

Sampling methodologies

PHYSICS:

- Currentmeter moorings: two 75 kHz ADCPs moored in antitrawling cages (pyramid shaped) with miniaturized dual acoustic releases,
- Classical moorings:
 - (a) mooring on the inner side of AC: 5 AQUADOPP6000- currentmeters at 150, 400, 800, 1200 and 2000 dbar separated by SBE25 thermistors (or equivalent) at 250, 600, 1000 and 1600 dbar,
 - (b) mooring on the outer side of AC : 4 AQUADOPP6000- currentmeters at 150, 400, 600, 1200 and 3000 dbar with SBE25 thermistors (or equivalent) at 250 and 900 dbar.
- Deployment of about 80 XBTs (for high resolution thermal analyses), both along the deep ocean section and across a cyclone, deployment of 5 surdrift buoys in the cyclone
- CTD/Niskin rosette-casts with LADCP measurements at stations
- VMADCP acquisition en route

TRACE ELEMENTS, ISOTOPES, BIOGEOCHEMICAL PARAMETERS:

- **Tracers and isotopes:** they will be collected in the dissolved and particulate phases throughout the water-column. For the *dissolved phases*: sufficient amounts of seawater (60 L for Ra/Pb, 10L for iron isotopes, 10 L for Nd, 20 L for Pa/Th; although the Toulouse group is currently developing a protocol allowing the collection of all these tracers on the same sample and therefore using a smaller volume, ca 30 L) will be collected to allow the analysis of the isotopic and chemical tracers, after filtration on board. For the *suspended particles*: major, minor and trace elements, (Ba, Si, Ca, Fe, Al, Mn, U ...) in suspended matter will require 5-10 L of seawater using dedicated pressurized filtration units. This will allow assessing the vertical distribution of these elements in the water column with a good resolution (15 to 20 depths on CTD casts, between 0 and 2000 m or bottom). For some elements (e.g.: REE, ²³¹Pa, Ra, Nd, Sr and Pb isotopes), analyses of the particulate phases require the use of *in-situ* pumps (battery operated pumps that filter large volumes of water, 100-1000 L). Multi-coring on the shelf and slope (using the INSU Oktopus GmH) will allow collecting surface sediment, overlying and interstitial waters: all the TEIs mentioned above will be measured in the solid phase (and in the interstitial waters whenever possible), allowing balancing their source/sink budget, together with the alkenones. In addition, redox-sensitive tracers (together with O₂ and pH) will be measured in the interstitial waters.
- **Trace metals and speciation:** samples will be collected using acid-cleaned Go-Flo bottles mounted on kevlar line long of about 4000 m, and eventually on a ultra-clean rosette equipped with auto fire module (une demande a été formulée par M. Boyé et C. Jeandel et déposée auprès de l'INSU le 5 décembre 2006 pour l'acquisition de cet appareillage). All sub-sampling and filtration will be carried out in a clean container (INSU). The samples are filtered using on-line filtration (0.2 µm) under N₂-pressure from the Go-Flo bottles.
- **Macro-nutrients and biological parameters:** macro-nutrients (N, Si, P), Chl-a, pigments and phytoplankton taxonomy, primary production, O₂ isotopes and O₂/Ar will be determined in samples collected using the Niskin-Rosette.
- **Carbon:** *Inorganic carbon:* underway pCO₂ will be measured from the clean seawater system of the ship, DIC (dissolved inorganic carbon), TA (total alkalinity) and pH will be sampled from the Niskin. *Organic carbon and particulate inorganic carbon:* DOC, PIC, TOC (dissolved, total inorganic and organic carbon respectively): samples for total carbon (PIC, TOC) need to be collected using Niskin-bottles equipped with Silicone tubing and Viton o-ring by an appropriate scientist comfortable with organic trace samples handling. DOC/TOC/PIC sampler needs to be the first or second one (after the gas) and it is suggested that all scientists using Niskin bottles worn plastic gloves during the cruise. Samples will be collected in glass ampoules (8 ml) poisoned with 85%-H₃PO₄ flame sealed and stored without filtration in the dark at 4°C.
- **Atmospheric nutrients and trace metals:** High-volume (1m³ min⁻¹) samplers equipped with cascade impactor heads for size segregation will be used for aerosol collection (University of East Anglia). Rain samples will be collected on an event basis by deploying large (42cm diameter) plastic funnels for the duration of rainfall only (for the University of East Anglia).
- **Sediments:** The INSU Oktopus GmbH (Germany) multiple corer (head version MUC 8/100) equipped with 8 transparent polycarbonate cylinders will be deployed. It is one of the simplest and most efficient designed for successful coring and careful tubes recovery on the deck. Tubes are 61 cm height and 9.5 cm inner diameter. Weight addition allows the sampling of various sediments (up to 16 x 12 kg). When deployed, downward speed is carefully controlled (1 m/s) and instrument depth is permanently controlled both by the length of run out steel cable and by the record of a "pinger" dual echo (fastened on one side of the multi-tubes corer. During operation, cable tension is checked in order to track oscillating behaviour due to waves. Overlying water and up to 8 cores can be retrieved for each station. Expected sediment height in core tubes ranges from 25 to 45 cm. Only the top 20 cm will be processed at first (30 sampling level for classical slicing). Two cores will be dedicated to pore waters extraction and solid fraction analyses, three cores will be dedicated to incubations (benthic fluxes and luminophores), one to microelectrodes, one to sulphate reduction rate (radiotracer ³⁵S) and one to DET incubation.
- **Remote sensing:** data acquisition from the NASA MODIS team.
- **Particles concentrations in the water:** the PVM5 (profileur vision marin) available from Villefranche/Mer will be operated.