MARINE CHEMISTRY AND GEOLOGY

MCG aims to identify and quantify key processes involved in the settling, transformation and burial of particulate matter in shelf seas, on the continental margin and in the deep ocean. The most rapid processes are resolved by direct observations, complemented by laboratory-controlled experiments and analytical studies. Decadal to long-term climate-driven variability is deciphered by exploiting shallow and deep-sea tracers in sedimentary archives as well as by geophysical techniques. MCG is strongly committed to multidisciplinary sea-going research in order to understand, reconstruct and predict the effects of ocean-climate change.

In the past year, research within the department has re-focused on the benthic boundary. Research questions of MCG are formulated by three related themes:

- Productivity controls on sediment deposition
- Sediment transport and early diagenesis
- Sediment accumulation and climate change

Productivity controls on sedimentary deposition aims at relating the physical forcing conditions of particle export from the water column to the temporal and spatial supply of sedimentary organic matter, carbonate particles and biogenic silica to the seafloor. Particle production, settling dynamics and seasonal to interannual variability in seabed deposition fluxes are determined using time-depth series sampling by bottom moored sediment traps, current profilers and turbidity sensors.

In 2005, sediment trap moorings provided the first time-series of changing particle export, transformation and deposition in the Mozambique Channel and the Irminger Sea (North Atlantic) in ongoing process studies with the Department of Physical Oceanography (LOCO). Preliminary results from the Mozambique Channel show a pronounced seasonality with two bursts in mass deposition towards the deep seafloor which seem related to the activity of large eddies at the origin of the Agulhas Current. The moorings were successfully redeployed, now equipped with experimental cages to directly address the pressure related dissolution behaviour of biogenic silica, to be recovered in 2006.

In 2005, Neven Lončarić received his Ph.D.-degree at the Free University in Amsterdam. The main conclusions from his thesis are highlighted below.

Sediment transport and early diagenesis investigates the spatial and temporal scales of resuspension, transformation, recycling and burial of marine particles near the sediment-water interface. Sediment transport and rates of benthic production, microbial activity and sediment-water exchange are determined *in-situ* using autonomous benthic landers. Combining laboratory experiments with sea floor observations, we aim to understand the mechanisms controlling the recycling/preservation balance of organic matter, biogenic silicates and carbonates.
In 2005, a weekly sampling program addressing the cycling of dissolved organic matter in coastal waters started at the NIOZ jetty in the Marsdiep tidal inlet, complemented with measurements onboard the R.V. Navicula.

The 2005 Hermes-Canyons cruise with the RV Pelagia focused on the importance of Iberian Margin canyons systems as pathways for sedimentary transport, from the shelf down to the 5000 m deep ocean basin. Results, highlighted below, show that massive fluxes of recent sediments in the Nazaré and Lisbon/Setubal canyon are driven by internal tides in the upper canyon, and by episodic density-driven currents in the middle and lower canyon. During this cruise, the newly developed remotely operated bottom-tracking vehicle MOVE! underwent its first deep-ocean trial run at 1500m water depth.

Sediment accumulation and climate change traces climatic and oceanographic forcing conditions over anthropogenic, historical and geological time-scales, as recorded by shallow and deep cores, seabed imaging and deep seismic profiling, supported by XRF-core scanning and chemical analyses of the sediment.
In the NE Atlantic Ocean, research aims at further defining the climate-driven control on cold water coral mounds and on the accumulation of sediment drift deposits along the margins of the basin, to put quantitative constraints on North Atlantic circulation. In the SE Atlantic, the potentially important role of tropical regions in glacial-interglacial climate change is addressed.
Research cruises in the Gulf of Cadiz and Rockall Trough elucidated the distribution and structural build up of cold water coral mounds, and their relation to past climate change. Together with the Departments MEE and BIO, the controls on coral growth and the associated fauna were examined, while coral branches and sediment cores were sampled for use as natural climate archives. In collaboration with the Free University, MCG's research on deep corals is one of the finalists nominated for the national Academic Year Award (www.academischejaarprijs.nl).

Apart from the scientific themes, MCG is also responsible for the national marine research facilities (MRF) for nutrient analyses and XRF core scanning (CORTEX), and for providing state-of-the-art expertise for sediment trap, coring, bottom imaging and seismic profiling studies.