Geophysical Research Abstracts
Vol. 21, EGU2019-13025, 2019
EGU General Assembly 2019

Sea spray and bubbles ambient noise relation in the Southern Baltic

Katarzyna Dziembor (1), Zygmunt Klusek (2), Tomasz Petelski (3), Piotr Markuszewski (3), Przemysław Makuch (3), Iwona Wróbel-Niedźwiecka (3), Jacek Piskozub (3), Małgorzata Kitowska (3), and Violetta Drozdowska (3)

(1) University of Warsaw, Faculty of Physics, Geophysics, Warsaw, Poland (katarzyna.dziembor95@gmail.com), (2) Institute of Oceanology Polish Academy of Sciences, Marine Physics Department, Marine Acoustics Laboratory, Sopot, Poland, (3) Institute of Oceanology Polish Academy of Sciences, Physical Oceanography Department, Air-Sea Interaction Laboratory, Sopot, Poland

Sea spray aerosols (SSA) are an important part of sea–air interactions. Their emission from the oceans, especially during storms, affects many processes in the air–sea boundary layer environment. Higher concentration of marine aerosols affects cloud condensation nuclei, albedo changes and light scattering (Lewis and Schwartz, 2004). Studying this volatile phenomenon is crucial for a better understanding of our environment, creation of reliable climate models and forecasts, especially in the time of rapid climate changes.

It should be noted that sea spray fluxes and the amount of air bubbles beneath the sea surface are correlated (Blanchard, 1963). Hence, here we present the results of connected acoustic and aerosol measurements conducted on-board R/V Oceania during research campaigns on the Southern Baltic Sea. By using the acoustic methods, we were able to estimate how many bubbles were beneath the waves. The acoustic buoy system, with the bandwidth of the tract reduced to the frequency range from 80 Hz to 12.5 kHz, was oriented towards registration of wind/rain components of underwater noise. Simultaneously, we collected the data from the CSAPS_100–HV Particles Measuring System aerosol particles counter, moved vertically between 8, 11, 14, 17 and 20 m asl (Petelski 2014), and the meteorological data to forward analysis. Sea spray fluxes were calculated according to gradient method proposed by Petelski (2003) and compared with data obtained from the acoustic equipment.

In the results, we present the outcome of aerosol and acoustic data relation based on underwater sound intensity generated by a local wind dependent on surface sources. Taking into account the applicability, low costs of acoustics measurements in comparison to traditional methods and the possibility of obtaining long series of measurements, we plan to explore this area of research during future field campaigns.

Blanchard, D. C. (1963). The electrification of the atmosphere by particles from bubbles in the sea. Progress in Oceanography. https://doi.org/10.1016/0079-6611(63)90004-1

Lewis, E. R., & Schwartz, S. E. (2004). Sea salt aerosol production: Mechanisms, methods, measurements and models—A critical review. In Geophysical Monograph Series. https://doi.org/10.1029/152GM01

Petelski, T. (2003). Marine aerosol fluxes over open sea calculated from vertical concentration gradients. Journal of Aerosol Science, 34(3), 359–371. https://doi.org/10.1016/S0021-8502(02)00189-1

Petelski, T., Markuszewski, P., Makuch, P., Jankowski, A., & Rozwadowska, A. (2014). Studies of vertical coarse aerosol fluxes in the boundary layer over the Baltic Sea. Oceanologia. https://doi.org/10.5697/oc.56-4.697