

Investigation of Anbarestan (Sabzevar) Region from the viewpoint of Medical geology

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Abstract

Anbarestan region, at 38 Km from Sabzevar city on old Sabzevar- Neyshabur route, is located on Mesozoic ophiolite zone at margin of mini continent on east of Central Iran and forms part of the Sabzevar ophiolite belt. Rock environment consists of ophiolite (Basic and ultra Basic) peridotites, Serpentinite, Donite, Pyroksinite rocks, Globotruncana lime of lower lava in down part of Tuff and locally radiolarite. These have been observed in field surveys of some units like serpentinite, brick, tuff and diabase dyke. Alterations identified in field scale include serpentinite, argillite, silicification alterations. 23 soil samples for geochemistry analysis and determining their main, minor and rare components with ICP-OES apparatus were sent to organization of geology and mining exploration. Geochemistry studies showed that based on mineral indices of chrome and manganese in whole region's soil, it is contaminated with chrome, magnesium and nickel. In some stations there also exist barium, cobalt and arsenic contaminations. Considering the concentrations of chromium, manganese, nickel and cobalt elements are high and that of phosphate, nitrogen and potassium are very low in ultramafic regions. We tried to specify toxic elements and minerals in soil and water, because entrance of these elements to water resources and plants which grow in soil of this region will be transmitted to human and livestock food cycle and would cause long-term health and sanitation problems for residences of these areas . Generally, the purpose of this study is to investigate the rate and distribution of heavy metals and poisonous elements and to determine the amount of emission in the subject area where its major part is ultramafic.

Keywords: *Ophiolite; Heavy metals; Poisonous elements ; Soil; Human;*

Introduction

Pollution caused by elements and minerals is considered to be one of the main environmental problems that endangers the public health. Anxious elements and minerals are of considerable importance because can be harmful for health even in negligible amounts and hurt the main parts of the human body like heart, kidney, liver, lungs, brain and etc. it may also result in pernicious diseases and cancer cells in the body.

Geographic Situation and Geology of the Zone

The zone under study is located 38 km from north-east of Sabzevar parish and between 57°46'00" and 57°53'00" and latitude of 36°20'00" and 36°24'00". A part of northern ophiolite of Sabzevar which depends on marginal Mesozoic ophiolite constitutes the plateau of the central Iran. The most important way to access the zone is the asphalt way between Sabzevar-Ghoochan or the old way of Sabzevar-Neishaboor.

The most important geologic units are (Figure- 1)

Mesozoic

Unit Sr: consists of the parts with the color of light green to dark green.

Unit Kumgb: includes micro gabbros and diabase.

Unit Kuspk: comprises tracked green andesite to grey one, traced (split – crotophyre) with inner layers of echo, splitted shear horizons and split.

Unit Kuvl: consists of bolster lava, halo caustic, halo caustic pillow, halo caustic shears and echo with inner layers of pelagic limes.

Unit Klpa: includes cream limes to pink limes with fossils.

Cenozoic:

Unit da: are rocks in cream, yellowish cream, and are considered to be a part of youngest volcanic activities.

Discussion

Bed rock in each zone of releasing the heavy elements in the environment is so important. If a soil in a zone is polluted, it influences the water, atmosphere, plant, animals and man and causes long term sanitary and medicine problems for inhabitant. The considered zone is located in the ophiolite tape of Sabzevar which contains magnetic minerals. These zones contain large amounts of Cr, Mn, Ni and Co but the value of P, Na and K is not considerable. Also, the amounts of Si and Mg decreases with oxidation.

Oxidation of ophiolite rocks (especially those which are rich in serpentines), results in the formation of soils and minerals with high concentration of Cr as well as toxic and heavy elements like Ni and Mn. Chrome is an inorganic and carcinogen pollutant. The chrome that originates from serpentines soils, initially is with the 3-capacity and is chemically static. It converts to the form of 6-capacity in the presence of manganese oxides. In order to investigate the concentration of heavy elements in the soils of ophiolite zone, 23 soil samples were sent to ICP-OES laboratory of Mine Explorations and Geologic Organization.

Since field of medicine in geology considers the effects of natural geologic factors on human healthy, the influences of toxic and heavy elements in the zone were regarded on the people to see whether there is relation between geologic factors and cancers like lung cancer, respiratory problems and etc. (information are obtained from Cancer Institute of Iran and hospitals).

Analysis results were compared to standards in the table-1 to investigate the pollution in the zone and determined the polluted zones (where concentration of heavy elements is high or manifold of worldwide standards). (Figure- 2)

Results

After survey of soils analysis results and comparing their allowable values in the zone with standard values, it was concluded that all soils in the zone face to pollution due to presence of Mn, Ni and Cr and also there is pollution of Ba, Co and As in several stations.

Because soils originating from serpentines contain the highest values of heavy elements, ophiolite formations and specially serpentines in the zone are considered as environmental pollutant.

Documented instances for cancer diseases are observed in the zone due to the pollution of soils with serpentines and existence of dominant winds (eastern winds) that move from the path of serpentines (especially station 8, northeast of the village) to the habitat. The main cause of the widespread cancers in the zone is presence of chrysolite minerals that has led to

respiratory problems, lung cancer and mezotelioma , and in the case of swallowing and entering to the body results in stomach and bowel cancers.

Station 8 is one of the most polluted stations in which large amounts of serpentines (chrysolite, deadlock) exist. Also there is a spring emerging from serpentines in station 8. Results have shown that one the lowest quality of soil and water exists in this serpentine zone. Soil pollution due to elements like Cr, Ni, Mn, Co, As may cause lung cancer, pneumonia, prostate cancer, damage to kidneys and liver and etc.

In fact, enrichment of elements like Cr, Mn, Ni, Co ,... in the soils of the zone is indicative of geophysical nature of the elements which is proved by ophiote potential of the zone.

Mortality has never being stopped, for example in recent months two people were died due to lung cancer and mezotelioma. This issue refers to the indispensable role of environment and environmental factors. For example, wind is a dominating factor and index in the zone which plays a dangerous role in spreading the serpentines inside and on the margins of village.

Tables

Table 1: Allowable value for elements in the soil in mg/kg (ppm).

Parameter Metals/Metalloids	Suitable value for human haalth and environment
Antimony, Sb	20
Arsenic, As	20
Barium, Ba	400
Beryllium, Be	-
Cadmium, Cd	3
Chromium (Total), Cr	50
Cobalt, Co	50
Copper, Cu	60
Lead, Pb	300
Manganese, Mn	500
Methyl mercury	-
Mercury, Hg	1
Molybdenum, Mo	40
Nickel, Ni	60
Tin, Sn	50
Zink,Zn	200

Figures:



Figure 1: The existed units in the zone under study from map 1:100000 belong to Sabzevar.

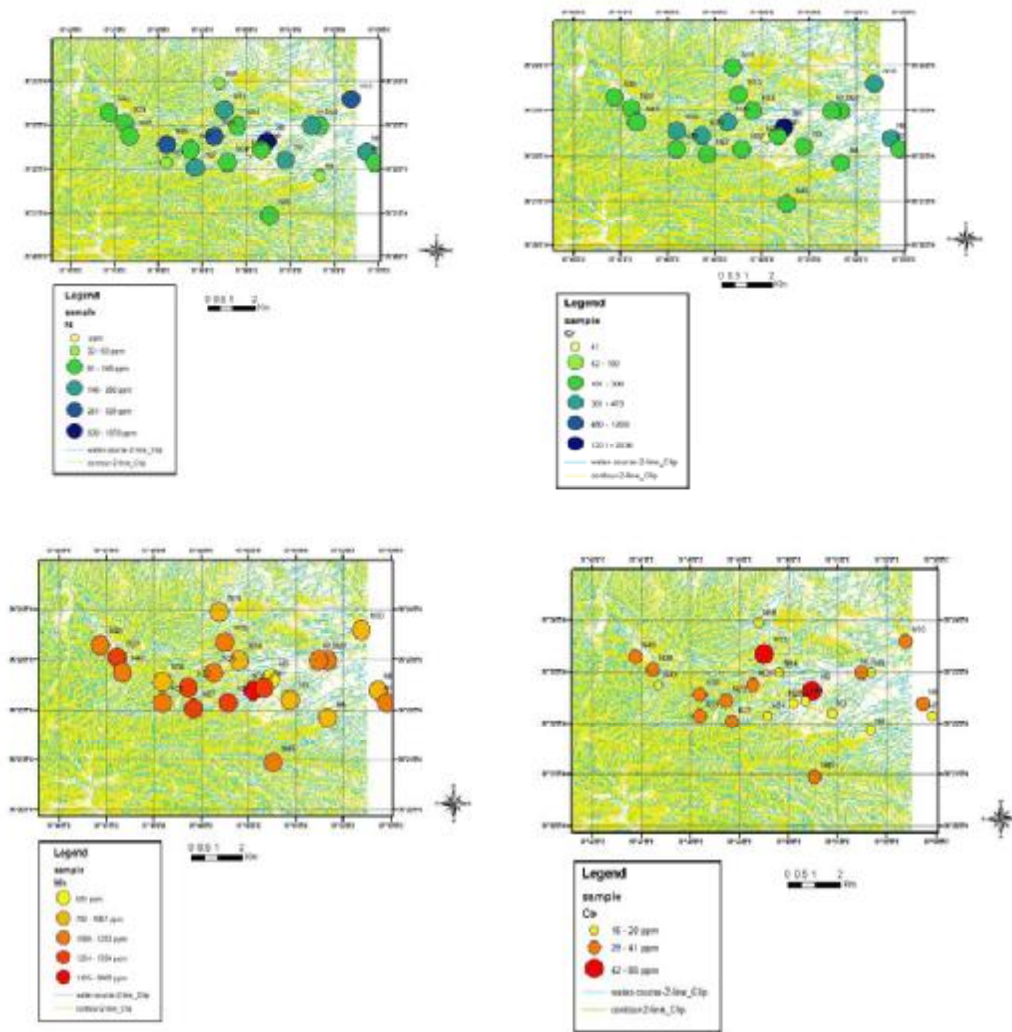


Figure 2: Soil pollution of elements like Cr, Mn, i, Co

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