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Facies, granulometry, morphoscopy and exoscopy of south armorican continental shelf sediments (inner shelf – Bay of Biscay)

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Introduction

Pleistocene sedimentary wedge have been observed all along the west french coast. On south armorican shelf, the connection between this pleistocene sediments and the present sedimentary wedge in term of sediments movement is quite unknown. Reconstitution of sediments history in term of transfert and residence in several kind environments of deposition allows to track these sediments during eventual transport and then to polarize zones of supply. This reconstitution is possible through several sedimentological technics as facies analysis, morphoscopic, exoscopic and granulometric studies.

Vibrodrilling campain led by “La Société Rennaise des Dragages” in May 2006, produced new sedimentological data. Aera of interest is located 12 Km south eastward of Groix Island and 9 Km north estward of Quiberon Peninsula, in offshore. 23 cores have been sampled 30 m deep and have a maximal size of 1.50 m. They are constituted of detritic deposits that show various granulometric range (from silts to peebles) with important fauna contents (bivalves shells, sea-urchins shells, sponge spicules). These dark grey beds are easily recognizable due to their color and contrast with ochre and yellow shoreface sands of the top of the cores.

What is more, 18 samples of present sandy sea floor surface have been collected in April 2007 by scuba divers from 3 beaches of Morbihan (Britany, France) to 25 m

deep to characterize the connection degree between coast and inner shelf (-30 m) in term of sediments movements.

Methods

Morphoscopic, exoscopic and granulometric studies have been led on samples of material (6 cores and all sea-floor samples) to reconstruct deposits environments succession crossed by sediments. Samples have been observed through binocular microscope and scanning electronic microscope (S.E.M). Quartz grains surface shows features herited from the differents environments of deposition that these sediments cross during their transport. These features result of physico-chimic conditions that occured in the differents environments. Mecanic features are intergranular impact tracks as conchoïdal fratcures, straight grooves. Chemical features are deep surface etching and dissolution picking. Cores have been described with facies sedimentological methods in order to obtain the last deposits environment for each sequence and to stratigraphicaly correlate cores at the scale of the studied zone. Granulometric studies on several levels of these cores and on all sea-floor samples have been lead to characterize the effects of present hydrodynamic condition on sediments grains.

Results

Cores show individualized facies, grouped in sequences present from the base upward: Peebles of gneiss and granules from tidal dominated bay (facies S1). Medium to fine sands, sometimes with thin pieces of shells relative to a bay environment (facies S2 and S3) and shelly interbeds described as storm washovers in a calm bay environment (facies T). Coarse grains to granules, with bioclastic contents from marine shoreface domain (facies S4) and characterized by ocher and yellow coloration. This bed is limited downward by a swell erosion surface. This succession reveals a landward stepping of the facies.

The binocular microscope observation shows a high ratio of « émoussés luisants » grains (more than 80 % of grains) which is caracteristic of marine influence. Observation with S.E.M shows that the majority of quartz grains presents dissolution features generaly produced in marin domain and diagenetic silica recristaliaztion thin layer. It indicates a long time of residence in this environment. Intergranular impacts, herited from anterior transports, are very smooth and intense dissolution etching spread out from these tracks.

Sea-floor samples show granulometric evolution in relation to hydrodynamic conditions. Between beaches and -10/-15 m in depth, sediments show a granulometric selection produce by high hydrodynamic conditions. Below this limit, sediments are less sorted and localy, the presence of a shaly thin layer indicates a drop of hydrodynamic

conditions.

Discussion

This landward stepping pattern probably results from the last marine transgression during quaternary age which began -18000 years ago (Pleistocene). Relative sea level was approximatively at -120 m, and rise during the global warming and ice cap thawning which cover the north of Europe during the last glacial period (Weschelien). At the end of this marine transgression (8000 years B.P), relative sea level was positioned -25 m lower than today. These deposits represent a Holocene transgressive fossil wedge constituted of bay facies preserved during the rise of sea level. The intense dissolution on quartz grains surface indicate a long time of residence in marine environment and motionlessness of fossil sediments since the end of the trangressive period.

Hydrodynamic condition appears to be too low to move sediments below -15 m deep during fair weather periods. No clues of continental or coastal supplies have been observed on this grains through granulometric studies. All this data indicate that the studied zone is disconnected from the current coast zone in term of sediment alimentation.

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