Speciation and migration pathways of ^{137}Cs and plutonium isotopes on geochemical system river – sea

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Arctic Basin plays very important role in preservation of ecological equilibrium on earth. This area is a region of formation of global atmospheric processes and it is the natural filter for the contaminated streams. The sources of contamination of Arctic Basin are different and world spread. They could be local like direct dumps including industrial pollution and operation of vehicles and global ones like Northern hemisphere fallout or trans-boundary transfer. One of the most important sources of radioactive pollution of Russian Arctic area is the Great Siberian Rivers runoff. PO Mayak is very well-known reprocessing plant, which can be very dangerous contaminator due to connection with Kara Sea throw rivers Techa-Iset-Tobol-Ob water system.

During our investigations we have tried to embrace the whole system 'river – estuary –sea' from the main potential source of radioactive pollution to adjacent part of the sea. The main part of investigations has been connected with the analysis of speciation and migration forms of technogenic radionuclides in water fraction. The carried out researches have shown that the considerable part of cesium in water system have transferred in suspended form while strontium was in dissolved fraction. Since plutonium isotopes have a big affinity to organic matter about 60 – 80 % of plutonium from river samples was associated with colloidal fraction. For the sea water this percentage was lower because of coagulation of colloids in high salted media.

Paleoproxy farming in Florida caves: Calibrating present-day calcite to past speleothems

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Cave formations, or speleothems, are important globally for their high-resolution paleoclimate records [1, 2, 3, 4]. Here we report an extension of our previous microclimate timeseries inside Hollow Ridge Cave (HRC), Marianna, FL, where we continuously monitor cave-air CO_2, Radon-222, temp, humidity, barometric pressure, drip rates, and airflow velocity and direction. Cave air pCO_2 must be an important regulator of the rate and timing of calcite dripstone formation [4, 5]. Growing modern calcite for a year in HRC has shown that high cave-air (summer) CO_2 inhibits calcite growth in the poorly ventilated interior of the cave, suggesting that calcite deposition in HRC is seasonal and paleoclimate records likely track winter climates. Multi-year air and dripwater (element, isotope, DIC) data have allowed us to overconstrain the aqueous carbonate system, and to predict calcite deposition as a function of ventilation. We predict that the $\delta^{13}C$ of calcite precipitated in equilibrium with cave-air must track cave-air $\delta^{13}C$, which we have shown to be a function of mixing and ventilation (Fig. 1). Isotopic analyses of our farmed calcite will serve to test the prediction. Our work will also elucidate the effect of northern Gulf of Mexico monsoonal intensity on the isotopic composition of modern calcite, and test the local distinction between 'temperature' and 'amount' effects. This work will provide a multivariate calibration of Holocene-aged speleo-thems in HRC, and will establish the causes of isotopic shifts in north Florida speleothems and their paleoclimate interpretations for the northern Gulf of Mexico.

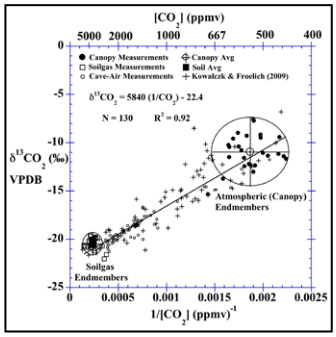

Figure 1: Keeling plot for HRC

[1] Wang, Y. *et al*. (2008) *Nature* **451**, 1090–1093. [2] Cruz, F. *et al*. (2005) *Nature* **434**, 63–66. [3] Spötl & Mangini (2002) *EPSL* **203**, 507–518. [4] Baldini, J. *et al*. (2008) *EPSL* **272**, 118–129. [5] Banner, J. *et al*. (2007) *JSR* **77**, 615–622.