

EGU2020-15108

<https://doi.org/10.5194/egusphere-egu2020-15108>

EGU General Assembly 2020

© Author(s) 2020. This work is distributed under the Creative Commons Attribution 4.0 License.



## Biochemical responses of oligotrophic Adriatic Sea surface layers to atmospheric deposition inputs

**Sanja Frka**<sup>1</sup>, Andrea Milinković<sup>1</sup>, Abra Penezić<sup>1</sup>, Saranda Bakija Alempijević<sup>1</sup>, Blaženka Gašparović<sup>1</sup>, Sanda Skejčić<sup>2</sup>, Danijela Šantić<sup>2</sup>, Vedrana Džaja Grgičin<sup>3</sup>, Stjepana Brzaj<sup>3</sup>, Sonja Vidić<sup>3</sup>, Iva Šimić<sup>4</sup>, Silva Žužul<sup>4</sup>, Ivan Bešlić<sup>4</sup>, Ranka Godec<sup>4</sup>, and Gordana Pehneć<sup>4</sup>

<sup>1</sup>Ruđer Bošković Institute, Division for marine and environmental research, Zagreb, Croatia (frka@irb.hr;

Andrea.Milinkovic@irb.hr; abra@irb.hr; Saranda.Bakija.Alempijevic@irb.hr; Blazenka.Gasparovic@irb.hr)

<sup>2</sup>Institute of Oceanography and Fisheries, Split, Croatia (sanda@izor.hr; segvic@izor.hr)

<sup>3</sup>Croatian Meteorological and Hydrological Service, Zagreb, Croatia (dzaja@cirus.dhz.hr; stjepana.brzaj@cirus.dhz.hr;

sonja.vidic@cirus.dhz.hr)

<sup>4</sup>Institute for Medical Research and Occupational Health, Zagreb, Croatia (isimic@imi.hr; szuzul@imi.hr; ibeslic@imi.hr;

rgodec@imi.hr; gpehnecc@imi.hr)

## Biochemical responses of oligotrophic Adriatic Sea surface layers to atmospheric deposition inputs

Frka<sup>1</sup>, A. Miliković<sup>1</sup>, A. Penezić<sup>1</sup>, S. Bakija Alempijević<sup>1</sup>, B. Gašparović<sup>1</sup>, S. Skejčić<sup>2</sup>, D. Šantić<sup>2</sup>, S. Brzaj<sup>3</sup>, V. Džaja Grgičin<sup>3</sup>, S. Vidić<sup>3</sup>, I. Šimić<sup>4</sup>, I. Bešlić<sup>4</sup>, S. Žužul<sup>4</sup>, R. Godec<sup>4</sup>, G. Pehneć<sup>4</sup>

<sup>1</sup>Division for marine and environmental research, Ruđer Bošković Institute, Zagreb, Croatia

<sup>2</sup>Institute of Oceanography and Fisheries, Split, Croatia

<sup>3</sup>Croatian Meteorological and Hydrological Service, Zagreb, Croatia

<sup>4</sup>Institute for Medical Research and Occupational Health, Zagreb, Croatia

The atmosphere is a significant pathway by which both natural and anthropogenic material is transported from continents to both coastal and open seas. Once deposited through atmospheric deposition (AD) processing, atmospheric particulate matter (PM) provides the aqueous ecosystems with an external source of nutrients and pollutants. This, in turn, influences the organic matter (OM) production by the phytoplankton, changes CO<sub>2</sub> uptake and indirectly affects the climate. The input of AD is especially important in oligotrophic environments and it is expected to increase in the future scenarios of a warmer atmosphere with increased PM emissions and deposition rates. While the majority of the data related to the AD impacts generated so far in the Mediterranean have been conducted on its western and eastern regions, the effects of the AD inputs to

oligotrophic surface waters of the Adriatic Sea sub-basin are unknown. This work is designed to assess the impact of AD on complex biochemical responses of Adriatic oligotrophic systems, considering the sea surface microlayer (SML) at the air-water interface.

Field campaign was conducted during the period of retrieval of sea surface oligotrophic conditions (February-July 2019) at the Martinska, Central Adriatic, Croatia. On-line black carbon (BC) concentrations were measured while the PM<sub>10</sub>, wet and total deposition samples as well as the SML and underlying water (ULW; 0.5 m depth) samples were collected simultaneously. The temporal dynamics of the SML biology as well as concentrations of inorganic and organic constituents enabled the assessment of their sources and the nature of the enrichments taking place within the SML. The first comprehensive insight into concentration levels of macro nutrients (N, P), trace metals (eg. Cu, Pb, Cd, Ni, Zn, Co) and OM (including aromatic pollutants) in atmospheric samples, their transport history, source apportionment and deposition fluxes to the oligotrophic Adriatic area will be presented. Daily and seasonal variations of PM<sub>10</sub> composition were affected by local traffic and open-fire events as well as by local meteorological conditions and long-range transport. The BC contribution of biomass burning versus fossil fuel combustion changed seasonally. Source apportionment module of LOTOS-EUROS chemical transport model enabled identification and quantification of main source areas contributing to deposition of PM. The main PM contributor is a public power sector outside Croatia while other contributing sectors are energy production, traffic, residential combustion as well as shipping. First deposition fluxes estimates show reasonable agreement between model calculations and measured data, and could be used for more general assessments of atmospheric inputs.

**Acknowledgment:** This work has been supported by Croatian Science Foundation under the IP-2018-01-3105 project: Biochemical responses of oligotrophic Adriatic surface ecosystems to atmospheric deposition inputs.

**How to cite:** Frka, S., Milinković, A., Penezić, A., Bakija Alempijević, S., Gašparović, B., Skejić, S., Šantić, D., Džaja Grgičin, V., Brzaj, S., Vidič, S., Šimić, I., Žužul, S., Bešlić, I., Godec, R., and Pehnc, G.: Biochemical responses of oligotrophic Adriatic Sea surface layers to atmospheric deposition inputs, EGU General Assembly 2020, Online, 4–8 May 2020, EGU2020-15108, <https://doi.org/10.5194/egusphere-egu2020-15108>, 2020