STUDY ON THE ELEMENTAL COMPOSITION OF MARINE PARTICULATE MATTER COLLECTED ON DIFFERENT FILTER MATERIAL

ANNA BRZEZINSKA-PAUDYN*, MARYAGNES R. BALICKI, and JON C. VAN LOON

Institute for Environmental Studies, University of Toronto, Toronto Ont. M5S 1A4, Canada

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Abstract. The chemical composition of marine particulate matter from the Southern Baltic has been studied using ICP atomic emission spectrometry. The samples were collected on polycarbonate 0.4 \( \mu \)m, cellulose acetate and glass fiber 0.45 \( \mu \)m filters, and on polycarbonate filters of 0.2, 0.4, 0.6, and 1.0 \( \mu \)m pore size. The suspensions were analyzed for the major elements Ca, Mg, Al, Fe, and P, and for the minor and trace constituents: Mn, Mo, Zn, Cu, Co, Cd, Cr, As, Se, Sb, Ag, and S. The concentrations of metals calculated on dry weight basis were higher when polycarbonate filters were used while the values for cellulose acetate and glass fiber filter were comparable. The determination of net mass particulate matter was the main reason for these differences. A comparative study of the chemical composition of suspensions from the Southern Baltic and from other areas showed a similar range of concentrations of particulate elements in coastal waters.

1. Introduction

Studies on the chemical composition of suspended matter have become increasingly important in oceanography and ecology. They are particularly useful in gaining knowledge of processes which occur in the estuaries and off-shore zones of the seas, where dissolved and particulate runoff from the rivers interact with sea water. Suspended particles play a major role in regulating chemical speciation, distribution and deposition of many chemical constituents in the sea. The elemental composition of suspended matter, as well as bottom sediments, has a significant influence on the living conditions of zoobenthos and through them, on many fish species.

Technical difficulties due to correct sampling and analysis provide serious obstacles to the study of marine suspensions. Owing to the much higher level of trace elements, suspended matter is more convenient material for analysis than sea water. Flame and flameless atomic absorption, neutron activation analysis (Brzezinska et al., 1983), and X-ray fluorescence (Culvert and McCartney, 1979; Feely et al., 1981) have been commonly used for the analysis of this material. Some recent papers indicate the usefulness of inductively coupled plasma atomic emission spectrometry (ICP-AES) as a relatively simple and multielemental method, which can cover the wide range of elements in the large number of samples necessary for marine monitoring programs (Berman et al., 1981; Boström et al., 1981).

* On leave from Institute of Meteorology and Water Management, Gdynia, Poland.

In this study, we applied the ICP-AES method to the analysis of major (Ca, Al, Mg, Fe, P) and minor (Mn, Mo, Zn, Ni, Pb, Cu, Co, Cr, Cd, As, Se, Sb, Ag, and S) elements in particulate matter collected on different filter material.

2. Experimental

2.1. Sampling and Storage

The suspensions were collected in the Southern Baltic, particularly from the surface of the coastal zone of the Gulf of Gdańsk (Figure 1). This work was done aboard the research vessel 'Hydromet' (Institute of Meteorology and Water Management, Marine Branch, Gdynia, Poland) in September of 1981. Sea water was taken by Go-Flow samplers (General Oceanics, U.S.A.) and filtered immediately after sampling. Sartorius (FRG) metal-free pumps and teflon filtration units were used for this purpose. Nuclepore polycarbonate membrane filters of 0.4 µm pore size, Millipore cellulose acetate and Whatman (GF/F) glass fiber filters of 0.45 µm pore size were used to study the effect of filter material on the whole analytical process including sampling. Ten samples were also filtered simultaneously through Nuclepore filters of 0.2, 0.4, 0.6, and 1.0 µm pore size.

The filters were soaked in 2N HNO₃ overnight, washed with deionized water and dried to a constant weight at 60 °C before and after filtration, and the mass of particulate matter was estimated by difference. A drying agent was present in the balance compartment to control the humidity during the weighing of the filters. During the work at sea, the filters were stored frozen at −20 °C in plastic jars and after the final drying and weighing they were kept at −4 °C. They were reweighed after transportation to

![Fig. 1. The net of sampling stations of marine particulate matter in The Southern Baltic (Gulf of Gdańsk).](image-url)