Seasonal and inter-annual variations of community metabolism rates of a Posidonia oceanica seagrass meadow based on continuous oxygen measurements with optodes

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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 O2 mass balance from a data-set of hourly measurements with an array of three O2 optodes deployed from August 2006 to October 2009. The method was checked by comparison with discrete measurements of metabolic rates derived from benthic chamber incubations also based on the diel change of O2. This comparison was satisfactory and actually highlights the potential caveats of benthic incubation measurements related to O2 accumulation in small chambers leading to photorespiration, and an under-estimation of GPP. Our data confirmed previous P. oceanica meadows GPP and CR values, strong seasonal variations, and net autotrophy. High resolution data revealed strong inter-annual variability, with a decrease of GPP by 35% and NCP by 87% during 2006-2007 characterized by a mild and less stormy winter compared 2007-2008 and 2008-2009. P. oceanica meadows are then expected to decrease export of organic carbon to adjacent communities (decrease of 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.