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Impact of dust enrichment on the metabolism of Mediterranean plankton communities under present and future conditions of pH and temperature

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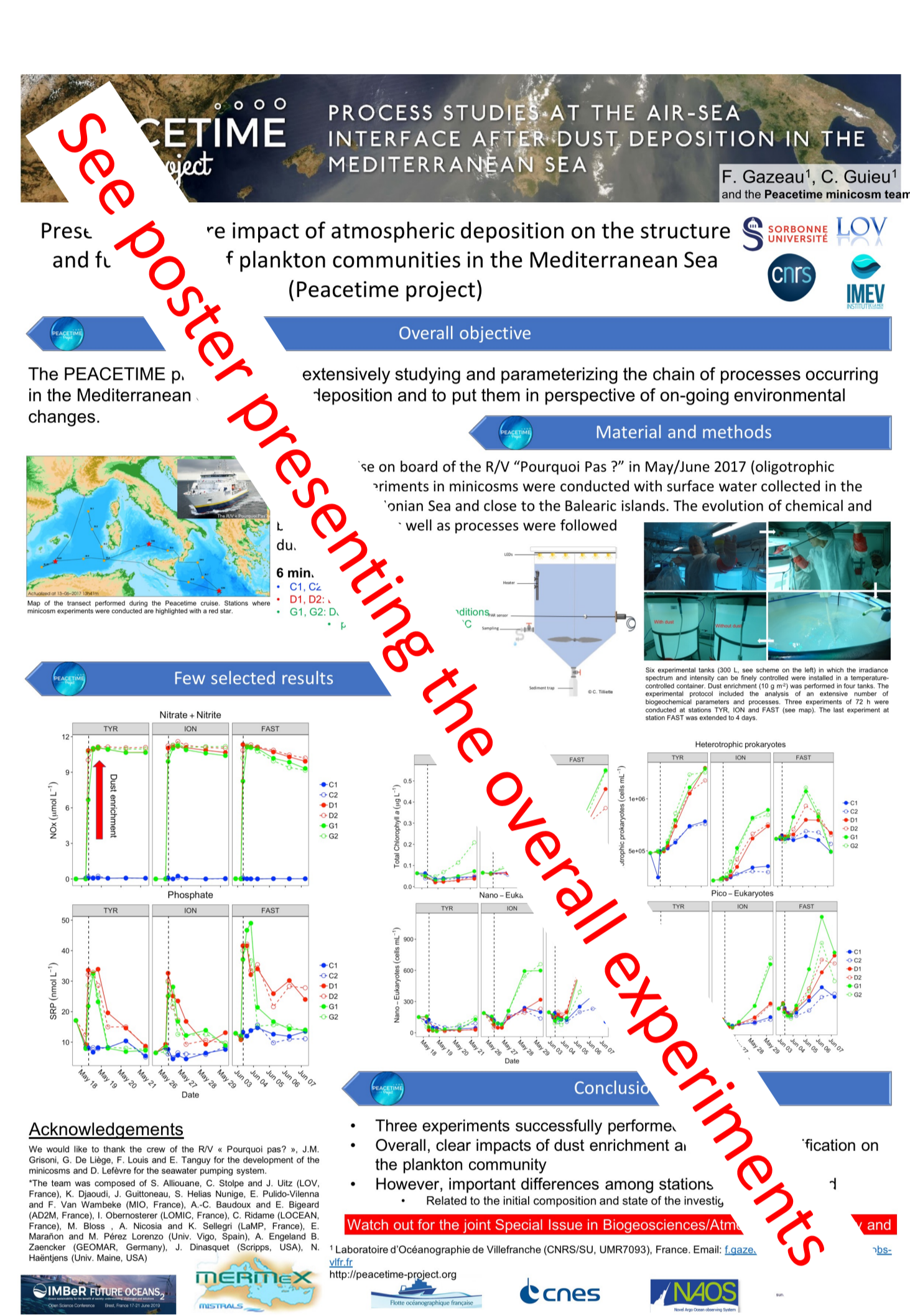
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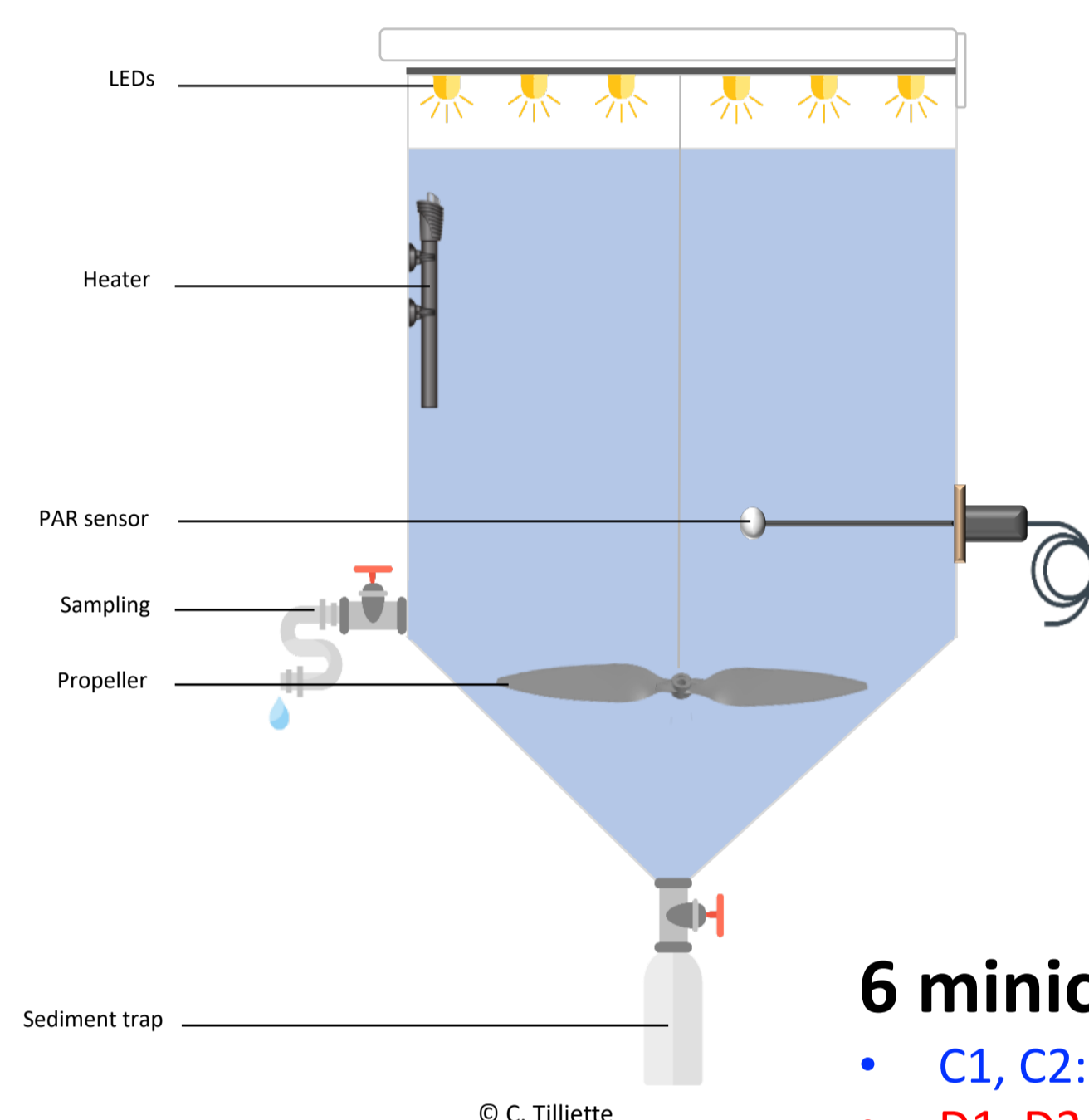
Overall objective

The PEACETIME project aimed at extensively studying and parameterizing the chain of processes occurring in the Mediterranean Sea after dust deposition and to put them in perspective of on-going environmental changes.



Material and methods

During a cruise on board of the R/V "Pourquoi Pas ?" in May/June 2017 (oligotrophic season), three experiments in climate reactors were conducted with surface water collected in the Tyrrhenian Sea (TYR), Ionian Sea (ION) and Alboran Sea (FAST).

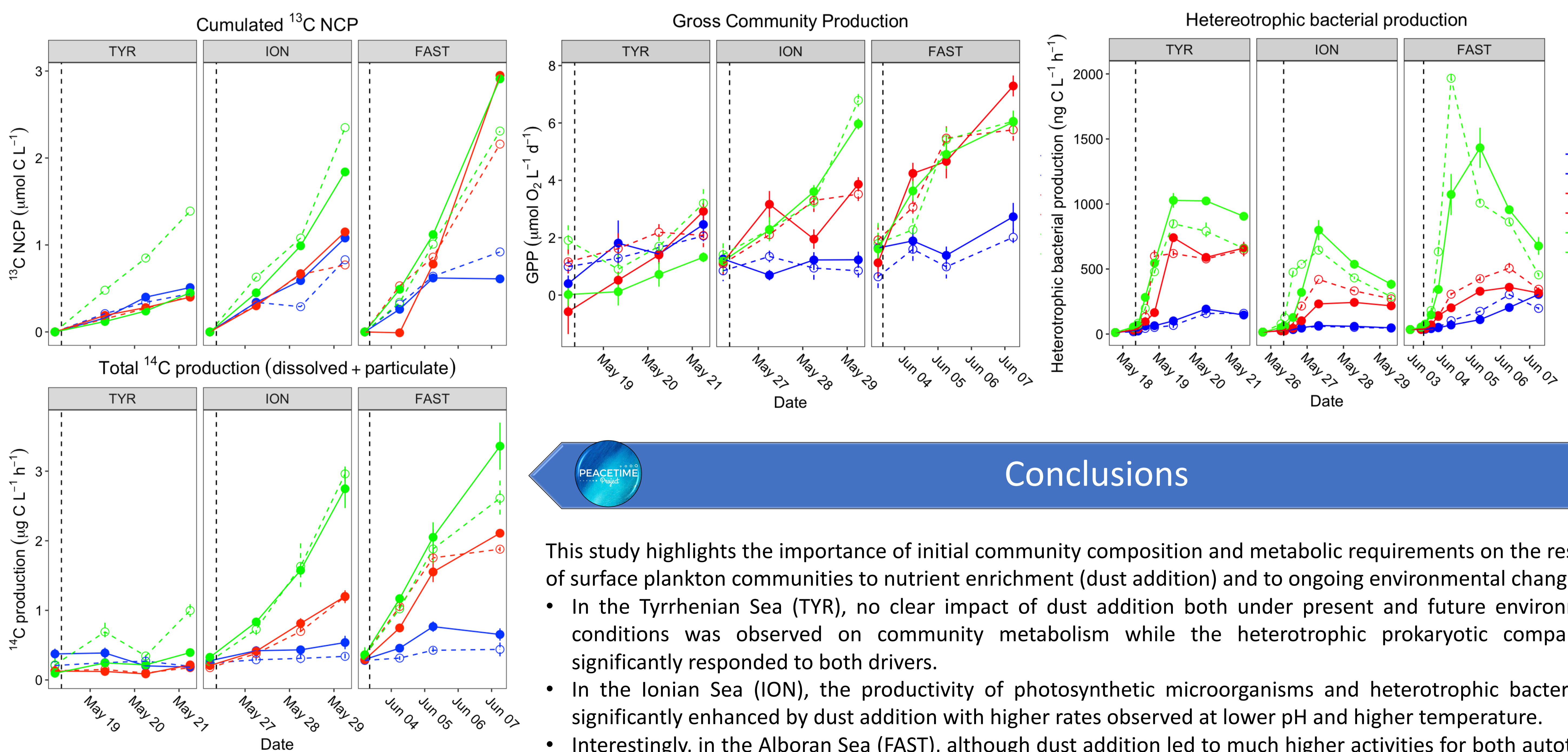


Six experimental units (300 L) were used to follow simultaneously and with a high temporal resolution, the evolution of biological activity (oxygen and carbon community metabolism, heterotrophic bacterial production, ¹³C net community production) among other parameters and processes, after dust addition (10 g m⁻²) both under present environmental conditions and following a realistic climate change scenario.

- 6 minicosms**
- C1, C2: Control
 - D1, D2: Dust enrichment
 - G1, G2: Dust enrichment under future conditions (pH - 0.3, temperature + 3 °C)

- ¹³C-HCO₃⁻ enrichment (+ 300 ‰) directly in each tank
- Separated incubations for ¹⁴C incorporation and O₂ metabolism (24 h, light-dark) at the corresponding irradiance and temperature levels
- Dark incubations at the corresponding temperature levels for heterotrophic bacterial production (³H-leucine, 2 h)

Results



Conclusions

This study highlights the importance of initial community composition and metabolic requirements on the response of surface plankton communities to nutrient enrichment (dust addition) and to ongoing environmental changes.

- In the Tyrrhenian Sea (TYR), no clear impact of dust addition both under present and future environmental conditions was observed on community metabolism while the heterotrophic prokaryotic compartment significantly responded to both drivers.
- In the Ionian Sea (ION), the productivity of photosynthetic microorganisms and heterotrophic bacteria was significantly enhanced by dust addition with higher rates observed at lower pH and higher temperature.
- Interestingly, in the Alboran Sea (FAST), although dust addition led to much higher activities for both autotrophic and heterotrophic compartments, future environmental conditions only positively impacted heterotrophic bacterial metabolism with no detectable effects on the activity of photosynthetic microorganisms.

Acknowledgements

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Watch out for the joint Special Issue in Biogeosciences/Atmospheric Chemistry and Physics

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