

Inter-annual variations over a decade of primary production of the Mediterranean seagrass *Posidonia oceanica*

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Posidonia oceanica meadows border nearly of all the coastlines of the Mediterranean Sea, and are present from depths between ~1 m and ~40m. They are among the most productive ecosystems on Earth, host a large biodiversity and provide numerous ecosystem services and goods. These ecosystems are declining in response to several human stressors: eutrophication (waste water and aquaculture), physical destruction (urbanisation of the littoral, anchoring and trawling), and climate change (sea-level rise and warming). We acquired quasi-continuous measurements of community gross primary production (GPP) by mass balance of O₂ measured on a mooring, from August 2006 to October 2016 over a *Posidonia oceanica* meadow (10 m depth) in the Bay of Revellata (Corsica). Over the 2006-2016 period, annual GPP averaged 88 molO₂ m⁻² yr⁻¹ and ranged from 61 to 108 molO₂ m⁻² yr⁻¹. Two years (2007 and 2013) were characterized by the lowest annual GPP, due to accumulation of leaf litter in fall and early winter due to the low occurrence of storms (absence of litter export), leading to occultation of benthic macro-algae. Among the other years, the inter-annual variability of GPP was related to changes during the February-August period, as GPP was repeatable among years during the September-January period. For the February-August period, inter-annual variations of GPP were related to Chlorophyll-a (Chl-a), solar radiation and water temperature. Phytoplankton GPP corresponded to a small fraction of community GPP, so the relation between GPP and Chl-a probably reflected inter-annual variations of nutrient inputs that favored both phytoplanktonic and benthic GPP. The correlation of GPP with solar radiation show that light availability contributes to inter-annual variations of the development of *P. oceanica*, in line with previous studies that showed the control of light availability on primary production seasonal and depth variations. The positive relation between GPP and temperature was consistent with the fact that the observed temperatures in the Bay of Revellata were within the comfort range for the growth of *P. oceanica*.