AZƏRBAYCAN ELMLƏR AKADEMİYASININ XƏBƏRLƏRİ
FİZİKA-RİYAZİYYAT VƏ TEXNİKA ELMLƏRİ SERİYASI, 2000 №2

UDK 574.

DETERMINATION OF RADIOACTIVITY AND HEAVY METALS IN WATER SAMPLES TAKEN FROM KURA RIVER

M.K.KERIMOV, B.A.SULEIMANOV, M.M.AHMEDOV

Radiation Research Department of Azerbaijan Academy of Sciences
370143, Baku, H.Javid, 31 a

The radionuclides and heavy metals concentration in water samples taken from various location of Kura river during several months and during the day were measured in order to development of relational database for pollution of water ecosystem.

The environmental pollution is the most serious problem that should be taken into consideration due to increasing population and growth of technology. However, a number of investigations have been performed to prevent environmental pollution. As known the nuclear physics techniques has increased the probability of chemical and radioactive pollutants in monitoring of environment, in particular, aquatic systems. The heavy metals are introduced through rivers or direct discharge as industrial waster to aquatic environment. In addition, the pollution could have been increased shipping rout and by airborne contaminant. For these reasons the monitoring studies include first priority to solve pollution problems in aquatic environment.

So far, there have been several reports regarding the variation of radionuclides concentration in soils of Azerbaijan [1-3]. However, determination of radionuclides into river waters of Azerbaijan namely, Kura river have not been carried out so far.

The goal of this study is the development of monitoring of an aquatic systems, systematic approach for the design, implementation and operation of relational database for pollution of water ecosystem: Kura, Araks river etc.

This work presents the results of the investigations of chemical pollution in samples of water taken from Kura river.

Radionuclides concentrations were measured in the samples taken from 7 separate places by using gamma spectrometric analysis method. The radon concentration were determined by collector chamber method. Heavy metals were determined by using Atomic Absorption Spectrometer "Varian-215".

According to the results of these measurements the gamma radiation measurements were 4-14mkR/h, having an average 9mkR/h. The radon concentration varied from lower detection limit to 132.5pCi/l with an average of 36.6pCi/l. The radium concentration of the water ranged from level detection limit to 27.4pCi/l having an average of 5.5pCi/l. Total activity of water deposits was found with an average of 126.2pCi/l.

Data of gamma-spectrometrical analysis of water from a number of locations during the January- September of 1999 are presented in the Fig.1 of specific activity levels of ^{226}Ra. The diagram amplitudes show the maximum content of radium at the locations.

Simultaneously with radiation measurements were carried the sampling and lab analyses of Hg, Cd, Pb and Cr^{6+} on a control points.. It is argued that the spatial and temporal distribution of heavy metals in the river corridor depends not only on an understanding of metal solubility and speciation, but also on an understanding of sediment dynamics which control, for example, floodplain alluviation and the accumulation of

metals in the bottom sediments of contaminated rivers, lakes and reservoirs. Existing long- and short-term records are examined to identify the current state of knowledge about the factors which affect heavy metal releases into aquatic environments [4-6]. At the first stage, the subject of research were the definition of the daily and seasonal change of this heavy metals (Fig.2).

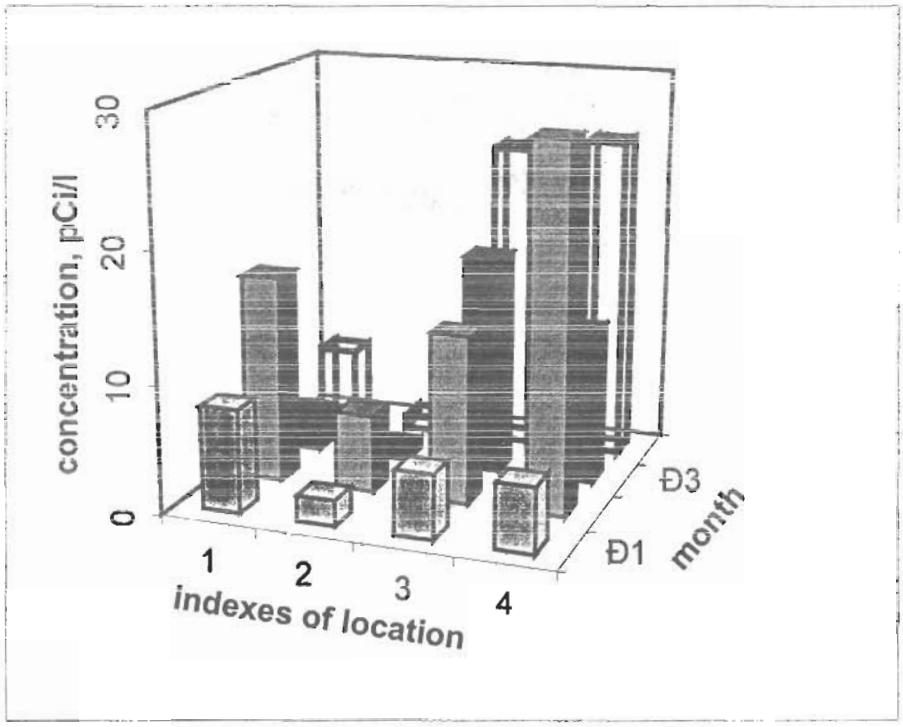

Fig. 1
Diagrams of specific activity level of ^{226}Ra in the water samples from 4 location during 4 month (1999)

The observed of high concentrations of Hg are probability connected with industry pollution. There are can observed value more than official limited concentration for fresh water resource. It is important to remember that metals in elemental form are largely insoluble, resulting in little *bioavailability* . Waterborne metals exist mainly in ionic form (Hg^{2+}, Cd^{2+}) or as ion complexes bound to organic or inorganic particles. These are carried down river or discharged with a freshwater waste stream into the marine environment. The change in salinity and pH which occurs when a freshwater flow mixes with polluted waters is often enough to change the form of the metal, causing it to precipitate out of solution or to adsorb to the organic or particulate matter within the water column. This leads to rapid deposition of metals in river, where accumulation over time can cause trouble even if the initial input seems fairly dilute. Benthic sediment bacteria are capable of adding organic sidechains to some metals, which may dramatically increase uptake and bioaccumulation. Organic forms of metals (e.g. butyltin, methylmercury) are more soluble in lipids than water (*hydrophobic*) while ionic forms are extremely water soluble (*hydrophilic*). The form of the metal is as important a consideration as its concentration where biological effects are concerned.

With limited exceptions, it is shown that few long-term studies of trends in heavy metal transport are available although, for some major rivers, limited data on trends in metal concentration exists.

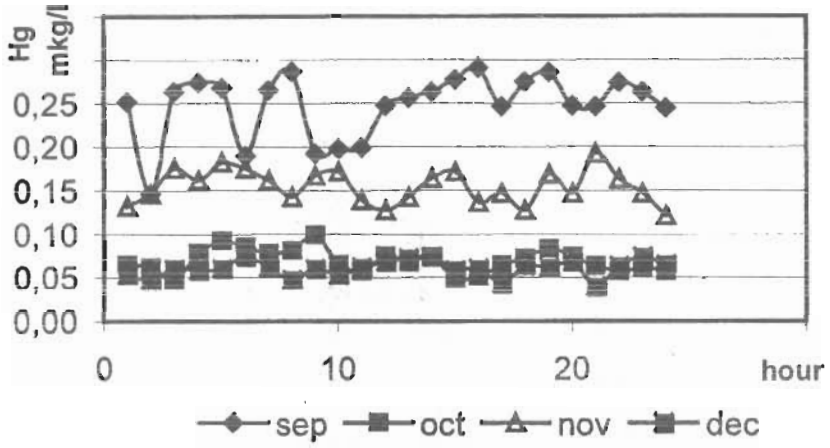

Fig. 2
Variation of Hg concentration during the day

Palaeolimnological reconstruction techniques, based on an analysis of lake and reservoir sediments, are identified as a possible means of supplementing monitored records of heavy metal transport. Although numerous studies have suggested that trends in atmospheric contamination, mining and urbanization may be identified in the bottom sediment record, other research has shown that the radionuclide-based chronology and the heavy metal distribution within the sediment are more likely to be a function of post-depositional remobilization than the history of metal loading to the basin. Despite these limitations, it is shown that the incorporation of reservoir bottom sediment analysis into a heavy metal research programme, based in river corridors of Azerbaijan, provides an opportunity to identify and quantify the relative contribution of point and non-point contributions to the heavy metal budget and to relate trends in metal contamination to specific periods of catchment disturbance.

1. J.A.Aliyev, M.A Abdullayev, *Artifical and natural radionuclides in plant-topsoil of azerbaijan. M.: Agricultural Science,* (1996) 159.

2. M.A.Abdullayev, J.A. Aliyev, *Migration of artifical and natural radionuclides in soil-plant system. B.:Elm,* (1998) 240.

3. J.A.Aliyev, M.A. Abdullayev, *Strontium-90 and Caezium-137 in plant-topsoil of Azerbaijan. M.: Nauka,* (1983) 101.

4. I.D.L.Foster, S.M.Charlesworth, *Hydrological Processes*, 10 (1996) 227.

5. D. R.DeWalle, P.J.Edwards, B.R.Swistock, R.Aravena, R.J. Drimmie, *Hydrological Processes*, 11 (1997) 1895

6. K.A.Hudson-Edwards, M.G.Macklin, M.P.Taylor, *Hydrological Processes*, V.13 (1999) 1087.

KÜR ÇAYININ SU NÜMUNƏLƏRİNDƏ RADİOAKTİVLİK VƏ AĞIR METALLARIN TƏYİNİ

M.K.KƏRİMOV, B.A.SÜLEYMANOV, M.M.ƏHMƏDOV

Su ekosisteminin informasiya məlumat bazasının yaradılması üçün Kür çayında bir neçə ay ərzində və bir gün ərzində radionuklidlərin və ağır metalların konsentrasiyası ölçülmüşdür.

ОПРЕДЕЛЕНИЕ РАДИОАКТИВНОСТИ И ТЯЖЕЛЫХ МЕТАЛЛОВ В ПРОБАХ ВОДЫ ВЗЯТЫХ ИЗ РЕКИ КУРА

М.К.КЕРИМОВ, Б.А.СУЛЕЙМАНОВ, М.М.АХМЕДОВ

Для создания базы данных водной экосистемы реки Куры измерены концентрации радионуклидов и тяжелых металлов в течении нескольких месяцев и в течении суток в различных точках пробоотбора.