ROPME/IAEA 2015

NORMALISATION OF TRACE ELEMENTS CONCENTRATIONS

IN SEDIMENTS OF THE ROPME SEA AREA

CONCLUSIONS

The absence of substantial amount of fine material (mud) in the sediment samples collected in 2011 and 2014 at the coastal zone of the RSA in the framework of the ROPME Mussel Watch Programme, don't allow the use of this data for studying the relationships between trace elements concentrations and the content of fine material in the sediment, in view of assessing trace element pollution distribution in the region.

To study the relations between trace elements and grain size distributions in the RSA sediments, the data from the 2001 and 2006 ROPME oceanographic cruises was used. Detailed Reports on the results of these cruises have already been submitted to ROPME Secretariat (IAEA, 2002 and IAEA, 2008).

In order to use Al as a geochemical normaliser to assess trace element pollution, a strong correlation has to be established between the concentrations of the conservative element (Al) and the abundance of fine sedimentary material (silt and clay) in the sediment. If such a strong correlation is established between these parameters, Al content could be used as a proxy for the fine aluminosilicate material, which is naturally enriched in trace elements, allowing thus the normalisation of the trace elements to Al in order to compensate for the natural variability of trace elements concentrations due to grain size. The reason to normalize trace elements concentrations to a conservative element (Al) is to distinguish between natural and pollution-related variability of trace elements concentrations, in order to assess pollution impact in sediments.

Using the combined results of the 2001 and 2006 ROPME cruises, no strong correlation was found between Al concentrations and the percentage of fine sedimentary material (silt and clay). The north-eastern parts of the region had substantially higher Al concentrations and lower Ca contents than the south-western area, which probably reflects the diverse mineralogical sedimentary provinces in the ROPME Sea Area. It seems that finer sediments are not only related to aluminosilicates but may also include carbonate-rich sediments, with lower metal concentrations. The lack of strong correlation between Al and mud was also

reported in the IAEA 2008 Report, which concluded that normalising trace element concentrations to Al for assessing pollution trends in the region may lead to errors because the fine sediments (mud) do not exclusively represent the trace element-rich fraction. The results of the present study, which are based in a larger data set, reinforce the previous statement. Therefore, normalisation to a conservative element (Al) in the ROPME Sea Area is not meaningful because Al cannot be used as a proxy of fine material in view of establishing the natural trace element variability in the RSA sediments.

Regardless of the unsuitability of the available data for normalisation purposes, several trace elements presented relatively strong correlations with Al (namely Cu, Cr, Co, Fe, Li, Mn, Ni, V), if a few outliers' values were removed from the data set. These correlations may indicate a common natural origin of these trace elements. Other trace elements, which are usually related with anthropogenic sources (such as Ag, As, Cd, Hg) didn't show any correlation with Al. However, in order to study in more detail trace element accumulation in sediments at the vicinity of land-based and sea-based pollution sources, it would be preferable to concentrate the sediment sampling at a more restricted area, which will have more homogeneous sediment mineralogy, allowing for trace element normalisation. Furthermore, to assess the potential impact of toxic trace elements to marine organisms, extraction schemes could be applied to sediments in order to study the bioavailable fraction of trace elements in sediments.