Isotopes of oxygen and hydrogen in natural waters from NE of Asia

N.A.KHARITONOVA, G.A.CHELNOKOV AND I.V.BRAGIN

690022, Russia, Primorsky region, Vladivostok, Prospect 100-letya 159, Far East Geological Institute Russian Academy of Science (tchenat@mail.ru)

Isotopes of oxygen and hydrogen are ideal natural tracers for describing phenomena of the water cycle so they are constituents of the water molecule. The $\delta^{18}O$ and $\delta^{2}H$ in waters violently rely on meteoric processes, and so infiltration into specific sediments leads to a characteristic isotopic signature which tags as the origin of groundwater as surface water–groundwater interactions. ^{3}H is the most attractive radioisotope for studying the principles of water circulation in nature so it is a perfect water tracer. The first particular data about the content of stable and radiogenic isotope of oxygen and hydrogen in natural water of region were presented in some studies (Chudaeva *et al*., 1999; Kharitonova *et al*., 2012), however simultaneous measurements $\delta^{2}H$, ^{3}H and $\delta^{18}O$ were never performed for this area.

The aims of this study are to define local meteoric waters line of Russian Far East, to identify the forming conditions of various groundwater types of area using isotopic parameters and estimate residence time of groundwater basing on tritium values.

More than 120 samples of precipitation, seawater, surface water and groundwater were collected across territory of Russian Far East during last 7 years and then analyzed for isotopic composition. Geochemical characteristics of these samples were published earlier (Chelnokov & Kharitonova, 2008).

Our data let us conclude:

1. All studied groundwater is meteoric water and shift from GMWL for some spas is the result of water-rock-gas interaction. Local meteoric water line for the southern part of Russian Far East can be determined by the equilibrium: $\delta D=7.6385\times\delta^{18}O+3.96‰$. Continental and lateral zonal distribution of stable isotopes on this territory is being observed.
2. There is the universal increasing in ^{3}H values in surface water from ocean to inland. Content of tritium is 20 TU in rivers of Amurskiy region, ~13 TU in rivers of Primorsky region and to ~5.5 TU in ones of Kuril Islands. Most of studied groundwater, excluding brackish waters of Rechitza outlet, have short residence time (less 50 years).

Low thermal Northern Dvina iodine water field: History of prospection and perspectives of development

I.L. KHARKHORDIN[1]*, F.G. ATROSCHENKO[1] AND V.V. NAZIMA[1]

[1]Geostroyproekt Ltd., 22-th Line, 3, St. Petersburg, 199106, Russia (*correspondence: kharkhordin@rambler.ru)

[2]Geostroyproekt Ltd., 22-th Line, 3, St. Petersburg, 199106, Russia (fatroschenko@mail.ru)

[3]Geostroyproekt Ltd., 22-th Line, 3, St. Petersburg, 199106, Russia (v.v.nazima@gmail.com)

Iodine water field is located at Northern Dvina River basin, north-west of European part of Russia [1]. Uncommon features of the field are as follows.

1) Depth to iodine water containing aquifer is only 100-120 meters.

2) Iodine water field was formed at low temperature conditions (below 10 ºC).

3) The source of iodine is organic fosils associated with marine clays (Q_{IIImk}) [2]. This clays was consolidated by ice shield, iodine water was espressed into upper part of padun aquifer (V_{pd}).

At present study analysis of hydrodynamic and hydrochemical conditions of iodine water field was performed, the numerical models of groundwater flow and iodine transport were created using MODFLOW-96 [3] and MT3DMS [4] computer codes. The main issues are:

- the present day recharge through mikulinski clays is impotant for iodine water field existence due quarternary time, it partly compensates iodine water discharge into Nothern Dvina River;
- resources of iodine water was estimated;
- limiting factor of iodine water field exploitation is fresh water upconing from low part of padun aquifer;
- strategy for iodine water field exploitation was elaborated.

[1] Malov (1980) Vodnye Resursy, No. 2, pp. 66-76 (In Russia). [2] Gurevich (1963) Izv. VUZov, Geologiya i razvedka, No. 7, pp. 123-125 (In Russia). [3] Harbauf & McDonald (1996) USGS, Open-File Report 96-495. [4] Zheng & Wang (1998) Contract Report SERDP-99, 239 p.

DOI:10.1180/minmag.2013.077.5.11