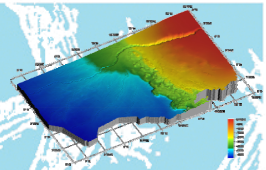
COMARGE



Continental Margin Ecosystems on a worldwide scale

Objectives of CoML/COMARGE

The overall aim of the project are:

1) To describe benthic assemblages and biodiversity patterns of benthic and bentho-demersal communities on continental margins in its multiple habitats and at different spatial scales.

2) To identify the contribution of environmental heterogeneities to these patterns.

The project is global in vision with the objective of integrating deep sea biological studies across different habitats and at different spatial scales, in order to understand why there are so many species in this oceanic transition province and what are the interactions among ecosystems.

COMARGE will foster synergies to integrate past, ongoing and future local, national and multinational scientific programs by establishing and coordinating a network of scientists interested in the study of margin ecosystems.

Why studying continental margins?

- Continental margins, defined here between the shelf/slope break and the edge of the continental plate, are transitional zones between oceans and continents where most sediments on earth are deposited. Sediment inputs widely vary from basin scale (Atlantic vs Pacific), to local scale (deep-sea canyons).
- Continental margins encompass a 4000 m depth range, crossing all water masses, gradients in food inputs, temperature, pressure and bottom currents.
- Continental margins can be active sites of tectonic activity, with a narrow shelf dropping off quickly into the depths of subduction trenches or they can be passive, with large accumulation of sediments on wide shelves and gentle slopes.
- Continental margins and shelves make up 20% of the ocean's surface but concentrate 50% of the global marine production. Primary production varies in space (depth and latitudinal gradients) and in time (seasonality).
- On continental margins, accumulations of organic matter over geological time scales and past or present tectonic activities favor the seepage of fluids rich in sulfide and methane.
- Continental margins are also reservoirs for living and minerals resources.

➲ **Collectively, these processes create unique ecosystems, which are only being discovered, but are already under anthropogenic pressures.**

From Known to Unknown

During the past few decades, our understanding of deep continental-margin has changed more than for any large area of Earth. Areas once envisioned as monotonous landscape are now acknowledged to have high degree of complexity and diversity. Knowledge of patterns and processes at **different spatial scales** is central to the understanding of global trends in biodiversity.

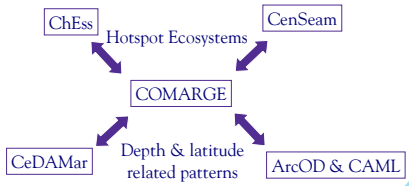
Continental margins are biologically and structurally heterogeneous. Continental slopes have "hotspots" such as the boundaries of oxygen minimum zones, reef-like coral mounds, canyons, and cold seeps, which are characterized by distinctly high biomasses, productivity, physiological adaptations and apparent high species endemicity. Owing to their broad but fragmented distribution, hotspot systems increase the spatial variation in species diversity but their relative contributions to margin biodiversity and their potential interactions with the sedimentary environment are unknown.

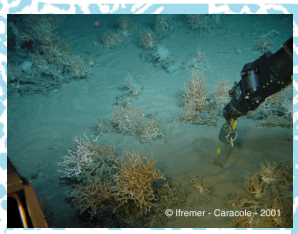
Continental margins are embedded into large scale environmental gradients such as those driven by latitude and depth. Three large-scale biological patterns are suspected to rely on these gradients: the exponential decline in biomass and densities with increasing depth, the occurrence of a mid-slope maximum in diversity, and the zonation of fauna. Fundamental patterns of species distribution first observed and explained in the context of monotonous slopes must now be re-evaluated in the light of the newly recognized heterogeneity of habitats

Most knowledge on the ecology of continental slope communities comes from the North-Atlantic. Progress towards determining the important processes maintaining high diversity on continental margins is likely to be greatest on these well-studied areas. Future plans should therefore test hypotheses devised in well-studied areas at new localities.

CoML/COMARGE in the framework of the Census of Marine Life

Continental margins are complex transitional zones of the deep Oceans. COMARGE thus is linked to other deep-sea field projects of the Census of Marine Life. Collaborations are being developed regarding scientific questions, taxonomic expertise as well as education and outreach activities.



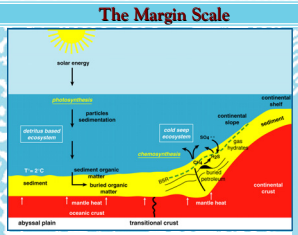


Patches of deep-sea corals on the North-Eastern Atlantic margin

The Regional Scale

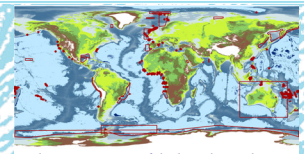
An assemblage of Mytilids living with chemosynthetic symbionts on the West African margin (3200 m)

The Margin Scale



Geological context and trophic resources of continental margin ecosystems (modified for passive margins from Sibuet & Olu, 2002)

The Global Scale



Preliminary census of biological sampling on continental margins worldwide, based on answers to the first COMARGE call for contribution sent in February 2006.

The Questions

"How does habitat heterogeneity, as influenced by hydrodynamic, chemical and geological processes, affect the diversity and therefore functioning of continental margin ecosystems?"

"How does habitat heterogeneity interact with latitude, depth and ocean basin effects?"

"Which biodiversity patterns are global, which are not and what can we learn from relating patterns to processes?"

The approach of CoML/COMARGE

Coordination of current and new sampling programs

- Identify recent, ongoing, and planned projects sampling ocean margins in well studied as well as undersampled regions;
- Encourage data sharing, standard sampling practices & data archiving;
- Promote common taxonomic identifications - Assure a high level of taxonomic quality and comparability;
- Develop standard analytical methodologies.

Data collation and synthesis

- Identification of existing datasets on continental margin species composition and habitat parameters;
- Prioritization of datasets: data quality, applicability to major margin questions, need for extensive taxonomic updating, feasibility of timely conversion to the OBIS system;
- Development of a COMARGE database, including archiving of environmental parameters, open to the margin community;

Steering Committee

Myriam Sibuet, *Ifremer, Brest, France*

Robert Carney, *Louisiana State University, Baton Rouge – USA*

David Billett, *NOC, Southampton - UK*

Lisa Levin, *Scripps Institution of Oceanography, La Jolla - USA*

Helena Passeri Lavrado, *UFRJ, Rio de Janeiro – Brazil*

Gilbert Rowe, *TAMUG, Galveston - USA*

Contact: **Lenaïck Menot** –Project Manager – lenaick.menot@ifremer.fr

Top right picture: 3D-bathymetry of the Equatorial West African margin (Zaïango/Biozaire project) © Ifremer