



Editorial: Impact of Aerosols (Saharan Dust and Mixed) on the East Mediterranean Oligotrophic Ecosystem, Results from Experimental Studies

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Keywords: Sharan dust, aerosols, eastern Mediterranean, mesocosm experiments, planktonic food web

Editorial on the research topic

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In oligotrophic environments, dust and nutrient inputs via atmospheric deposition are considered important sources of macro-nutrients and micro-trace metals fueling primary and secondary production. Yet, the impact of these dust inputs on the microbial populations has so far been partially investigated in the Eastern Mediterranean Sea (EMS). The objective of this special issue was to study the influence of dust deposition on the biological productivity, structure, and function of plankton and microbial communities in the Eastern Mediterranean. It is a collection of papers presenting the results of: (a) the impact of Saharan dust vs. mixed aerosols on the autotrophic and heterotrophic surface microbial populations in the EMS, (b) the impact of single vs. multi-pulses of Saharan dust introduction into the pelagic environment of the EMS, and (c) other experimental and field studies of aerosol impacts on the EMS ecosystem.

What is unique about the papers of this volume is that they focus on biological aspects covering a wide range of the pelagic food web, from viruses to copepods, using large-scale experimental approaches and using naturally collected aerosols, not dust analogs.

Two large-scale mesocosm experiments took place in Crete, Greece, in 2012 and 2014, at the HCMR mesocosm facility CretaCosmos (www.cretacosmos.eu). During the 2012 “ATMOMED” experiment, the addition of either natural pure Saharan dust or mixed aerosol (desert dust and polluted particles) in a single pulse into the ultra-oligotrophic environment of the Eastern Mediterranean took place. The 2014 “ADAMANT” experiment studied the effect of Saharan dust deposition on the pelagic microbial food web of the Eastern Mediterranean when added in multiple, successive dust pulses.

Seven papers (from the 2012 experiment, single addition) focus on the impact of atmospheric deposition (natural/Saharan dust vs. anthropogenic/mixed aerosol) on different parts of the pelagic microbial food web from viruses up to copepods. Herut et al. present an overview and rationale of this experiment with detailed information on the chemical characteristics of the aerosols (Saharan dust and polluted) used in 2012. Tsagaraki et al. present the overall response of the entire planktonic food web, from viruses to zooplankton, to the addition of Saharan dust and mixed aerosol. Rahav et al. study the impact of atmospheric deposition on N₂ fixation. Guo et al. focus on the bacterial community and investigate how the atmospheric input affects metabolic activities and community

OPEN ACCESS

Reviewed by:

Angel Borja,
AZTI Pasaia, Spain

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Specialty section:

This article was submitted to
Marine Ecosystem Ecology,
a section of the journal
Frontiers in Marine Science

Received: 24 July 2017

Accepted: 02 August 2017

Published: 21 August 2017

Citation:

Pitta P, Herut B and Tsagaraki TM
(2017) Editorial: Impact of Aerosols
(Saharan Dust and Mixed) on the East
Mediterranean Oligotrophic
Ecosystem, Results from Experimental
Studies. *Front. Mar. Sci.* 4:264.
doi: 10.3389/fmars.2017.00264

dynamics. Tsiola et al. concentrate on the impact of viral lysis and grazing by flagellates on bacterioplankton production. Meador et al. track variations in the lipidome associated with dust fertilization. Christou et al. describe the changes in the mesozooplankton community and evaluate the feeding response of the dominant copepod species.

Krom et al. present data from a microcosm experiment conducted in parallel with the 2012 mesocosm experiment. This microcosm experiment studies the effects of acid processes acting on Saharan dust in the atmosphere on primary and bacterial productivity and biomass.

Three papers present results from the second mesocosm experiment (multiple dust addition), conducted in Crete in 2014. Pitta et al. present the response of the whole microbial food web to the Saharan dust additions while also presenting data on the chemical signature of this dust. Lagaria et al. focus on the response of phytoplankton populations to Saharan dust depositions. In Tsiaras et al. a biogeochemical model is customized to simulate the 2014 mesocosm experiment.

Finally, there are three more papers; one on the effect of dust-associated airborne microbes deposited into the sea on marine autotrophic and heterotrophic production (Rahav et al.), one on the impact of dry deposition on the sea surface microlayer (Astrahan et al.) and a last one describing a long term flux of Saharan dust to the suburban area of Athens, Greece (Vasilatou et al.).

The mesocosm experiments were funded by two projects, the EU-FP7 project “MESOAQUA” (grant agreement no. 228224) and the project “ADAMANT” (nr code/MIS: 383551), co-financed by the European Union and Greek national funds. Additional funding to the authors is mentioned at the end of each paper. The captain and the crew of the R/V *Philia* as well as the scientific, technical and administrative staff that made these experiments happen are also thanked.

Finally, we would like to acknowledge the contribution of the handling editor as well as of numerous reviewers to the completion of the present special issue.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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