Open system U-Th ages of Red Sea corals indicate the activity of freshwater aquifers at the last interglacial

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The Red Sea-Gulf of Aqaba is part of the 'Levantine corridor' where *H. sapiens* possibly migrated 'out of Africa' between 130, 000-100, 000 years BP. This 'corridor' however, lies currently in the heart of the most hyperarid desert belt on Earth, which imposes a formidable barrier to the supposed hominids migration. Yet, many fossil coral reefs scattered along the Red Sea show clear evidence for extensive interaction with fresh groundwater that resulted in recrystallization of the corals' primary aragonite skeleton to calcite. Thus, dating the age of recrystallization constrains the period when the Red Sea coastal aquifers were recharged with freshwater. However, traditional U-Th dating of corals requires close isotopic system. Therefore, we developed an open-system U-Th dating method and estimated the age of recrystallization of the tectonically uplifted fossil reef terraces along the shores of Aqaba. We found that ~140, 000 years ago, these reefs interacted with fresh groundwater and possibly also at ~118, 000 y. Apparently, the Red Sea region was wetter during the last interglacial than its current hyperarid conditions, thus facilitating the 'Levantine corridor' as the route of *H. sapience* 'out of Africa'.

Concentration of Ge in thermophilic cyano-bacterial community

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It is known that Ge is a widely dispersed trace element. The crustal abundance of Ge ranges from 1 to 1.7 ppm. Higher concentrations are found in silicates, polymetallic sulfide ores, coal and petroleum [1].

This study consideres Ge accumulation in thermophilic cyano-bacterial communities. Numerous hot springs are localized in Barguzin Basin (Baikal Rift Zone). The presence of microbial communities is found in all the outlets of thermal waters. We studied 7 hot springs, which are alkaline hydrotherms with SO_4-HCO_3-Na and SO_4-Na water composition. Hot springs waters have a similar composition and different content of HS^- and Rn. The structure of dominant microorganisms in investigated communities is similar. It presented of filamentous forms: bacterium *Chloroflexus aurantiacus* and cyanobacterial genera *Phormidium*, *Leptolyngbya*, *Mastigocladus* and *Oscillatoria*.

Ge is concentrated in the cyano-bacterial communities, which grows in sulphide-less, Rn-bearing hot springs. Ge content in the microbial community of Garga and Uro hot springs is in average 270 and 350 ppm in dry weight (up to 1000 ppm), Rn content in waters is 110 and 60 Bk/L respectively. It is characteristic that the Ge is accumulating in parallel with radionuclides: ^{226}Ra, ^{228}Ra, ^{210}Pb in Garga cyano-bacterial mat (4000, 4000, 3000 Bk/kg in dry weight) and ^{210}Pb (700 Bk/kg) in the Uro microbial community. Previously was shown that organic compound of Ge exerted an antimutagenic effect on γ-ray-induced mutations in *Escherichia coli* [2]. Biological role of Ge currently not fully known, we proposed that Ge-accumulation in the thermophilic microbial communities in Barguzin Basin may be due to antimutagenic mechanism protected from high concentration of radionuclides.

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