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### **Study of microphytobenthic primary production using an automated photosynthesis-energy curves acquisition in a laboratory climatic chamber**

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#### **Abstract**

Over the last decades, estuarine ecosystems have been subjected to anthropogenic pressures due to extensive industrial development, coastal development, dredging activities and land reclamation. Among the different facies that make up estuaries are mudflats, which are environments that promote the growth of dense biofilms of microphytobenthos (MPB). These MPB biofilms allow and control fluxes between the sediments and the water column, stabilize the sediments, can contribute up to 50% of estuarine primary productivity and are important food sources forming the basis of major estuarine food webs.

Despite numerous studies, the knowledge of the spatial distribution and production processes of MPB remains scarce because measurements of production processes are very time-consuming. Consequently, this study presents the development and functioning of a fully automated system for the measurement of oxygen microprofiles, allowing to acquire P-E curves with a large number of replicates. Sediment cores are sampled in the field and, back to the laboratory, they are placed in a laboratory climate chamber to control temperature, hygrometry and illumination. With only two electrodes, over a period of 24 hours, it was possible to record about 260 profiles automatically without any human intervention, under increasing illumination from 0 to 1700  $\mu\text{mol photons.m}^{-2}.\text{s}^{-1}$  (22 different light intensities being applied to the MPB). The automation of the system allowed to obtain a large data set leading to the creation of accurate photosynthesis-energy (P-E) curves.

Such an automated system was used to create numerous P-E curves in order to investigate the temporal and spatial variability of MPB primary production in a macrotidal estuary (Canche estuary, Opal Coast, France). For this purpose, primary production of MPB was studied on different biofacies along the salinity gradient, with numerous replicates. We were able to measure a net production ranging from 0 to 7mmol  $\text{O}_2.\text{m}^{-2}.\text{h}^{-1}$ .

#### **Keywords**

Microphytobenthos, Oxygen flux, Photosynthesis-energy curves, Automation