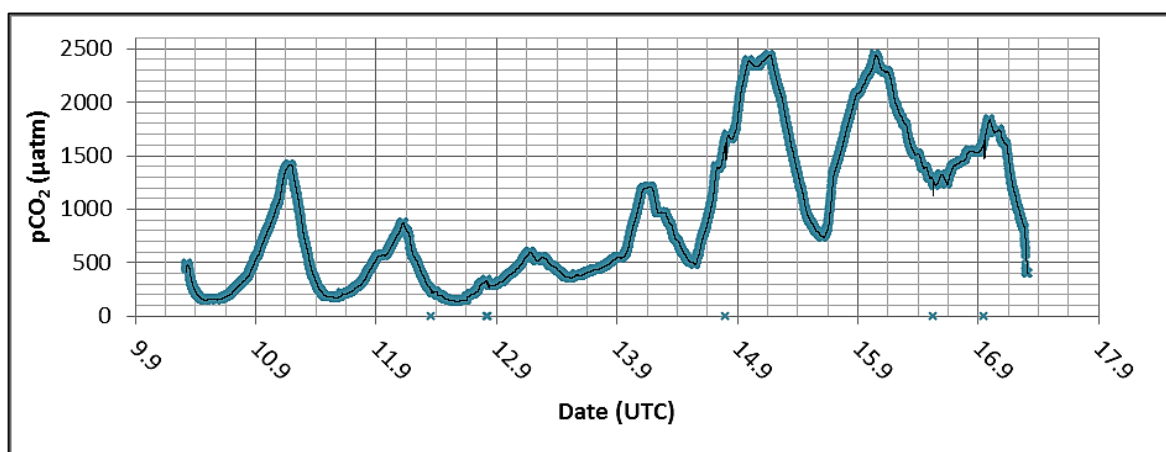


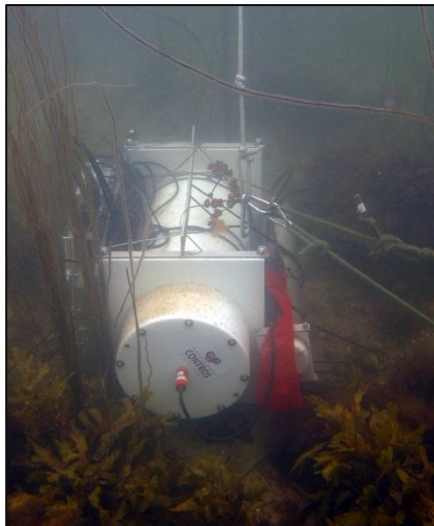
Use of the HydroC sensor for benthic pCO₂ continuous measurements.

The carbonate system in open oceanic environments is relatively well known (see GLODAP database, Key *et al.* 2004; Feely *et al.* 2004; Sabine *et al.* 2005). It provides the basis for future ocean predictive models used to design laboratory culture experiments or mesocosms set-ups to mimic present and future ocean acidification conditions (e.g. Riebesell *et al.* 2000; Engel *et al.* 2005; Iglesias-Rodriguez *et al.* 2008; Shi *et al.* 2009) (see Doney *et al.* 2008 for a review).

The dynamic of the carbonate system in nearshore zone is poorly known. In temperate regions, it is assumed to be partly depending on seaweeds and seagrasses photosynthetic/respiratory activity. Macroalgae along with other photosynthetic organisms take up dissolved inorganic carbon (DIC) during the day and release CO₂ at night. Since the CO₂ is a minor component of DIC and its diffusion rate in seawater is 10 000 times lower than in the air (Lobban and Harrison, 1997), macroalgae are adapted to the uptake of HCO₃⁻. Thus, they may strongly deplete or increase DIC in the adjacent water body and this phenomenon might be particularly strong when water exchange is restricted. The few studies carried out to date recording field variation of pCO₂ due to photosynthetic activity were conducted in non-tidal systems: in the Mediterranean Sea for floating macroalgae (Menéndez *et al.* 2001) and seagrass meadows (Invers *et al.* 1997) and in the Baltic sea for algal meadows (Middelboe and Hansen, 2007). The carbonate system associated to the tropical coral reefs is better known (Kayanne *et al.* 2005; Gattuso *et al.* 1993; 1997) and is known to contribute greatly to the global carbon budget (e.g. Iglesias-Rodriguez *et al.* 2002; Rees *et al.* 2007).



Picture 1: pCO₂ variation in a Baltic near shore macrophyte zone in µatm



Picture 2: Multiparametric benthic probe in the field.

The Contros HydroC CO₂ sensor has proven to be perfectly adapted to accurate benthic continuous measurement of pCO₂ in the field (see picture 2) and, together with other measurements, to the calculation of the overall carbonate system. Only concerns are relative to the battery size and reduced autonomy, forcing regular removal of the entire device. Solutions of partial autonomy (e.g. solar) would be appreciable. The addition of an external temperature sensor would also be interesting. First data show that CO₂ temporarily exceed 2000 μ atm in coastal waters (see picture 1). The presence and survival of benthic organisms in these areas indicate that they are adapted to tolerate these conditions temporarily or even permanently. The assessment of the carbon chemistry situation in these inshore waters may change our perspective of the ocean acidification effect, as well as the data and values we use to try to mimic future conditions under controlled laboratory mesocosms.

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