

Early diagenesis impact on Holocene sedimentary recording in the Bay of Biscay – cruise CADIAC, 2009

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Context

Early diagenesis processes in the Bay of Biscay have been studied in the mid-2000 on short multi-tube cores (cruises OXYBENT-FORAMPROX-PECH, Côtes de la Manche). In order to complete the data base and to characterize deep anoxic processes, 1 to 3 meters long piston cores were collected at 150, 550, 1000 and 2000m water depth on the continental slope of the southeastern part of the Bay of Biscay during the cruise CADIAC (Côtes de la Manche, 2009). The aim of this work was to determine how a recorded signal can be changed in the several thousand-year situation of the Holocene period. The sediment consists of a muddy facies deposited continuously during the Holocene.

The cruise CADIAC – work onboard

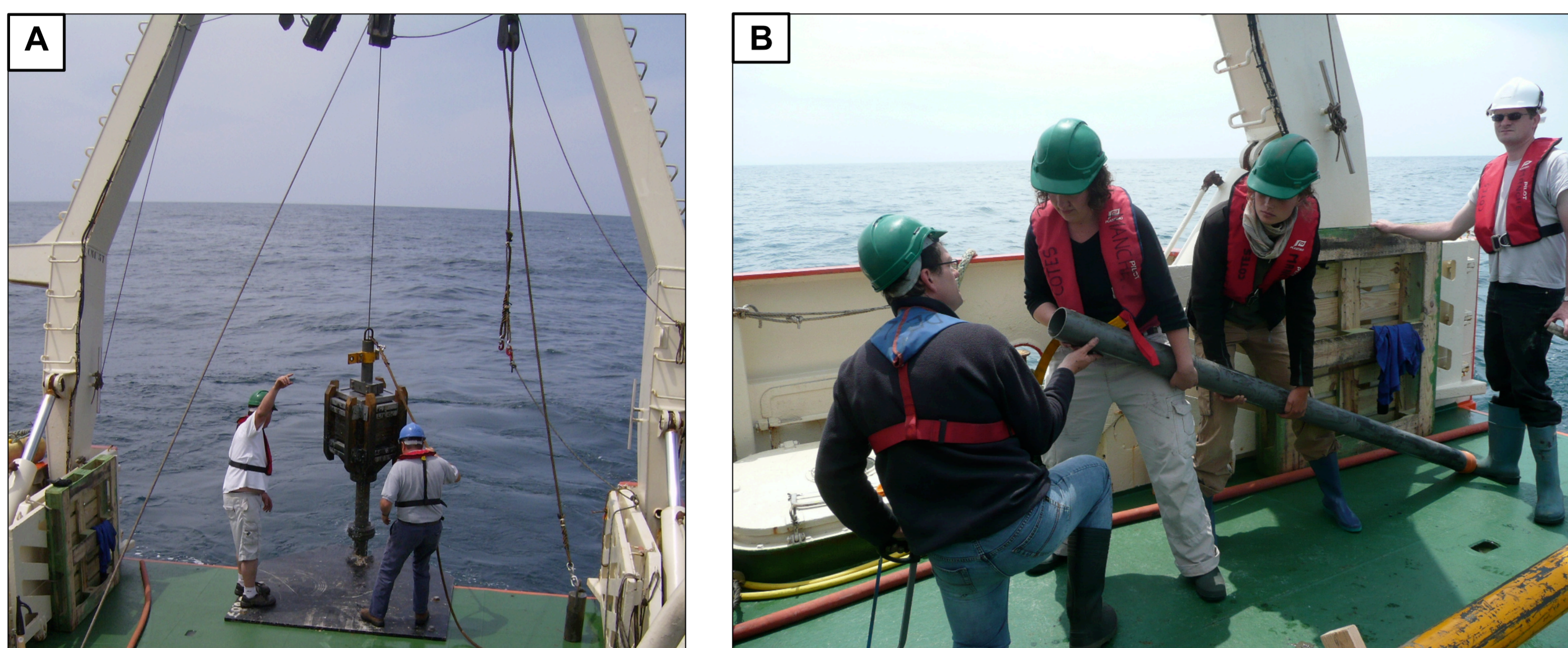
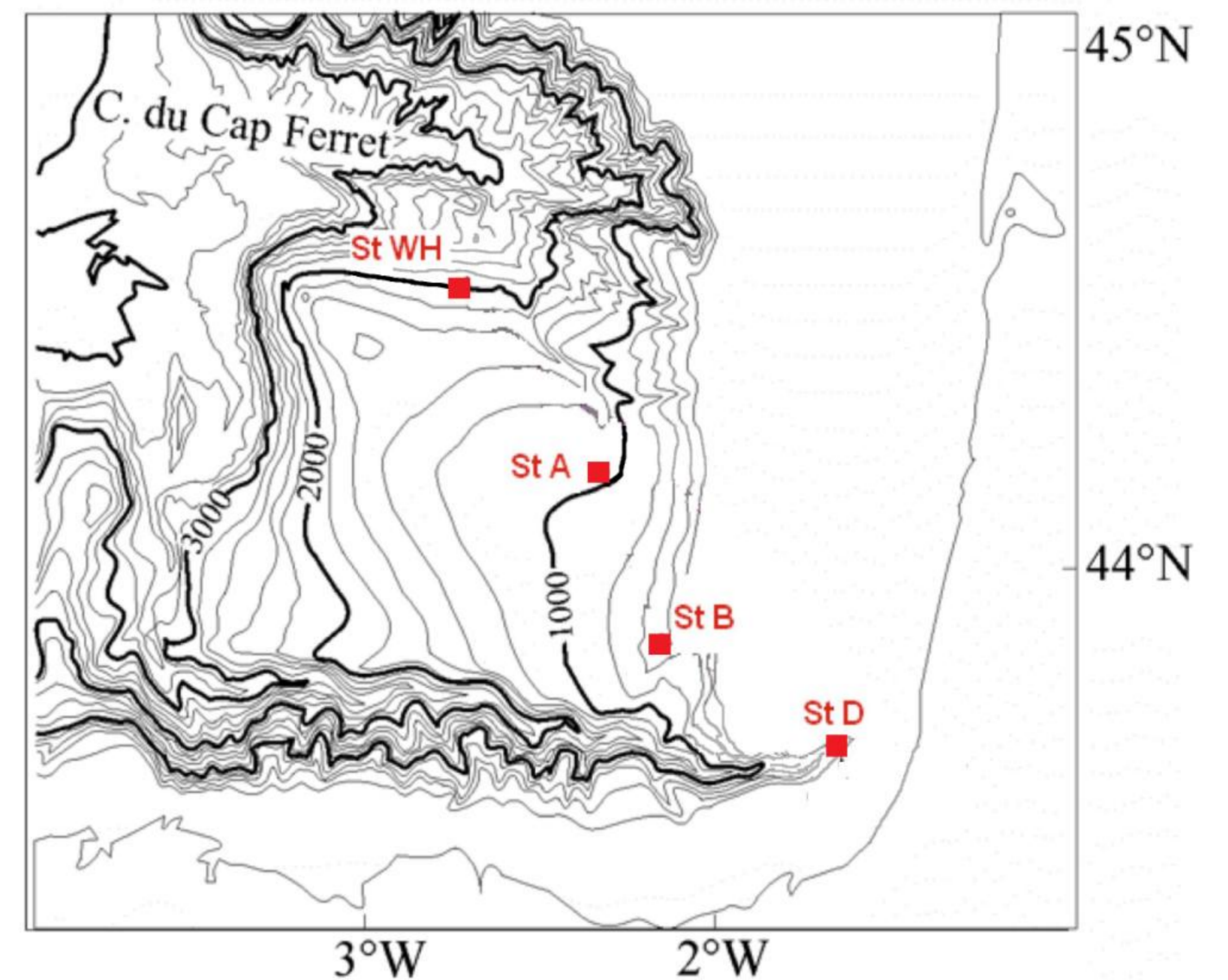


Figure 2: some pictures of the work onboard; (A) boarding of the Kullenberg corer; (B) conditioning the core.

Study area



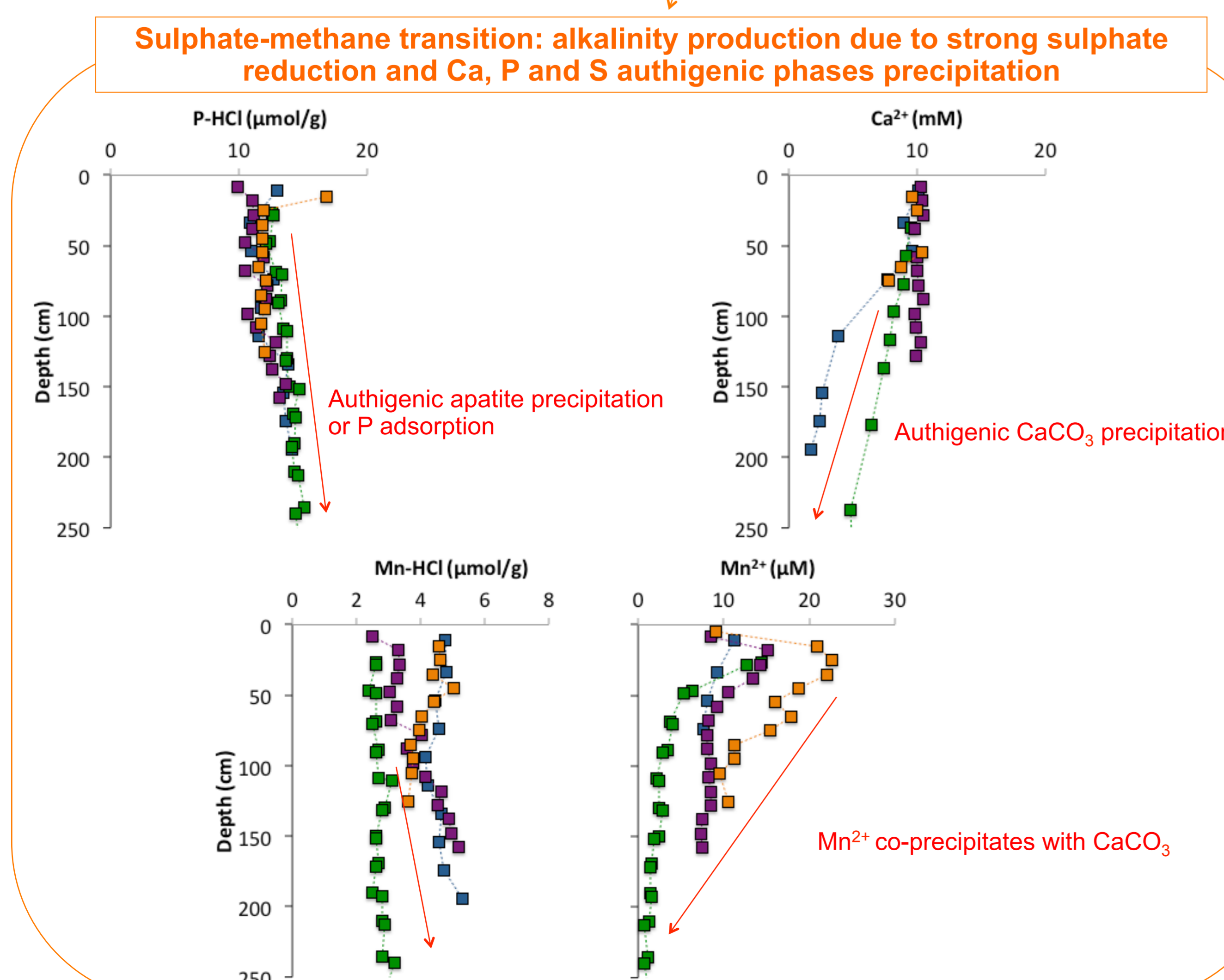
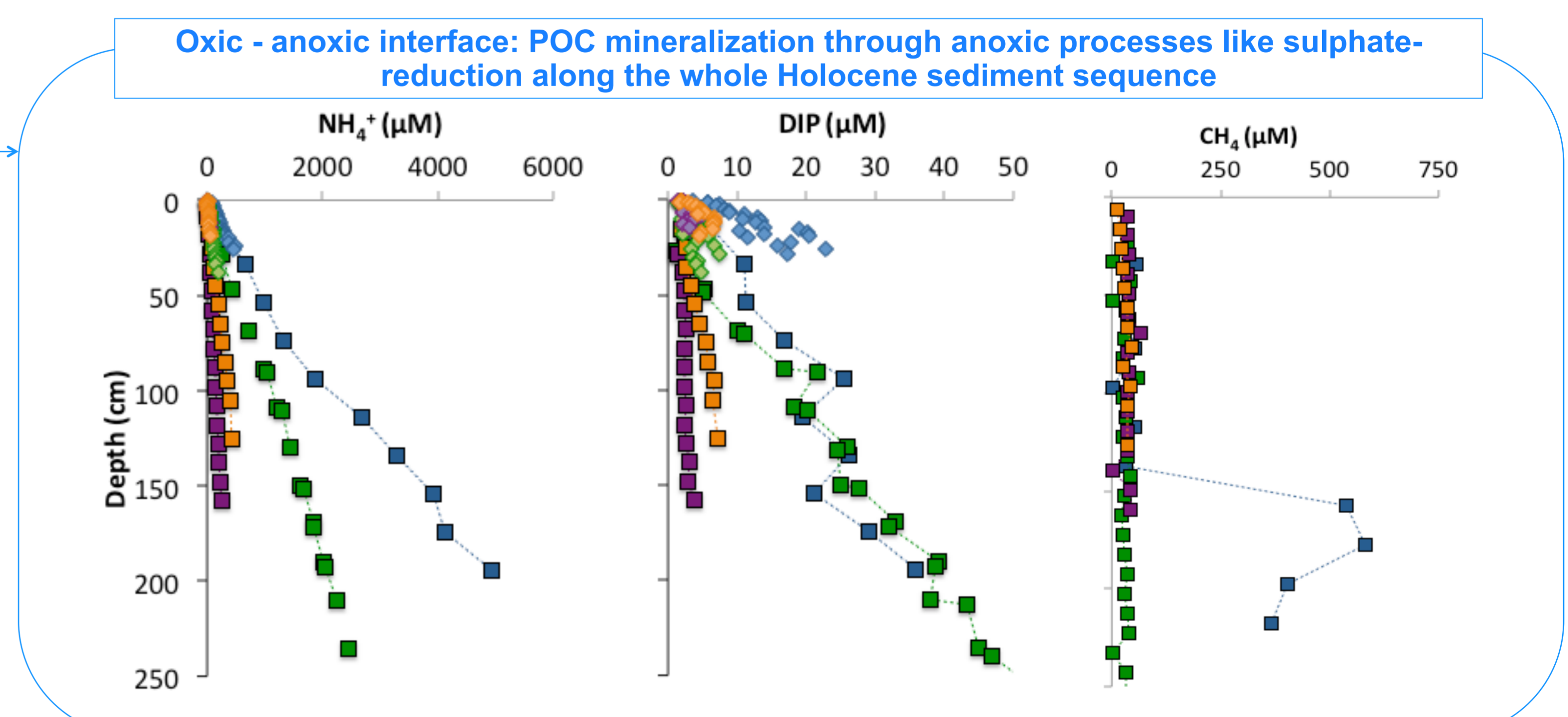
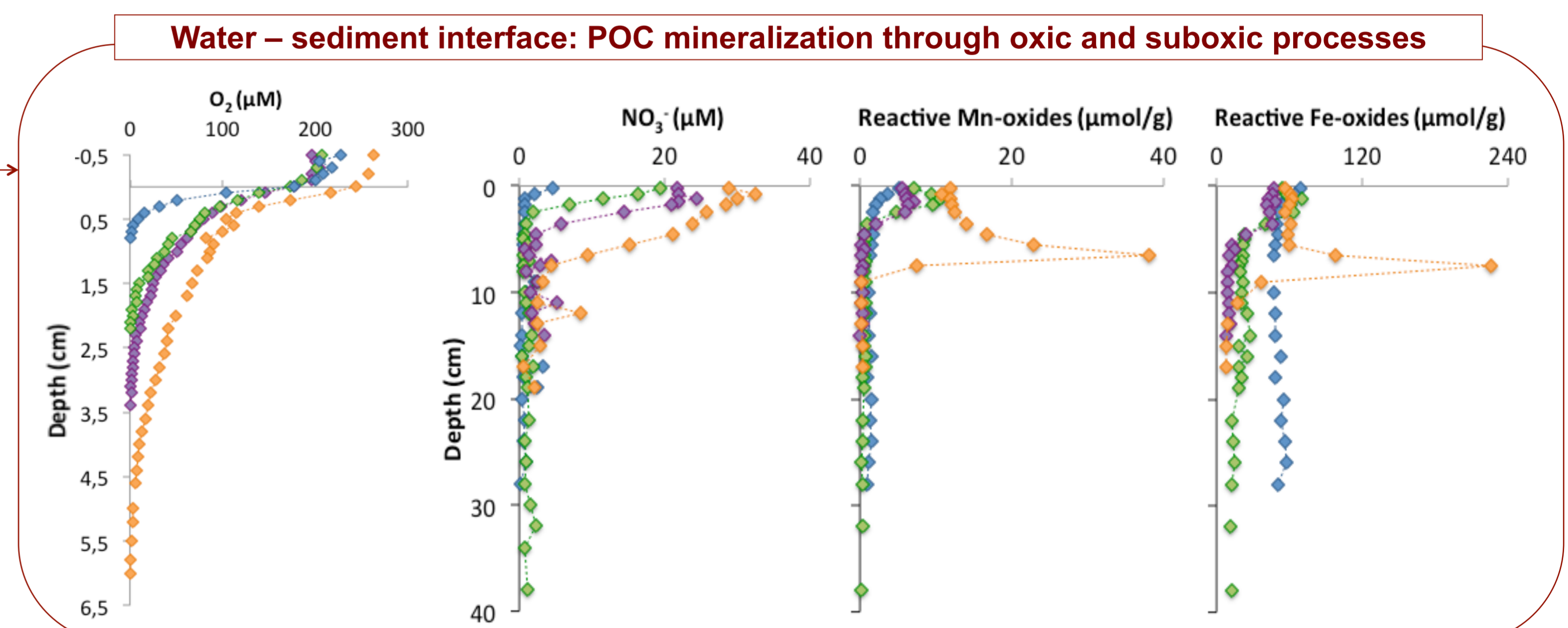
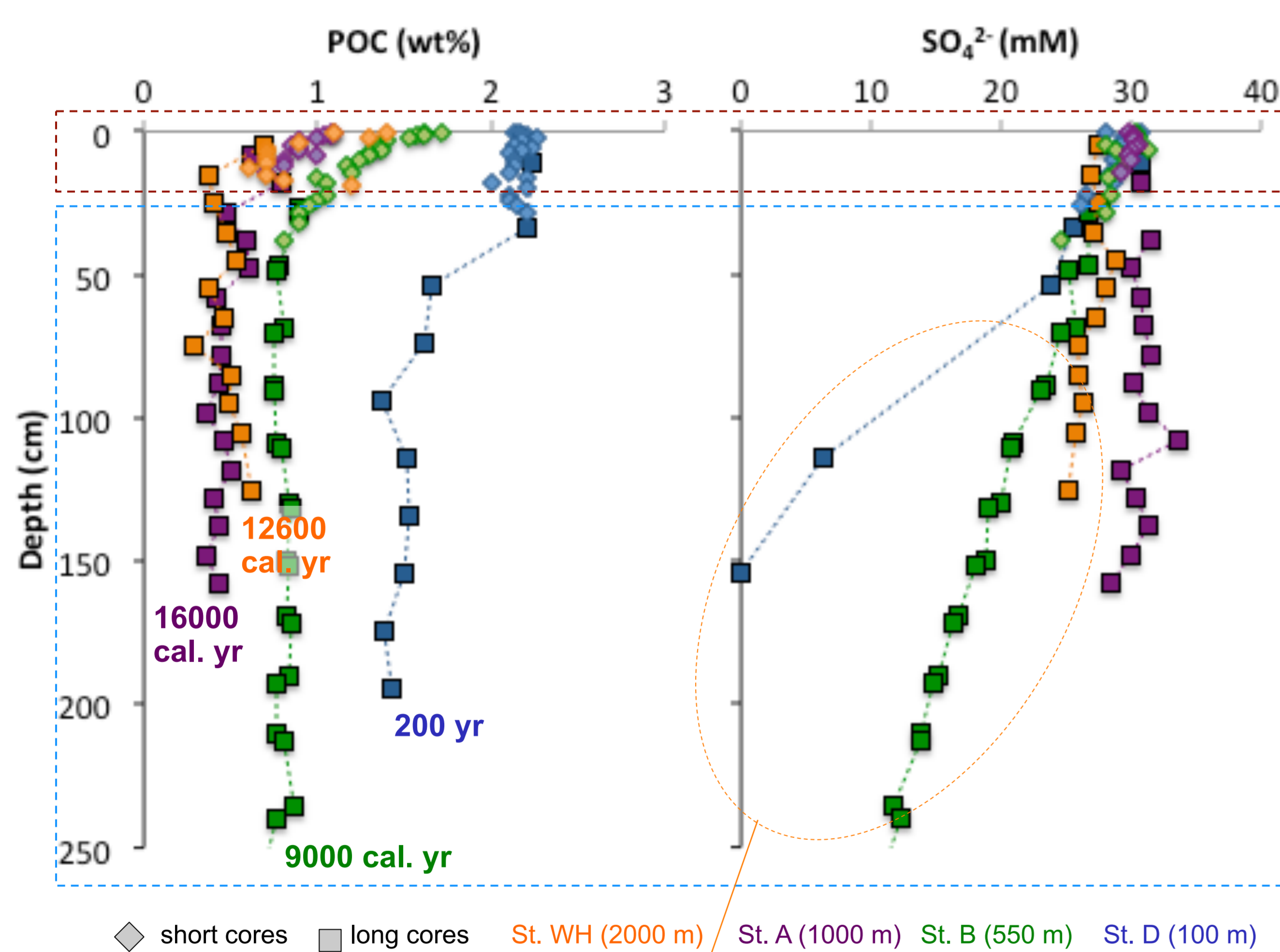
Station	Position	Water depth (m)	Core length (cm)
D	43°42.00'N 1°33.45'W	150	210
B	43°50.31'N 2°03.47'W	550	250
A	44°10.24'N 2°20.06'W	1000	160
WH	44°32.52'N 2°37.23'W	2000	130

Figure 1: map of the southeastern part of the Bay of Biscay; location, water depth and core length of the studied stations.

Biogeochemical processes in sediments at the meter-long scale

Profiles of dissolved compounds directly produced from organic matter mineralization have been obtained from a continuum between short cores and Kullenberg cores. They indicate that biogeochemical processes of organic matter degradation occur deeply in the sediments, all along the Holocene sequence and beyond. Three major interfaces have been identified to influence the transformation of geochemical proxies.

■ water – sediment: oxic/suboxic processes ■ oxic – anoxic: sulphate-reduction processes ■ sulphate-methane: authigenic phases of Ca, P and S



Conclusion

This study shows an extensive data set on redox parameters measured along four sediment cores. Such long and fastidious work cannot always be done on long core dedicated to paleo-oceanographic studies.

Our results, however, suggest us to encourage the paleo-oceanographic community to follow these recommendations: bring a small bench top centrifuge during cruises to extract pore waters. In each deep-sea core collect about 20 ml of sediment at regular interval (e.g every 50 cm for a 10 m long core, or a better vertical resolution if possible), extract pore water and keep the water in a fridge. This will give enough pore water to obtain profiles of dissolved calcium, sulphate and ammonium.

These three parameters will allow to locate the sulphate-methane transition zone and to quantify authigenic carbonate formation and deep sediment organic matter mineralization.

Quantification of diagenetic reactions modifying paleo proxies like C-org, carbonates, phosphorus or manganese is essential to distinguish environmental changes records from diagenetic signals.