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Studies of seasonal variations of aerosol optical properties with use of remote techniques

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According to the IPCC report, atmospheric aerosols due to their properties –extinction of Sun and Earth radiation and participation in processes of creation of clouds, are among basic "unknowns" in climate studies. Aerosols have large effect on the radiation balance of the Earth which has a significant impact on climate changes. They are also a key issue in the case of remote sensing measurements. The optical properties of atmospheric aerosols depend not only on their type but also on physical parameters such as pressure, humidity, wind speed and direction. The wide range of properties in which atmospheric aerosols affect Earth's climate is the reason of high unrelenting interest of scientists from different disciplines such as physics, chemistry and biology.

Numerous studies have dealt with aerosol optical properties, e.g. Dubovik et al. (2002), but only in a few have regarded the influence of meteorological parameters on the optical properties of aerosols in the Baltic Sea area. Studies of aerosol properties over the Baltic were conducted already in the last forty years, e.g. Zielinski T. et. al. (1999) or Zielinski T. & A. Zielinski (2002). The experiments carried out at that time involved only one measuring instrument –e.g. LIDAR (range of 1 km) measurements and they were conducted only in selected areas of the Polish coastal zone. Moreover in those publications authors did not use measurements performed on board of research vessel (R/V Oceania), which belongs to Institute of Oceanology Polish Academy of Science (IO PAN) or data received from satellite measurements. In 2011 Zdun and Rozwadowska performed an analysis of all data derived from the AERONET station on the Gotland Island. The data were divided into seasons and supplemented by meteorological factors.

However, so far no comprehensive study has been carried out for the entire Baltic Sea area. This was the reason to conduct further research of SEasonal Variations of Aerosol optical depth over the Baltic Sea (SEVA). The purpose of the SEVA project is to perform this kind of analyses using variety of methods of measurements (three measuring devices –MICROTOPS, Shadowband, CIMEL), using data from the Baltic's AERONET NASA stations. For the analyzes are also used the results of measurements made on board the R/V Oceania within the Maritime Aerosol Network (MAN). In order to obtain a complete picture of the seasonal variability of atmospheric aerosol properties over the Baltic Sea, analyses of air mass back-trajectories and wind fields are also taken into consideration. The final step of the analyses will involve the comparison with satellite data from MODIS model. Such a comprehensive and innovative range of research will provide the necessary information on the phenomenon of the impact of aerosols on the climate of the Baltic Sea.

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