

Trace metals in off-shore Mediterranean waters

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Summary

During the 1974-1975 period determinations of copper, zinc, cadmium and mercury were carried out on water samples collected mainly from off-shore areas of the Mediterranean Sea. General trends of horizontal and vertical distribution of these trace metals are presented and discussed.

Résumé

Pendant la période 1974-1975 des déterminations de cuivre, zinc, cadmium et mercure ont été effectuées sur des échantillons d'eau prélevée principalement dans des endroits situés au large de la Mer Méditerranée. L'orientation générale de la distribution horizontale et verticale de ces métaux à l'état de trace est présentée et commentée.

In order to acquire data on trace metal distribution in the off-shore Mediterranean on a north-south or east-west gradient as well as on geographical differences in their vertical distribution, measurements on copper, zinc, cadmium and mercury were conducted on water samples collected mainly from the western Mediterranean during several cruises in 1974-1975. The analysis of copper, zinc and cadmium was performed on Millipore filtered sea water (pore size 0.45 μ m) by anodic stripping voltammetry (ASV) with composite graphite mercury electrodes [1]; mercury was measured on unfiltered sea water by ASV using pure graphite electrodes [2]. The associated errors of individual measurements in both methods are estimated to range between \pm 10 and 20% in terms of standard deviation (1σ).

Surface distribution

The results of the measurements on the surface waters show that the concentrations of Cu and Cd are generally low. Of the 37 surface samples analyzed, 17 values for Cu and 9 values for Cd were below detection limits for the methods used. It was recognized that the higher levels of Cu tend to appear at stations located nearer the coastline, while no systematic gradient for higher Cd values, nor the correlation of Cd concentration with those of other metals was observed. On the other hand, the average surface concentration of Zn in the northwestern Mediterranean as well as in the Aegean and Cretan Seas tends to be somewhat higher than those in other regions of the Mediterranean studied. The cause of these higher Zn concentrations can probably be attributed to the input of Zn from land-based industrial and urban sources and from fresh water run-offs. Although only a small number of data are available, no difference was found in the average surface concentrations of Hg among the northwestern Mediterranean, southwestern Mediterranean and the Tyrrhenian Sea.

Vertical profile

The vertical profiles of Zn distribution observed in various parts of the western Mediterranean show, in general, Zn-maxima considerably below the chlorinity maxima. A Zn-profile obtained from a station on the continental slope suggested interaction of near-bottom water with the sea bed.

The vertical profiles of Hg concentrations indicate that the mechanism responsible for the vertical variation of Hg may be different from that for Zn, especially in the near-bottom water.

REFERENCES

- [1] R. Fukai and L. Huynh-Ngoc, Chemical forms of zinc in sea water-Problems and experimental methods, *Jour. Oceanogr. Soc. Japan*, 31 (1975) 179-191.
- [2] R. Fukai and L. Huynh-Ngoc, Direct determination of mercury in sea-water by anodic stripping voltammetry with a graphite electrode, *Anal. Chim. Acta*, 83 (1976) 375-379.

DISCUSSION

Question and comments:

1. In what manner have the voltammetric data on Hg been checked and confirmed by atomic absorption spectroscopy?

Have direct comparisons been made with the two different analytical methods (voltammetry and AAS) for the studied sea water samples? (H.W. NÜRNBERG, Germany)

- By analyzing some biological samples by both methods. The agreement between the results obtained by two different method was good. For sea water samples we have not yet made the comparison.

2. Could you please inform me regarding your sampling and concerning the collections made from the Aegean and the Sea of Crete. (C. PAPADOPOULOU, Greece)

- The surface sampling was made at the following positions:

39°21'N, 25°11'E

38°16'N, 24°51'E

36°09'N, 25°53'E

3. Le profil vertical du mercure fait apparaitre me semble-t-il un maximum en surface d'ou une source évidente. Voulez-vous préciser le profil également au voisinage du fond?

(G. LAPICQUE, France)

- Bien que nous observé des concentrations de mercure plus élevées au voisinage du fond il semble encore trop tot pour tirer une conclusion sur la seule base des quelques mesures qui ont été faites a ce jour.

4. The temperature in vertical distribution in connection with Zn and Hg vertical distribution. (A. BALLESTER, Spain)

- Not made.

5. It is remarkable if you can determine Hg electrochemically with simple graphite electrode. Have you compared your electrochemical results with some standard method?
(V. ŽUTIĆ, Yugoslavia)
- Yes, we have compared the electrochemical method with atomic absorption method by analyzing some biological samples. The agreement between the results obtained by two different methods was excellent.