maxima in biogenic opal productivity during cold stages. This is interpreted to reflect enhanced trade-winds during cold stages leading to colder SSTs and stronger upwelling (productivity).

At tropical Site 1239, the long-term history of terrigenous supply is more complex and largely controlled by Andean uplift in the Pliocene and regional tectonic processes in the early Pleistocene. On orbital time-scales, however, we observe a clear relationship between maxima in iron contents and biomarkers indicative of fluvial sediment supply during interglacials particularly well developed after the Mid-Pleistocene climate revolution (MPR). These data suggest more humid conditions during interglacials and reduced glacial rainfall, an relationship that does not support the common view of a southward ITCZ shift in the eastern Pacific during glacials, which should have led to higher rainfall onshore Site 1239.

We also found higher interglacial terrigenous input at Site 1237 after the MPR. Assuming that the general increase of trade-wind strength during glacials as suggested by our data before the MPR is likewise valid in the Late Pleistocene, this higher interglacial supply off Peru may mirror stronger fluvial input in the generally arid environments. This may argue for strengthened El Niño-like conditions during late Pleistocene interglacials and more La Niña-like atmosphere ocean pattern during glacials consistent with our results from Site 1239.

Sampling and analysis of dissolved noble gases in the porewater of marine sediments in northeastern Okinawa Trough, Japan

TEFANG FAITH LAN[1], NAOTO TAKAHATA[2], KAORU KIYOTA[2], MAKOTO TSUTSUMI[2], AKIO KANEKO[2], TSANYAO FRANK YANG[1] AND YUJI SANO[2]

[1]Department of Geosciences, National Taiwan University, Taiwan (f92224105@ntu.edu.tw)
[2]Ocean Research Institute, The University of Tokyo, Japan

Noble gases dissolved in porewater of marine sediments preserve primitive chemical signatures of *in situ* fluids. High hydrostatic pressure increases gas solubility on sea floor also enhances the abundance of noble gases in marine sediments. Noble gases have been widely exploited as geochemical tracers. With properties of high mobility and chemical inertness, noble gases do not react with other species under almost all circumstances. The major consequence of this inertness is that noble gases pass easily into the gas phase, and is efficiently lost from the solid Earth. Air contamination, however, affects noble gas analysis severely, has been a key issue during core-recovering.

Here we present the multi-core pore-water sampler and analysis procedures of samples from Northeastern Okinawa Trough. The sampler is capable of taking sediments from various depths, which offers information of noble gases in different depths. In addition to multi-depth sampling, this device prevents samples from air-contamination during recovering. Thus noble gas signatures could be even more primitive than those dissolved in seawater. Analysis of samples from the device requires a special extraction system. Sediments are heated within copper tubes and are blown out to a vacuum vessel in certain temperature. We further heat the vessel to advance noble gas diffusion. The sampler paired with the analysis procedure is proved to be useful and can be applied to various marine and hydrological research. The preliminary results indicate the sampling and experiment procedures are feasible. Helium isotopic ratios in pore-water samples ranged from 3.62 to 5.06 R_A, and are derived from mixing of seawater and hydrothermal fluid.