# On the radioactivity of coastal seawater from Oran, Algeria

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Resumé

En appliquant la méthode du MnO<sub>2</sub> colloidal pour l'extraction de certains radionucléides contenus dans de grands volumes d'eau de mer, on a identifié par la spectrometrie gamma le <sup>54</sup>Mn et le <sup>60</sup>Co; dans les cendres des suspensions le <sup>137</sup>Cs. Les radionucléides <sup>144</sup>Ce-<sup>144</sup>Pr, <sup>106</sup>Ru-<sup>106</sup>Rh et <sup>65</sup>Zn étaient absents dans l'eau et les suspensions. L'uranium était présent seulement dans l'eau de mer filtrée. En conclusion l'activité de l'eau de mer est due principalement au <sup>40</sup>K.

Summary

The extraction of man-made radionuclides from filtered seawater by means of colloidal MnO<sub>2</sub> and whole gamma spectrometry by a Ge(Li) detector coupled to a multichannel analyzer, indicated the presence of  $^{54}$ Mn and  $^{60}$ Co, while in suspended matter only  $^{137}$ Cs was found. Uranium has only been identified in filtered seawater.

## Material and Methods

The upper layer of Mediterranean seawater sampled at Kristel along the West Algerian coast during May 1984 has been investigated for man-made radionuclides after filtration and extraction with colloidal manganese dioxide/1/.

Total gamma spectrometry has been carried out for the following samples:

- 1) MnO<sub>2</sub> precipitate from filtered seawater,
- 2) Suspended matter ash,
- 3) Blank MnO2 precipitate.

The measurements were performed by means of a 65 cm $^3$  Ge(Li) detector (high resolution, 1.8 keV) coupled to a multichannel analyzer. Each sample was counted twice for 18 hours. Only those radionuclides, whose activities were within at least three standard errors, were considered.

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#### Results and Discussion

 $^{54}$ Mn(835 keV) at a concentration of 0.027 pCi/l was found in filtered seawater, but no measurable activity was found in the ash of suspended matter. Trace amounts of  $^{60}$ Co were detected in filtered seawater, while <0.02 pCI<sup>137</sup>Cs/l was measured in suspended matter. 106Ru-106Rh and  $^{65}$ Zn were not detected in any of the samples analyzed.

It should be noted that only in filtered seawater was a more intensive gamma energy at 186 keV found.  $^{226}\text{Ra}$  arising from the natural  $^{238}\text{U}$  chain, has a gamma energy that overlaps the 186 keV of  $^{235}\text{U}$ . The photopeaks of  $^{214}\text{Bi}$  (610 keV) and  $^{214}\text{Pb}(352$  keV) arising from  $^{238}\text{U}$  are constant in all samples and blanks. Because the gamma energy of 186 keV in filtered seawater is twice that in the ash of suspended matter and the background, the presence of natural uranium(measurement error 19%) is assumed.

In conclusion, total gamma activity of the seawater samples was very low; the main source of radioactivity was due to  $^{\rm 40}{\rm K}.$ 

### References

1. GUEGUENIAT, P., GANDON, R., LUCAS, Y. Determination of radionuclides of Ce, Co,Fe,Ru,Zn and Zr, in seawater by pre-concentration of colloidal manganese dioxide. Reference Methods for Marine Radioactivity Studies II. Technical Reports Series No. 169, IAEA, Vienna, 1975.

#### Discussion

S. FOWLER: How many times have you seen this  $^{235}$ U signal? It would be of interest to repeat this measurement to see if it is transient.

I. GEORGESCU: All the samples were measured only twice at the beginning of July 1984 and in early September 1984.

P. KRITIDIS: If the samples are not sealed in order to prevent the loss of  $^{222}$ Rn, this might explain the presence of more counts in the 186 KeV ( $^{226}$ Ra +  $^{235}$ U) gamma-line than those expected on the basis of  $^{222}$ Rn daughters.

I. GEORGESCU: The sea water samples were stored in plastic barrels, sealed, and the radionuclide extractions were performed the next day using the colloidal MnO<sub>2</sub> found in the water (following filtration). After the MnO<sub>2</sub> precipitate was dried at  $68^{\circ}$ C, it was measured for gamma activity after one month at the laboratory of the Institute for Physics and Nuclear Engineering at Bucharest, Romania. The ash of the suspended matter of these samples as well as the blank did not show a peak at 186 KeV. Seven kms inland from the coastal sampling site, there is situated a thermal source of water at  $35^{\circ}$ C. It is known that uranium is dissolved in certain natural waters at this temperature. We must consider that this work is only a preliminary study. It is now planned

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to examine sea water of the Oran region (Kristel) in a large area offshore as well as along the west and east littoral shores.

C. TRIULZI: How do you explain the presence of  $^{54}$ Mn and  $^{60}$ Co, typical fission products, in this marine area?

I. GEORGESCU: In my opinion the presence of these manmade radionuclides can be explained by some marine currents which approach the coast at Oran. In this region of Algeria, there are no known land-based sources of these radionuclides.