Seasonal and inter-annual variations of gross primary production, community respiration, and net community production of a i seagrass meadow.

BORGES AV[1], AND CHAMPENOIS W[1]

[1] *Chemical Oceanography Unit, Université de Liège, Liège, Belgium*

We report gross primary production (GPP), community respiration (CR) and net community production (NCP) over Posidonia oceanica meadow at 10 m in Corsica (Bay of Revellata) based on the open water O_2 mass balance approach from a data-set of hourly measurements with an array of three O_2 optodes that was deployed from August 2006 to October 2009. The method was checked by the comparison with discrete measurements of metabolic rates derived from benthic chamber incubations also based on the diel change of O_2. This comparison was satisfactory and actually highlights the potential caveats of benthic incubation measurements related to O_2 accumulation in small sized chambers leading to photorespiration, and an under-estimation of GPP. Our data-set confirms previously established knowledge on community metabolism of P. oceanica meadows: these communities were characterized by intense GPP and CR values, with strong seasonal variations, and were net autotrophic at annual scale. However, the high resolution data-set we obtained reveals additional knowledge that was missed by discrete benthic measurements with a coarse resolution (at best monthly). There was a strong day-to-day variability of GPP and CR, probably linked to changes in light availability, and extremely high but transient GPP events were recorded. Strong inter-annual variability of community metabolic rates was evidenced, with lower GPP and NCP during the 2006/2007 yearly cycle characterized by a mild and less stormy winter compared to the 2007/2008 and 2008/2009 yearly cycles. This finding suggests that one possible future evolution of carbon flows in P. oceanica meadows would be the decrease of export organic carbon to adjacent communities and a decrease of GPP and NCP, since a decrease in frequency and intensity of marine storms is expected in future in the Mediterranean Sea, due to a northward shift of the Atlantic storm track.

[1] Chemical Oceanography Unit, Département d'Astrophysique, Géophysique et Océanographie (AGO), Institut de Physique (B5), Allée du 6 Août, 17, Université de Liège, Liège, Belgium (alberto.borges@ulg.ac.be)

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