Warming as driver of beach metabolism in Antarctic sedimentary shores. A case study in Deception Island, Antarctic Peninsula

Mariano Lastra [1], Jesús López [1], Jesús S. Troncoso [1], Luis Sampedro [2], Manuel A. García-Gallego [1],

[1] *Universidad de Vigo, Vigo, Spain*
[2] *Consejo Superior de Investigaciones Científicas (CSIC), Pontevedra, Spain*

Algal wrack subsidies from rocky subtidal shores to the intertidal environment are responsible of important biogeochemical processes that link neighbor coastal ecosystems. The response in decomposition of algal wrack deposits to global warming has not been studied in ice-free Antarctic shore line to date. With this aim, the effect of temperature on algal wrack decomposition was tested following the hypothesis that the biogeochemical processing of wrack biomass would accelerate in response to temperature increase. To do this, green house effect at ground level was induced through passive open top chambers (OTCs) in two sites of Foster Bay, in Deception Island, South Shetland archipelago. OTCs rised soil temperature within the range predicted by the IPCC (2014) for the West península in the next few decades, between 0.5 and 1.5 ºC. The effect of temperature manipulation was tested in 2 target substrates: the fresh red macroalgae *Palmaria decipiens* (Reinsch), and in bare sand. The different responses of soil variables in the wrack patches and bare sand indicated that algal deposits raised interstitial metabolism. The manipulative experiment pointed out that a small warming (< 0.5 ºC) affected the wrack decomposition process through traceable speeding soil respiration through CO_2 flux, accelerated inorganic nutrients release to the interstitial environment (N and P), and augment microbial pool gauged through the total soil DNA. Our results predict that expected global warming would increase in a 25 % the release C to the atmosphere as CO_2 during the wrack decomposition. That increases for the total inorganic N released to the coastal ocean would be of a 22 %, whereas the availability of P will drecrease in almost 50%. Likewise, microbial biomass tracked through total soil DNE increased in almost 20 %. This study confirms the key role of sandy beaches in recycling ocean derived organic matter, highlighting their sensitivity to a changing scenario of global warming that predicts significant increases in temperature over the next few years.

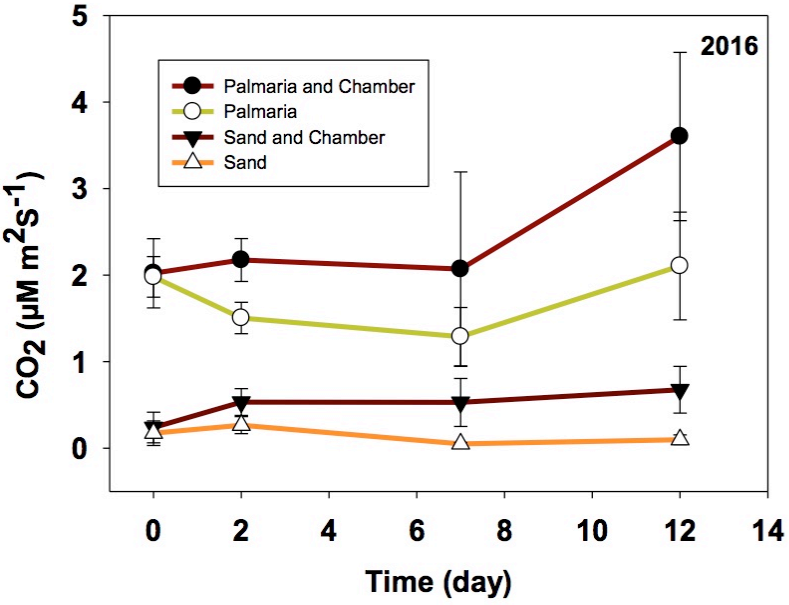

Figure 1. Average CO_2 flux (µM m^{-2} s^{-1}) over the 12 days of experiment for the warm-induced chambers (OTC) and control plots of fresh *Palmaria decipiens* and bare sand.

References

IPCC (2014) Climate Change: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (eds Pachauri RK, Meyer LA), Geneva.