A preview of the ocean acidification's impact on potential respiratory activity

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INTRODUCTION

The increase in the anthropogenic CO_2 released to the atmosphere, induces an increase in the dissolved CO_2 in the ocean, causing elevated pCO_2 values and a pH decrease. Due to the increasing atmospheric CO_2, several on-going research programs are evaluating the impact of acidification on marine organisms, intent to predict their future. In this mesocosm experiment (KOSMOS 14GC), we assessed the effect of different CO_2 concentrations on metabolism in microplankton (0.7-50µm size) and in biogenic particles harvested by sediment traps.

MATERIAL AND METHODS

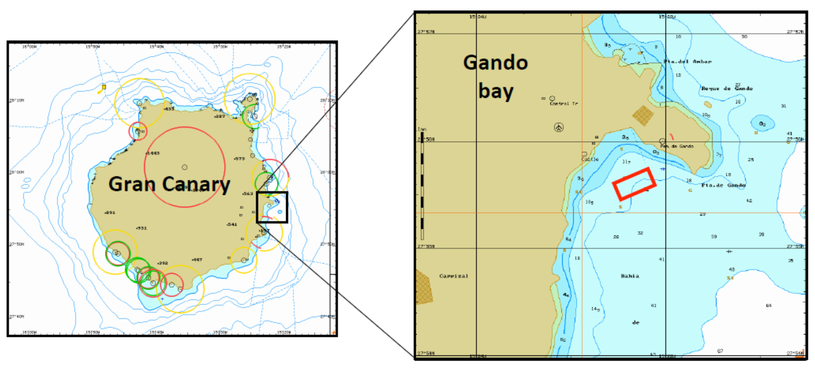
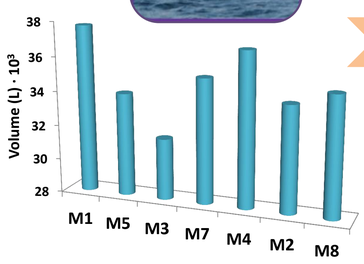


Fig1. Mesocosms location. Gando Bay, Gran Canaria.

Mesocosms



MICROPLANKTON (0.7-50µm) DEPTH = 13m

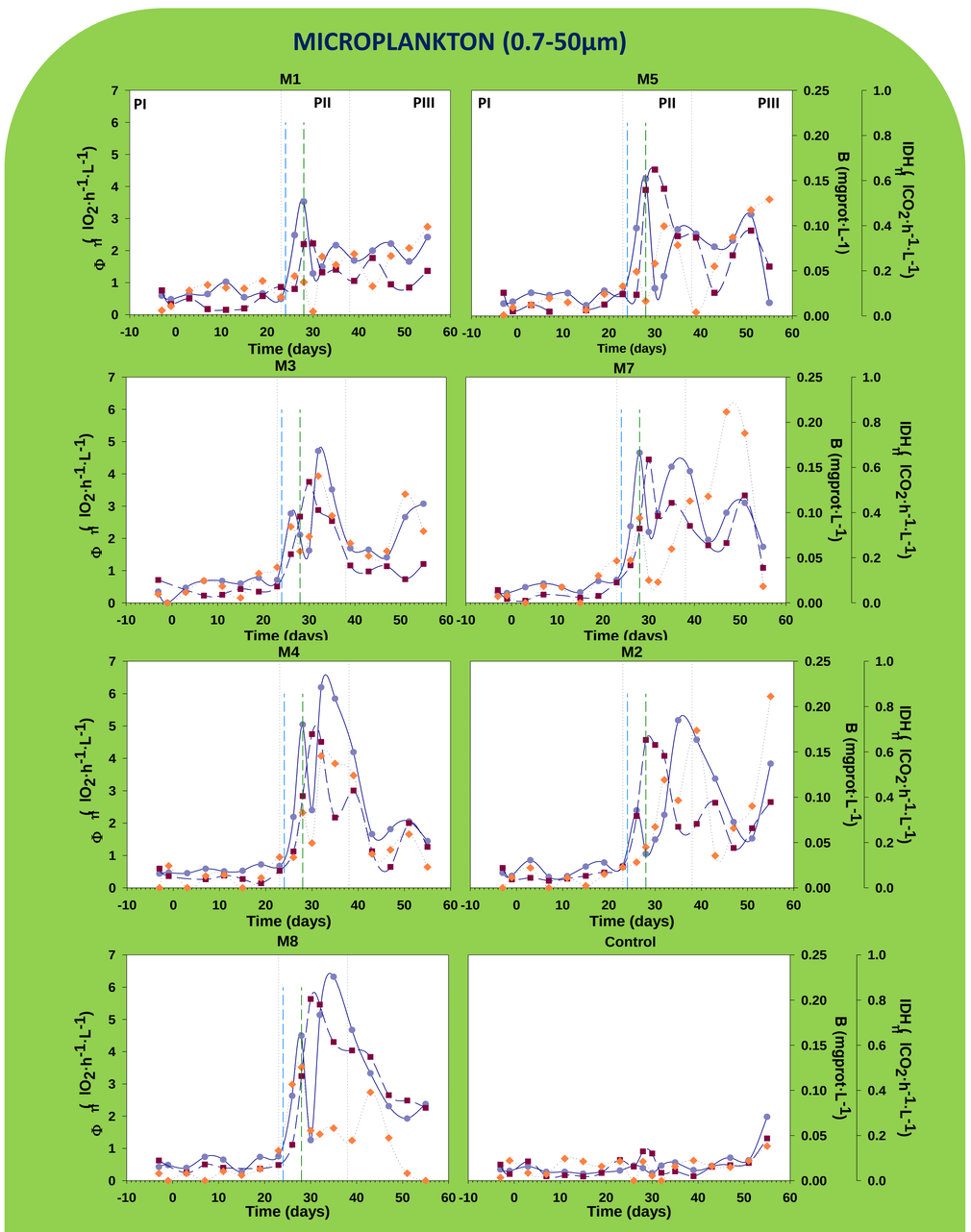
SEDIMENT TRAPS DEPTH = 15m

PARAMETERS

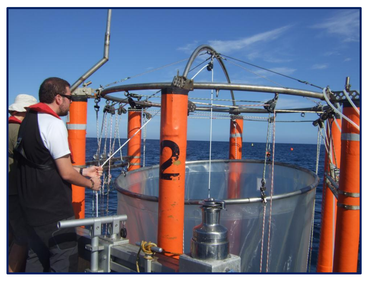
- **Potential respiration (Φ) → Electron transport system activity**
- **IDH activity → Isocitrate dehydrogenasa (CO_2 producing enzyme)**
- **Biomass (B) → protein content**

RESULTS

MICROPLANKTON (0.7-50µm)



- **Φ : Two peaks appear in the bloom phase. The first on the same day (or day before) as the chlorophyll peak and the second, around one week later.**
- **B : The maximum value appears near the chlorophyll peak.**
- **IDH: Although deep-water addition leads to an increase of IDH activity in all the mesocosms, the results are more variable than the ETS activity and the biomass.**
- **In the intermediate pCO_2 range, Φ and IDH seem to have the same behaviour**



LEGEND

Φ — B — IDH

Deep water addition — Chl*a* peak

PHASE I (PI): Oligotrophic period

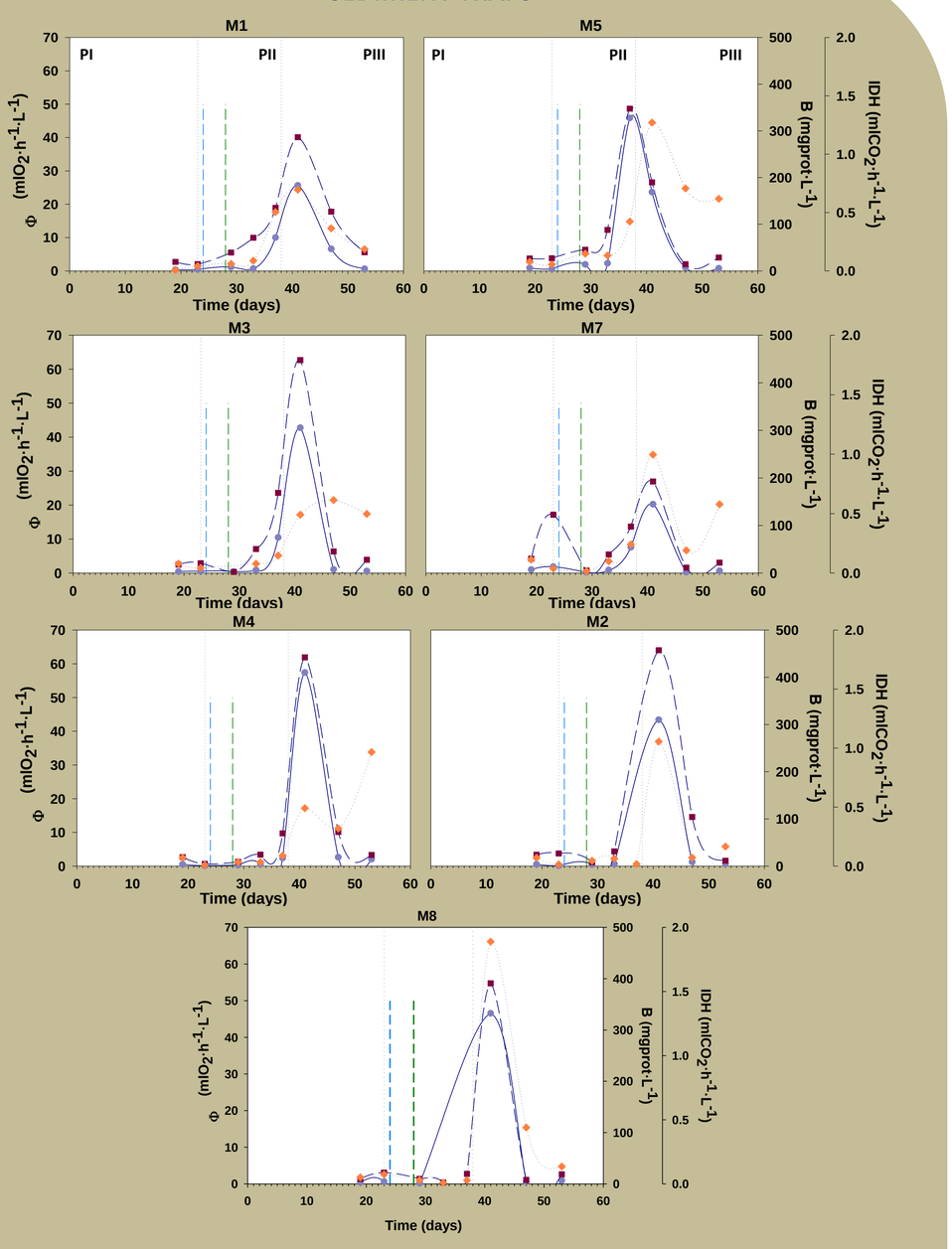
PHASE II (PII): Bloom period

PHASE III (PIII): Post-bloom period

pCO_2 RANGE (µatm)

Control		395.44 ± 8.09
M1	PHASE I	398.71 ± 5.03
	PHASE II	372.34 ± 49.68
	PHASE III	324.84 ± 10.41
M5	PHASE I	509.57 ± 12.28
	PHASE II	403.75 ± 82.19
	PHASE III	438.35 ± 12.25
M3	PHASE I	654.30 ± 36.21
	PHASE II	496.72 ± 84.27
	PHASE III	558.02 ± 35.43
M7	PHASE I	768.41 ± 54.61
	PHASE II	574.39 ± 132.43
	PHASE III	697.46 ± 45.45
M4	PHASE I	796.09 ± 101.32
	PHASE II	631.59 ± 152.86
	PHASE III	732.59 ± 69.68
M2	PHASE I	1056.71 ± 132.99
	PHASE II	766.16 ± 214.54
	PHASE III	858.15 ± 82.60
M8	PHASE I	1221.99 ± 173.98
	PHASE II	920.67 ± 232.81
	PHASE III	974.42 ± 116.96

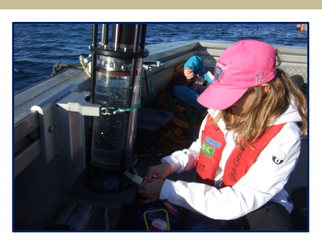
SEDIMENT TRAPS



- **All parameters display a maximum value, in all mesocosms, on the day 41, except for M5 where it appears on day 37. This value occurred in different pCO_2 treatment for each of the paremeters.**
- **Note that IDH activity, in M4, still has a peak on the last day of the experiment.**

CONCLUSIONS

- **Preliminary observations about the effect of the different pCO_2 treatments on potential respiratory activity show that the time-courses of all measured parameters were similar for all treatments.**
- **The appearance of two peaks in the Φ time-course suggests a change in the microplankton community.**
- **IDH activity is more variable than Φ, and may be related to changes in the metabolic pathways of the micro planktonic community.**
- **In sediment traps, the maximum concentration of live biogenic particles occurred around two weeks after deep-water addition.**



Aknowledgments

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