

Víztestek keveredésének kimutatása $^{87}\text{Sr}/^{86}\text{Sr}$ és $^{234}\text{U}/^{238}\text{U}$ izotóparányok segítségével

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Izotópklimatológiai és Környezetkutató Központ (IKER)
MTA Atommagkutató Intézet

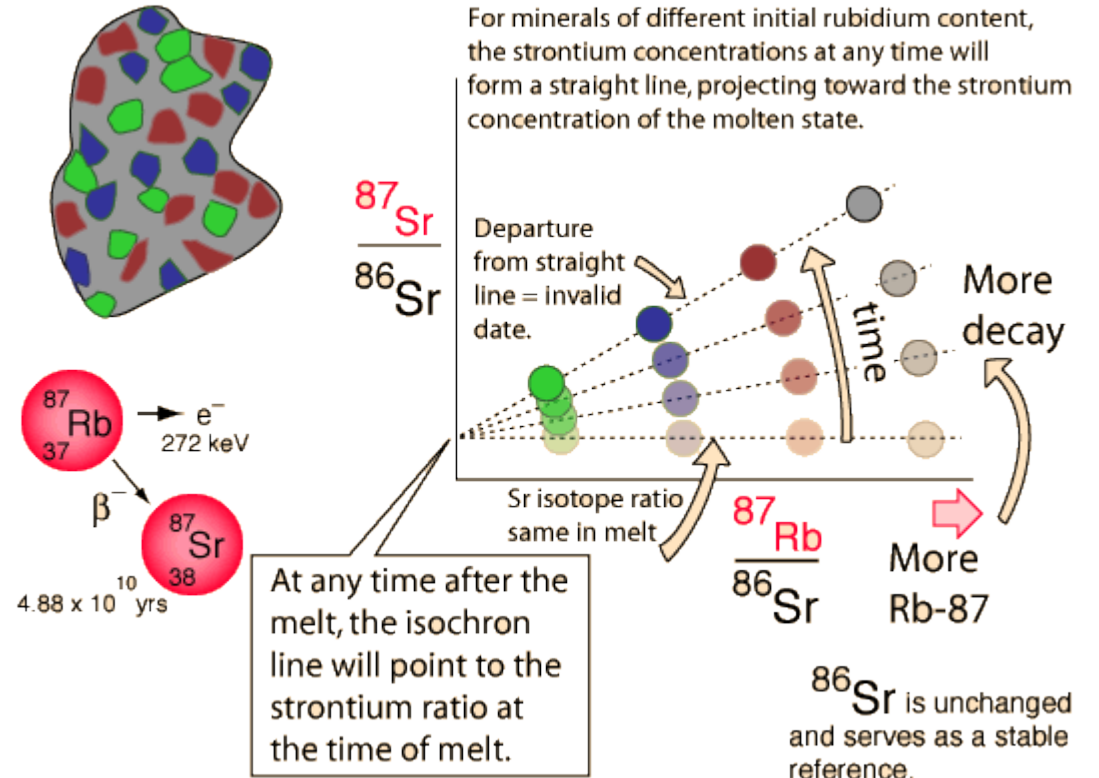


Izotóp
Klimatológiai
és Környezetkutató
Központ

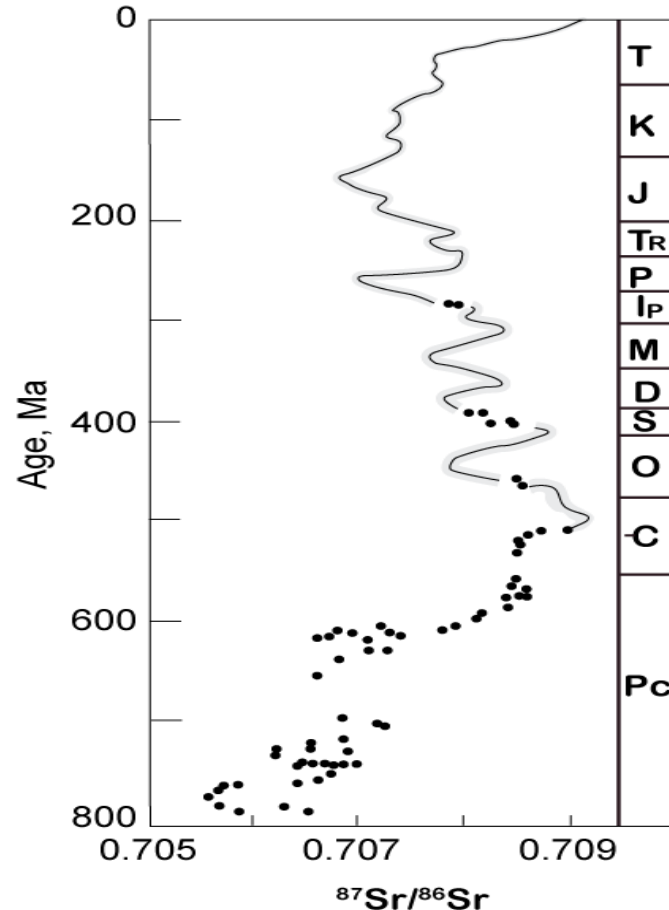
Rb-Sr rendszer

										<table border="1"> <tr> <td>Sm</td> <td>Radioactive (Parent)</td> </tr> <tr> <td>Os</td> <td>Radiogenic (Daughter)</td> </tr> <tr> <td>Rn</td> <td>Radiogenic and Radioactive</td> </tr> </table>										Sm	Radioactive (Parent)	Os	Radiogenic (Daughter)	Rn	Radiogenic and Radioactive										
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Os	Radiogenic (Daughter)																																		
Rn	Radiogenic and Radioactive																																		
H																	He																		
Li	Be															B	C	N	O	F	Ne														
Na	Mg															Al	Si	P	S	Cl	Ar														
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr																		
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe																		
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn																		
Fr	Ra	Ac																																	
		La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu																			
		Ac	Th	Pa	U																														

- Rb: alkali; soluble, mobile, highly incompatible, substitutes for K
- Sr: alkaline Earth; soluble, somewhat mobile, incompatible, substitutes for Ca
- Both concentrated in the Earth's crust; particularly Rb. High Rb/Sr in granitic rocks and their derivatives.



Sr kronosztatigráfia



- Sr present in relatively high concentration is seawater.
- Also concentrated in carbonates (abundant marine bio-sediment).
- Long residence time; therefore
 - Sr isotopic composition of open ocean water is uniform (in space).
- Sr isotope ratio varies in time, mainly due to changes in the relative fluxes from the continents (erosion) and mantle (ridge-crest hydrothermal activity).
- Particularly in the Tertiary, Sr isotope ratio of marine sediment can be used to date the horizon..

Az urán és bomlási sora

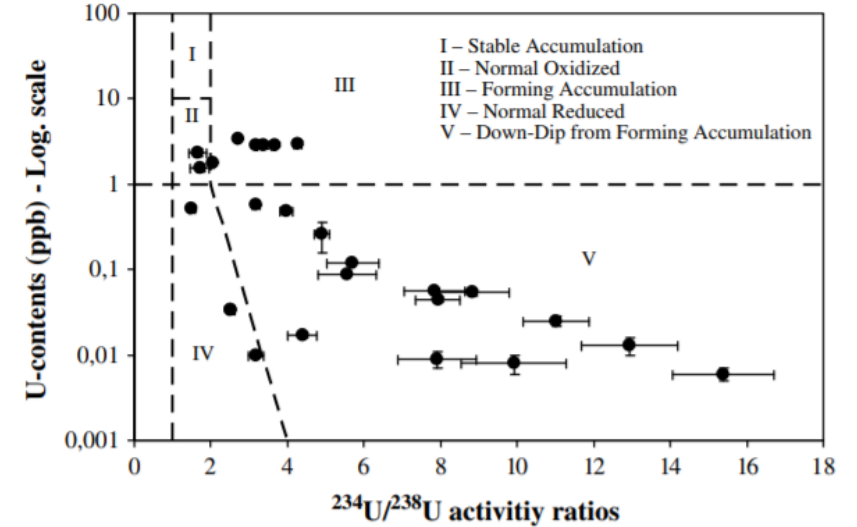
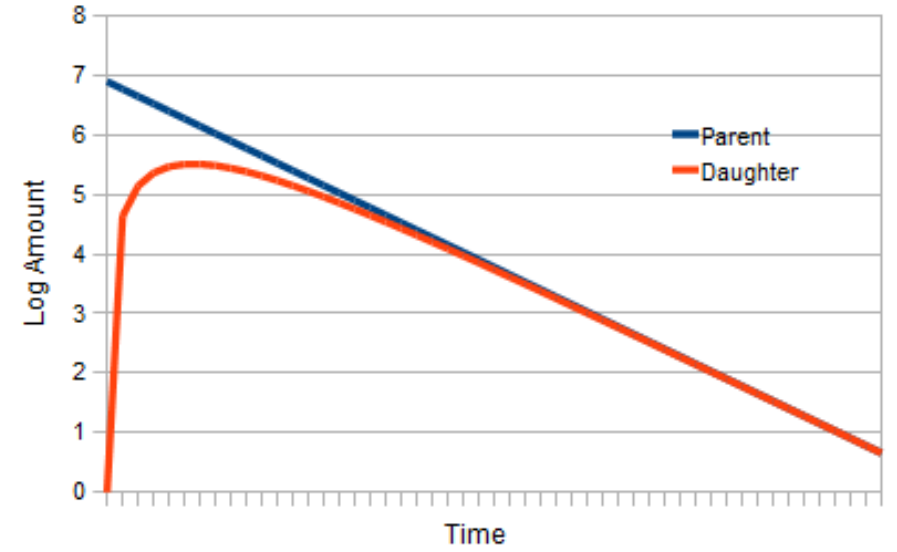
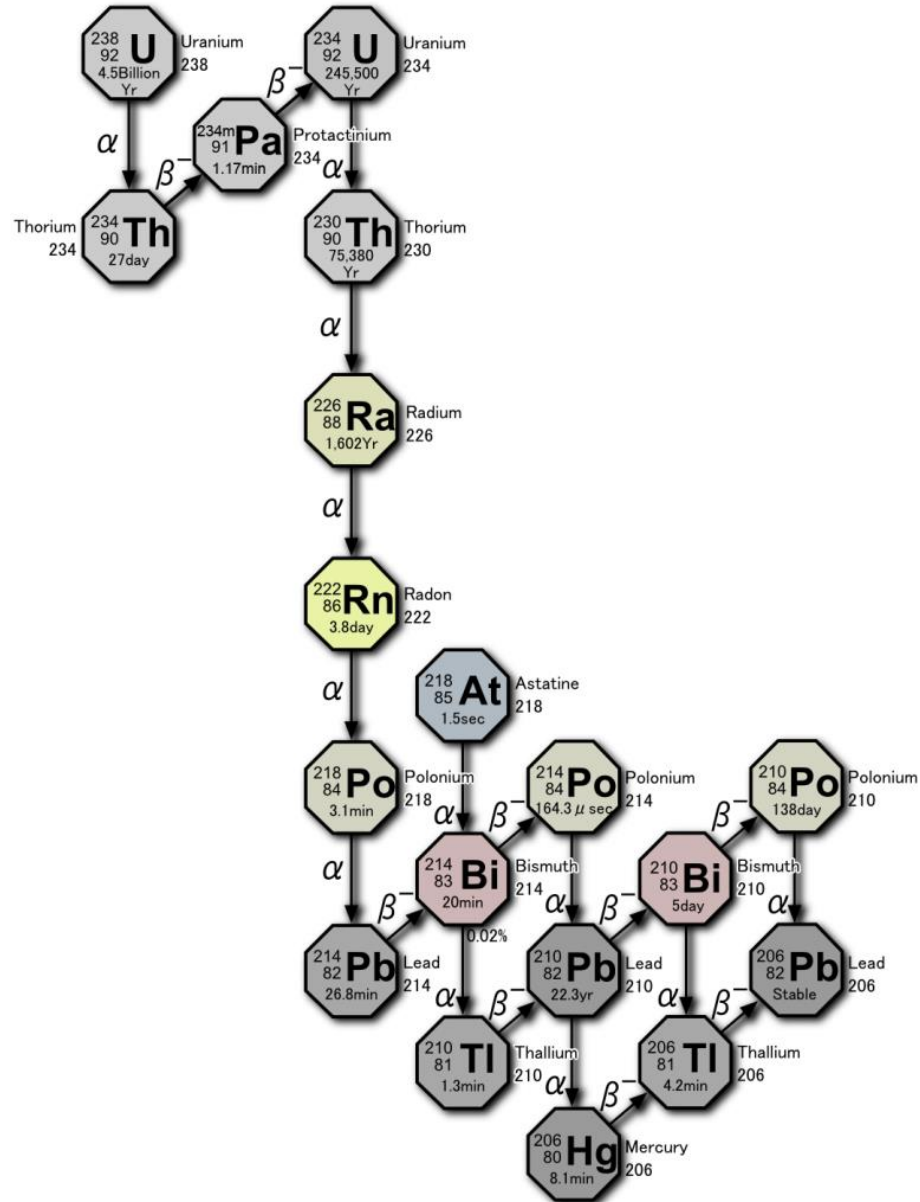


Fig. 4. The data for dissolved uranium in groundwater from Algerian Tunisian basin of the CI aquifer plotted on the U concentration vs $^{234}\text{U}/^{238}\text{U}$ activity ratio diagram proposed by Cowart and Osmond, (1980).

Sr-U izotóparány paramétertér

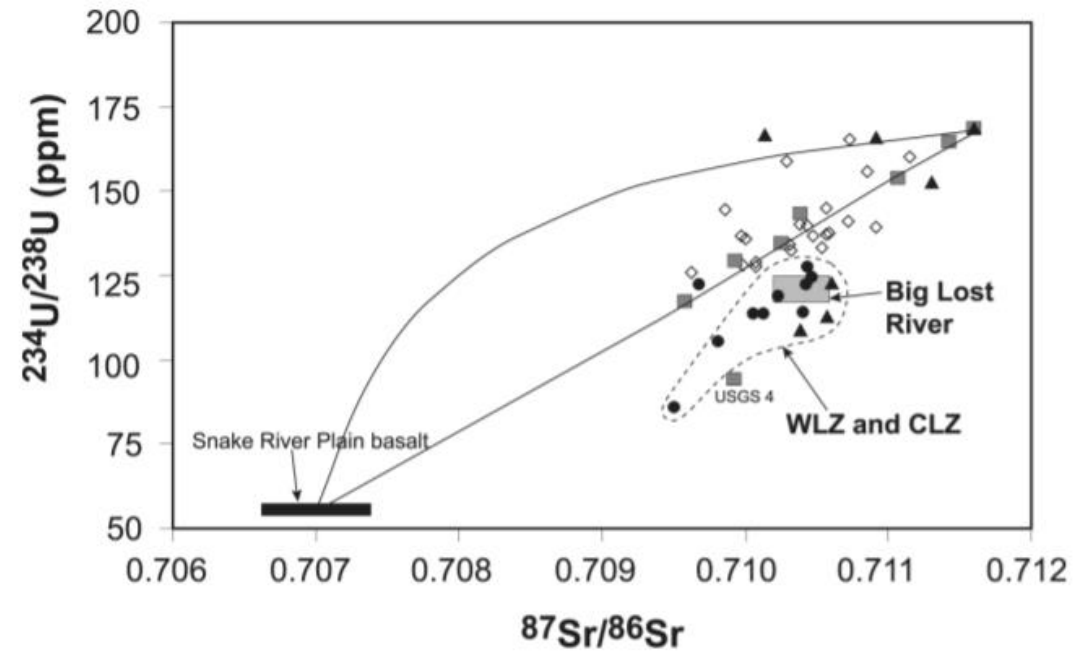
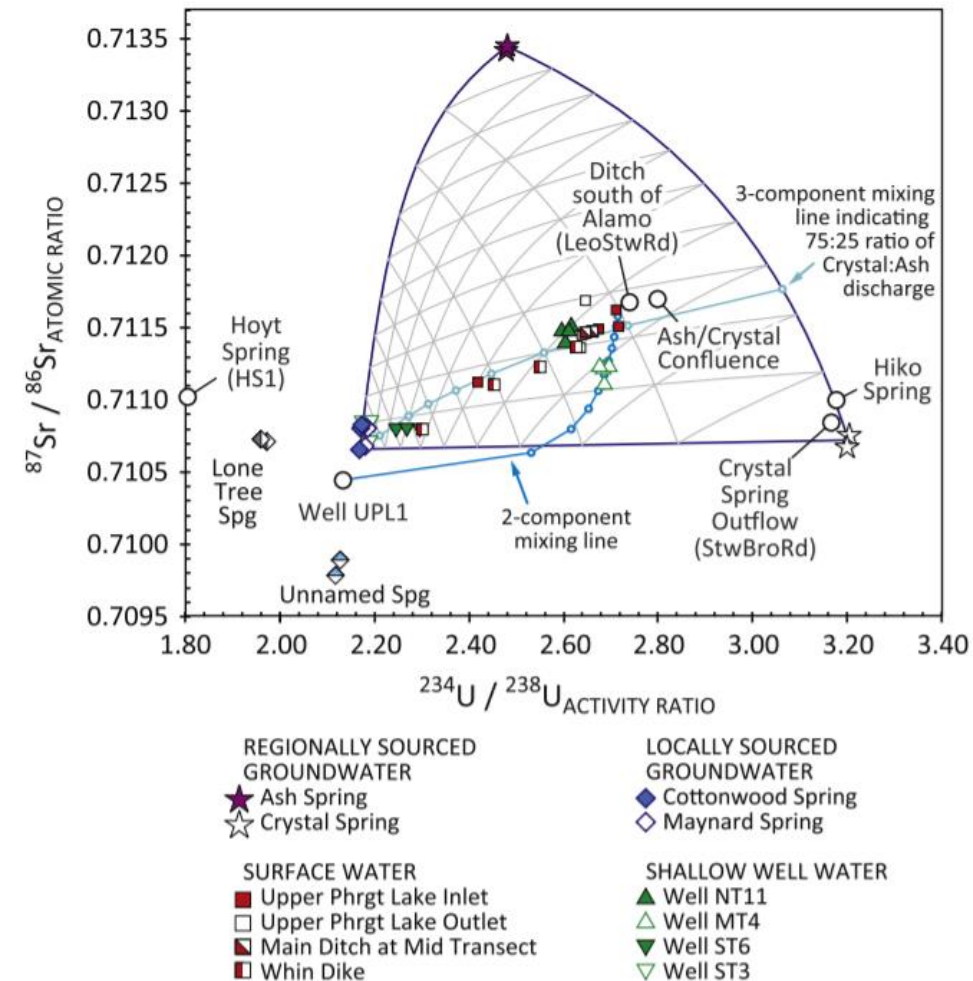


Figure 3. Plot of $^{234}\text{U}/^{238}\text{U}$ versus $^{87}\text{Sr}/^{86}\text{Sr}$. The range of $^{87}\text{Sr}/^{86}\text{Sr}$ for typical Snake River Plain basalt is shown; the $^{234}\text{U}/^{238}\text{U}$ ratio is assumed to be near secular equilibrium. Curves show possible reaction paths discussed in text. Two-sigma error bars are smaller than symbols. See Figure 2 for explanation of symbols. $^{87}\text{Sr}/^{86}\text{Sr}$ data are from Johnson et al. (2000) and T. Bullen (1998, written commun.). Shaded rectangle shows the range of values for Big Lost River samples. CLZ and WLZ are central and western low-isotope-ratio zones.

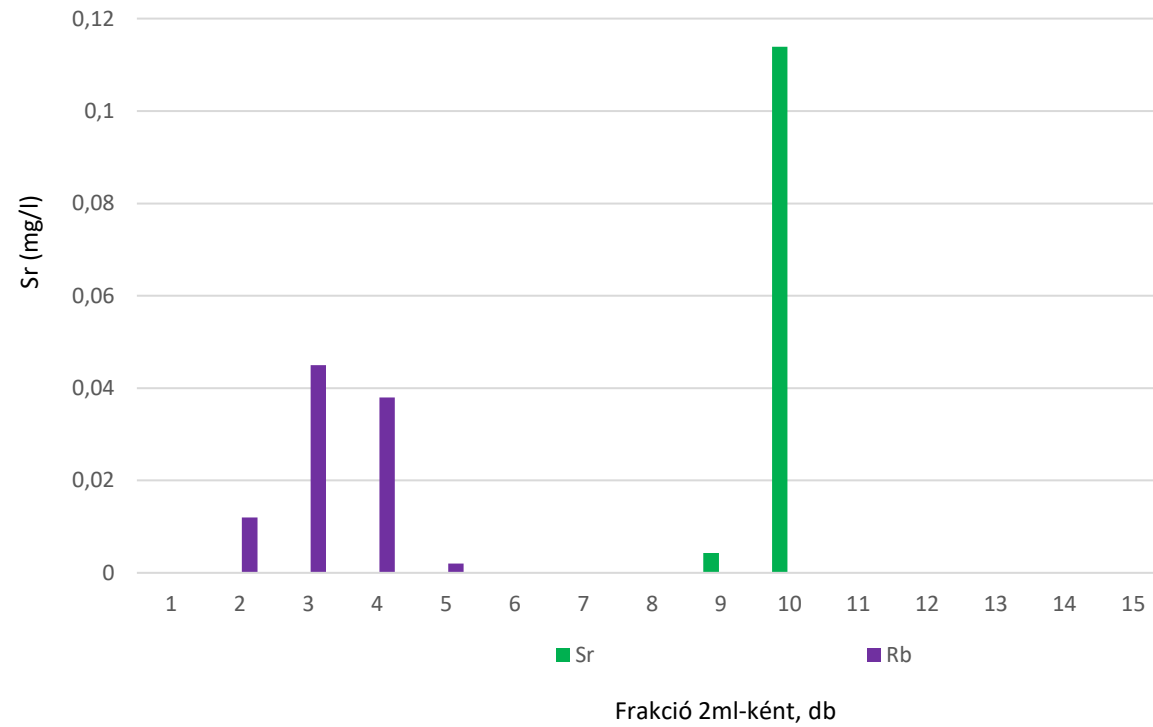
Preparálás 1. (Platzek et al., 2016)

- UTEVA gyanta, előre töltött
- 100 ppb U oldat (ICP koncentráció std), 15 mL
- Gyanta előkezelése: 4 M HNO₃, 5 BV (BV=bed volume; 4 mL), majd öblítés UTV-zel, közvetlenül a használat előtt
- Kondicionálás: 4 M HNO₃, 3 BV
- Minta felvitele
- Mátrix elúció: 5 BV 4 M HNO₃
- Minta gyűjtése: 5 mL 0,02 M HNO₃/0,0005 M HF
- A teszt során 1, ill. 2 mL-es frakciókat szedtünk. Ezeket kétszer bepároltuk tömény HNO₃-ban (ultrapure), majd 3 %-os salétromsavban vettük fel.

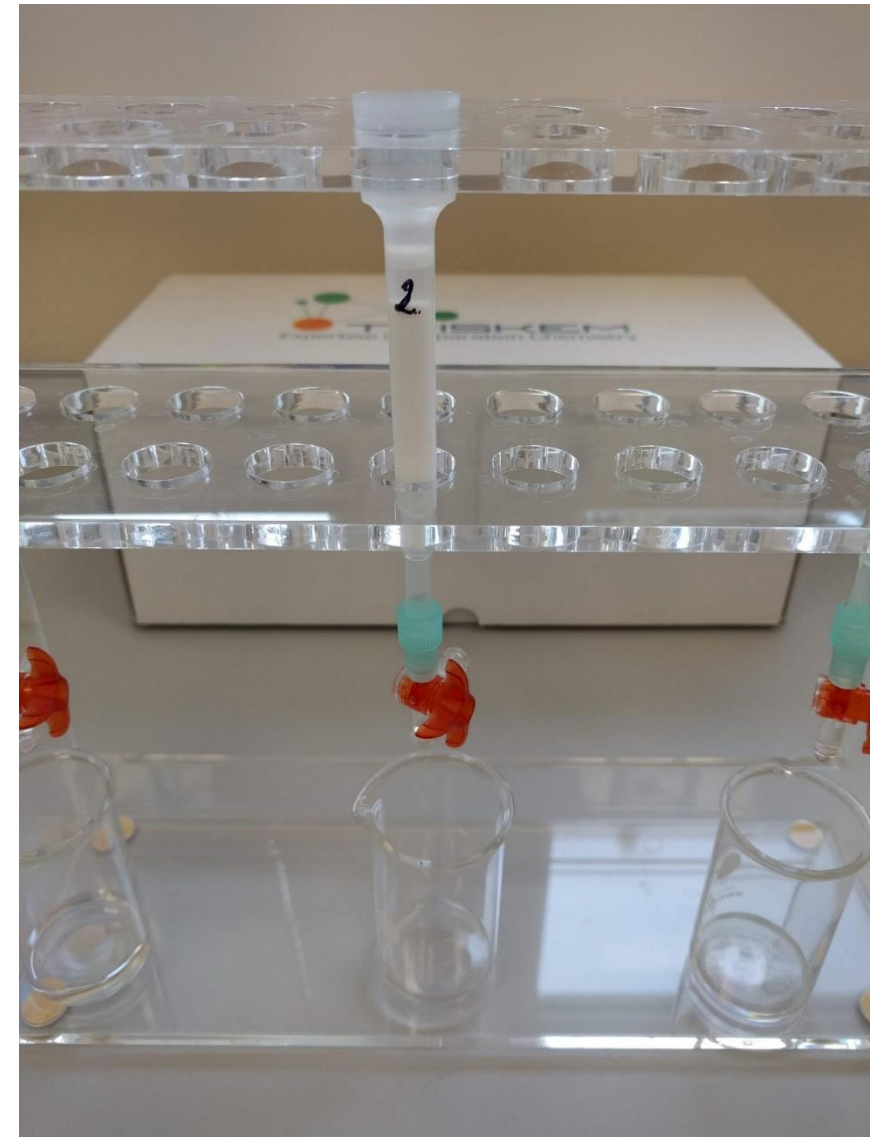
Preparálás 2. (Stoliker et al., 2013)

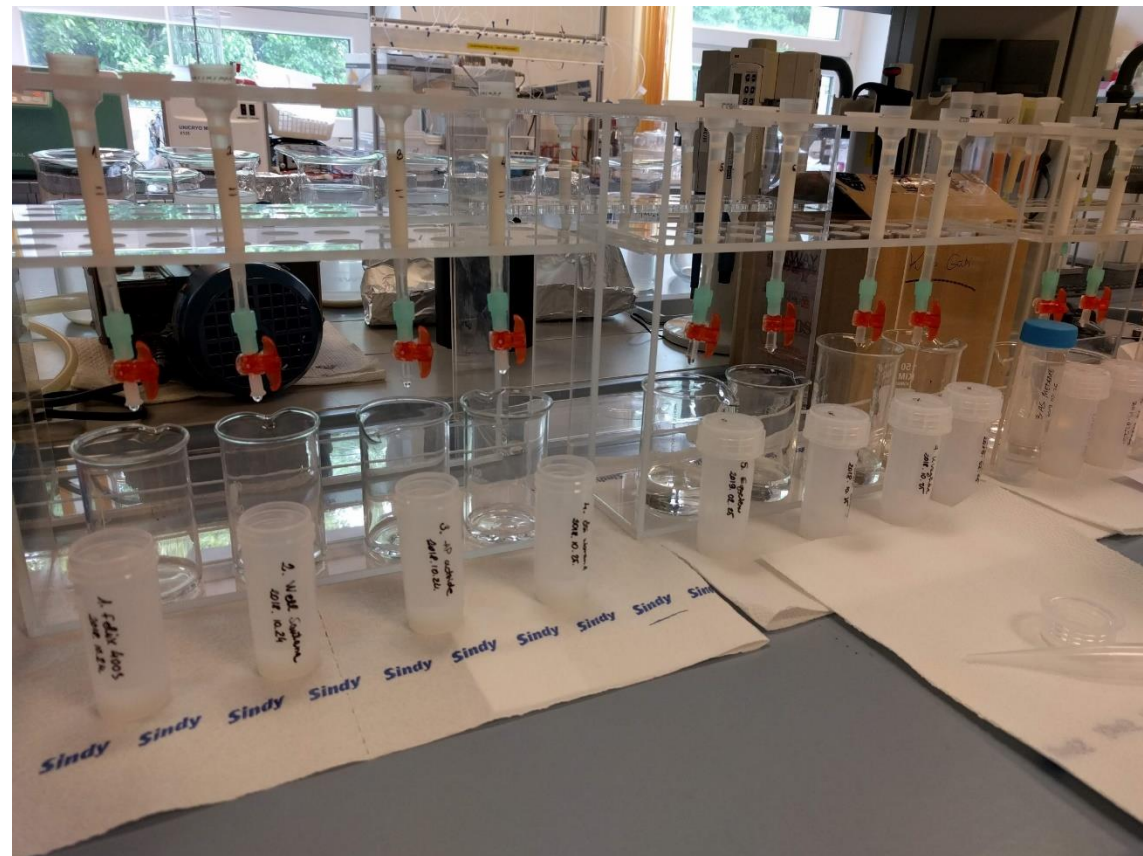
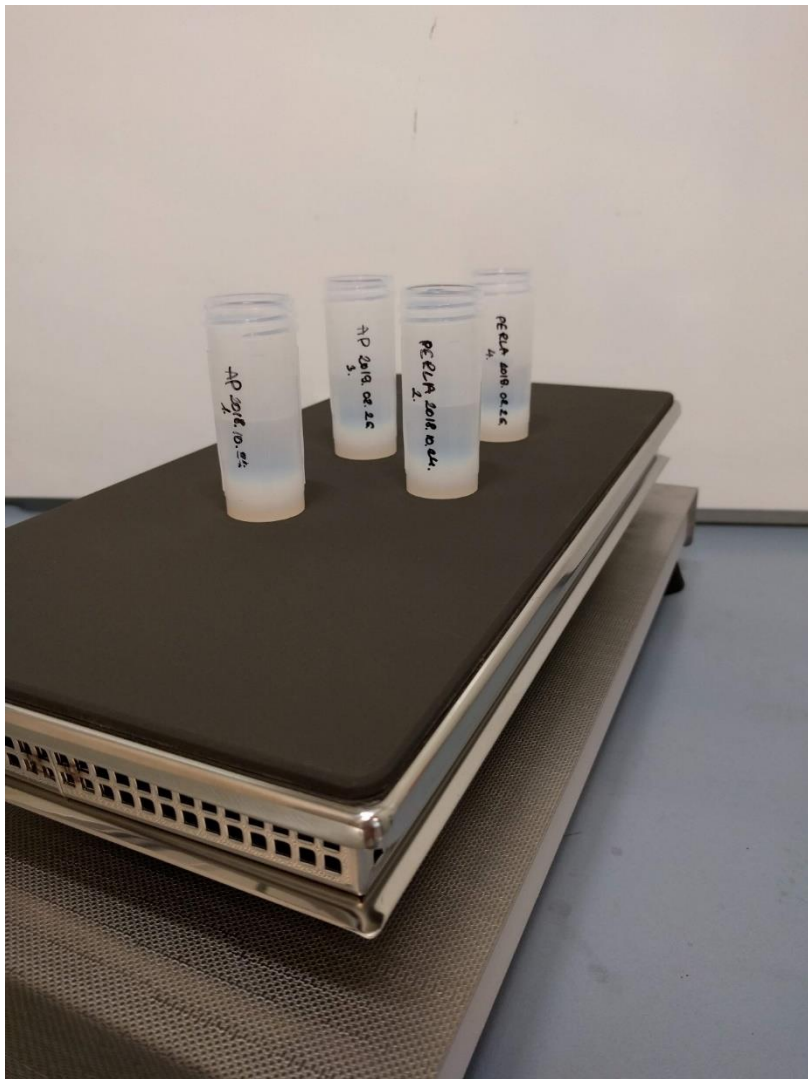
- AG 1x8 anioncserélő gyanta, 2 mL
- Kondicionálás: 30 mL 8 M HCl
- Minta felvitele: A) 7,5 mL 200 ppb urán oldat a gyantára; B) 7,5 mL 200 ppb urán oldat bepárolva, 3x1 mL cc. sósavval újból bepárolva, majd 1 M HCl-ban felvéve és a gyantára adagolva
- Mátrix lemosás: 8 M HCl, 5x3 mL
- U eluálás: 1 M HCl, 5x3 mL
- Mosás: 5x3 mL UTV
- A 2x4 frakciót bepároltuk, 3x1 mL tömény salétromsavban újból pároltuk, majd 3 %-os salétromsavban vettük fel.

Sr elválasztás Spec-gyanta (SEC)



SEC - size exclusion chromatography





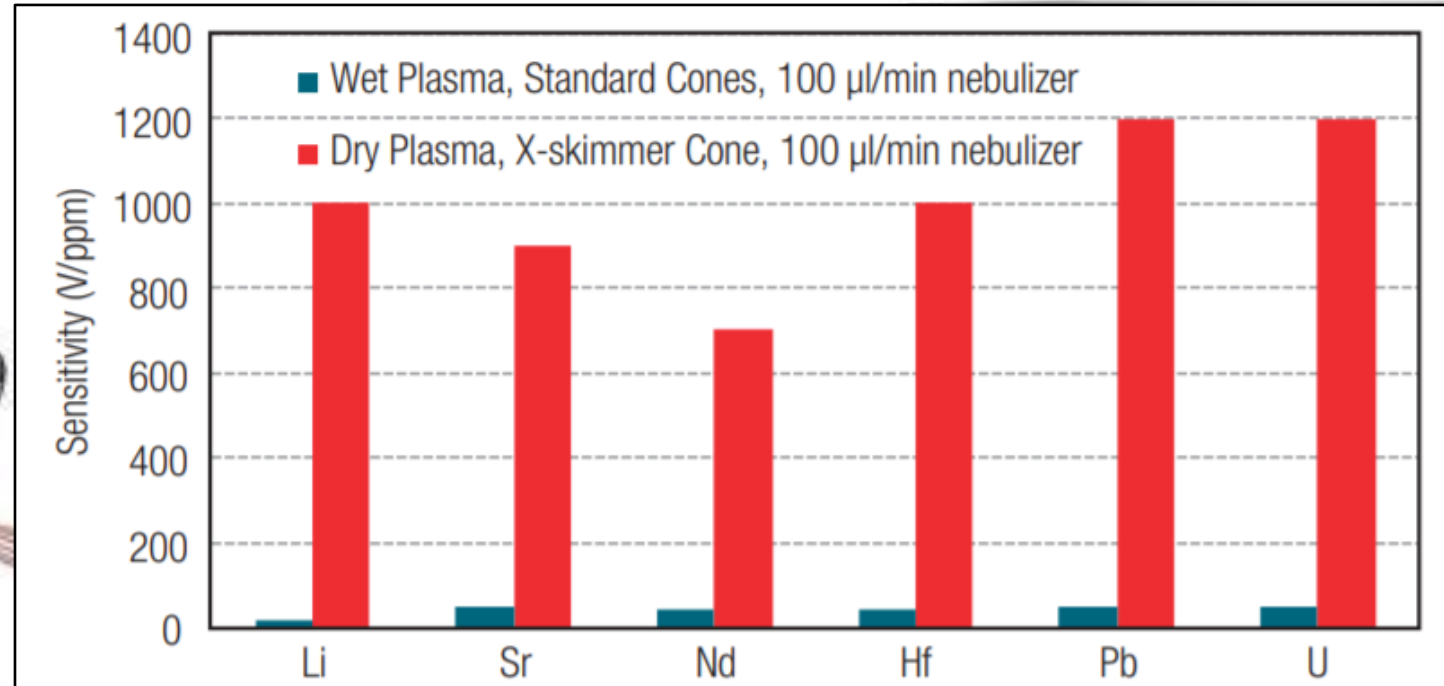
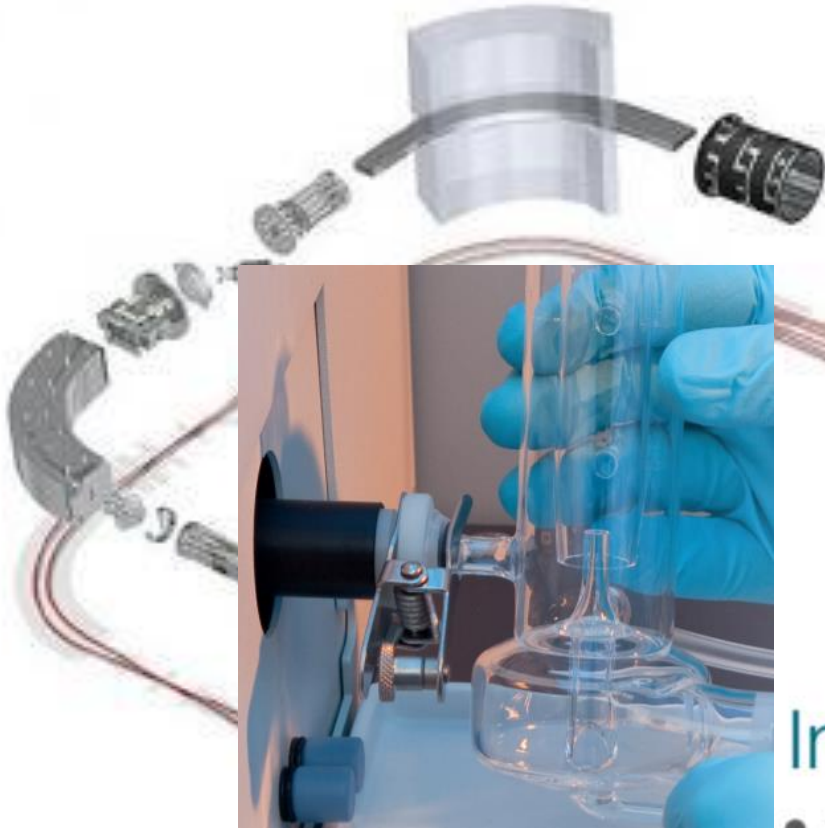
Sr oszlopkromatográfiás elválasztása,
akár 50ppb koncentrációjú oldatból kiindulva

Sr tartalmazó frakció bepárlása és salétromsavas roncsolása (Ultraszta 69% HNO₃)

Neptune Plus: multicollector inductively coupled plasma ion source mass spectrometer



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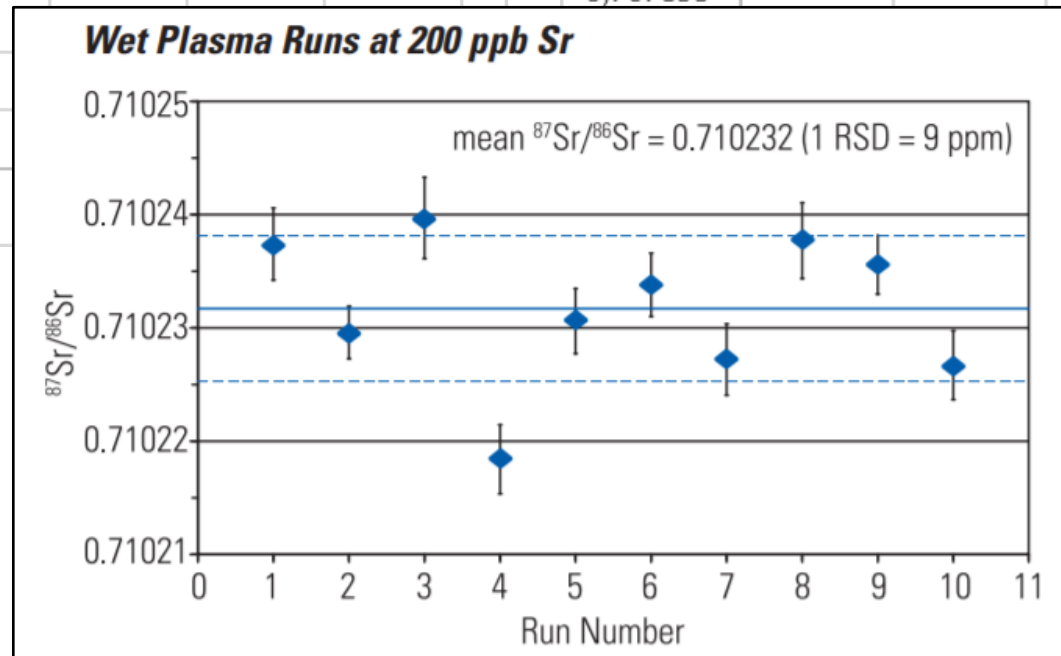
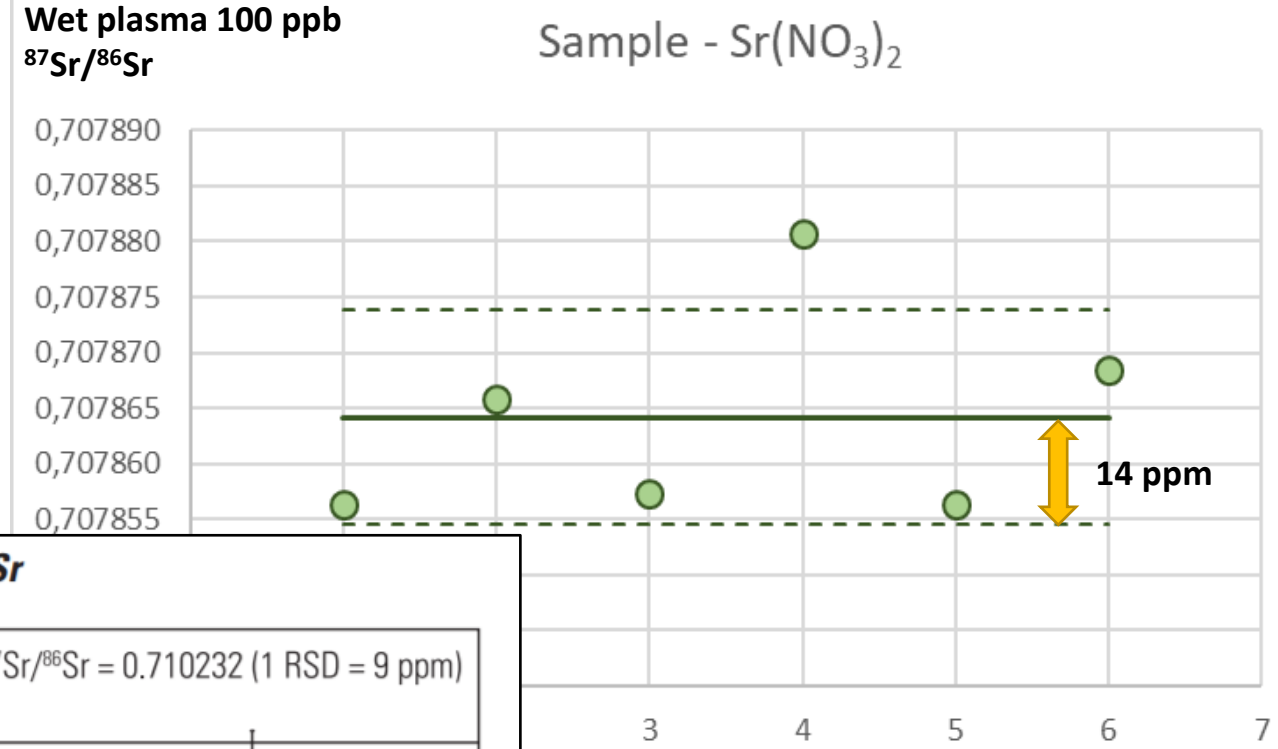
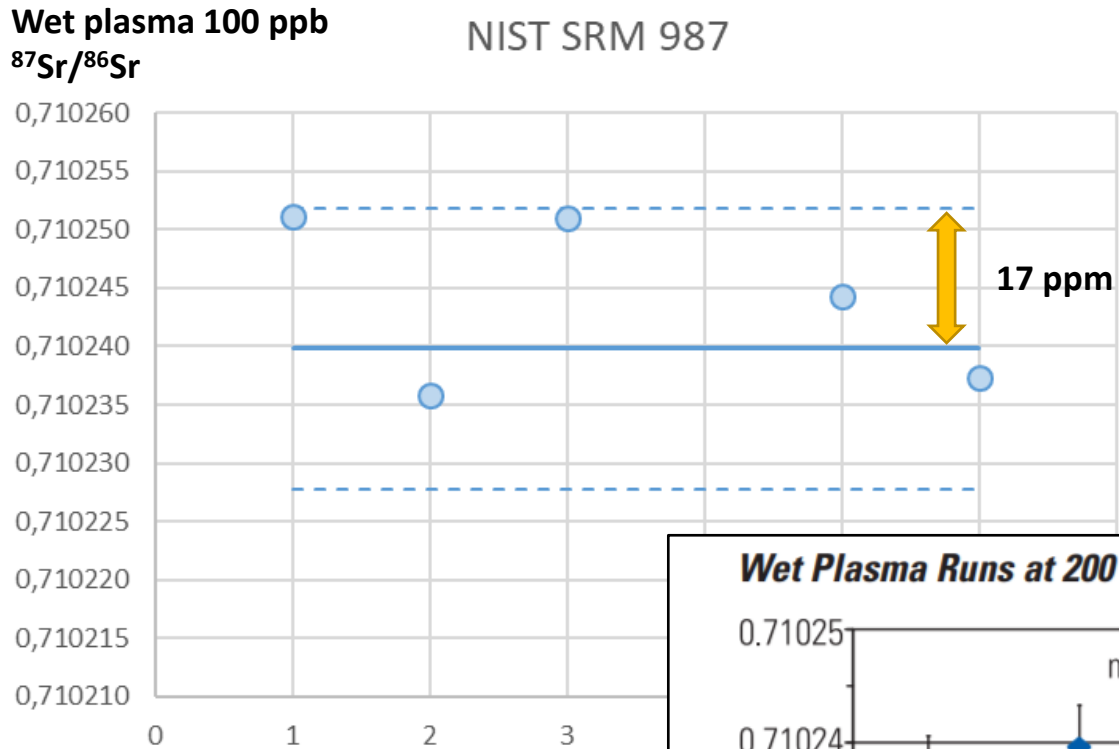


Inlet systems

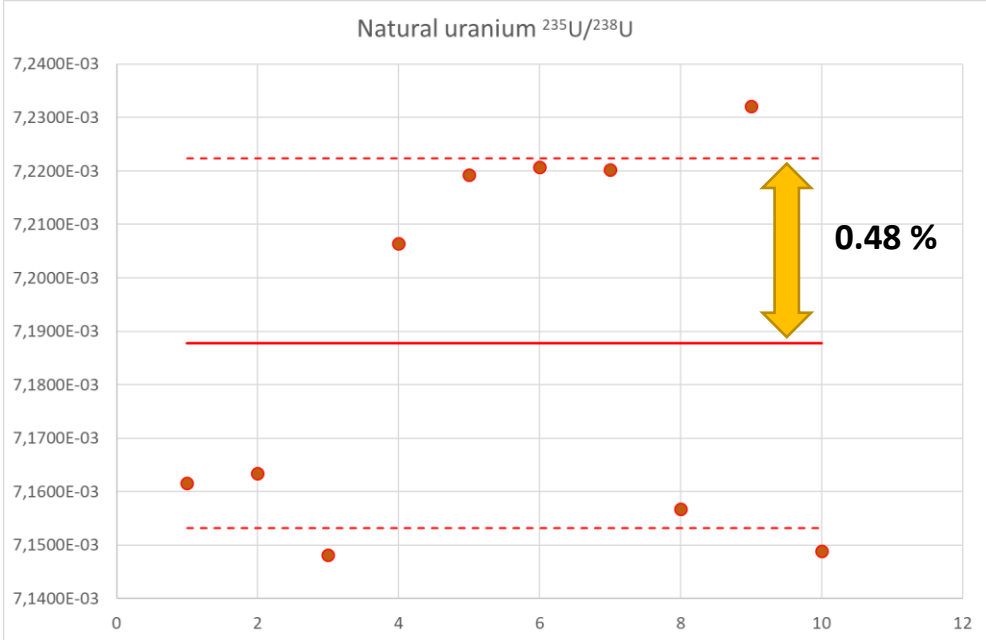
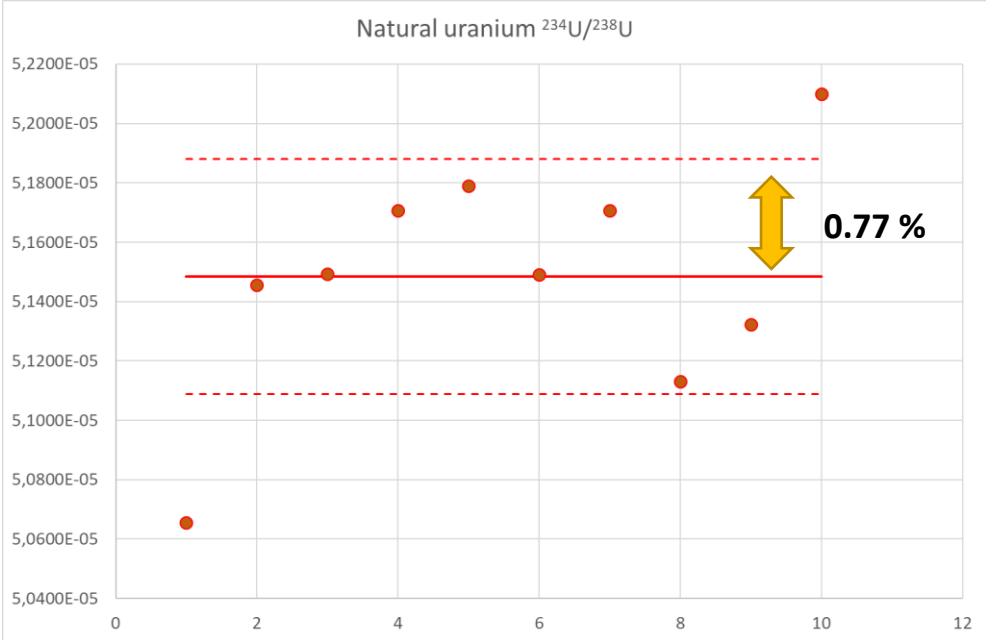
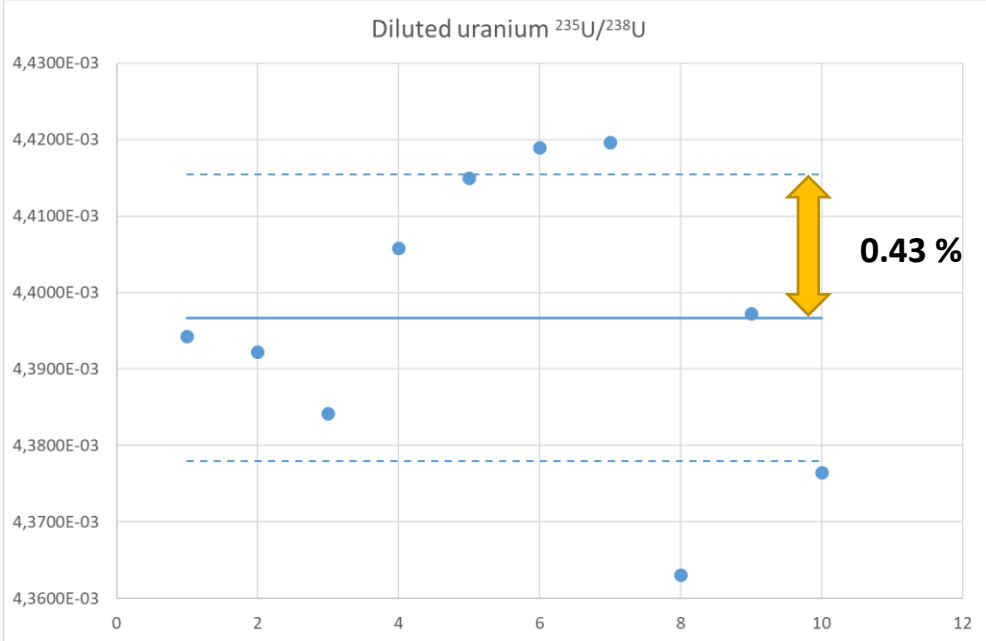
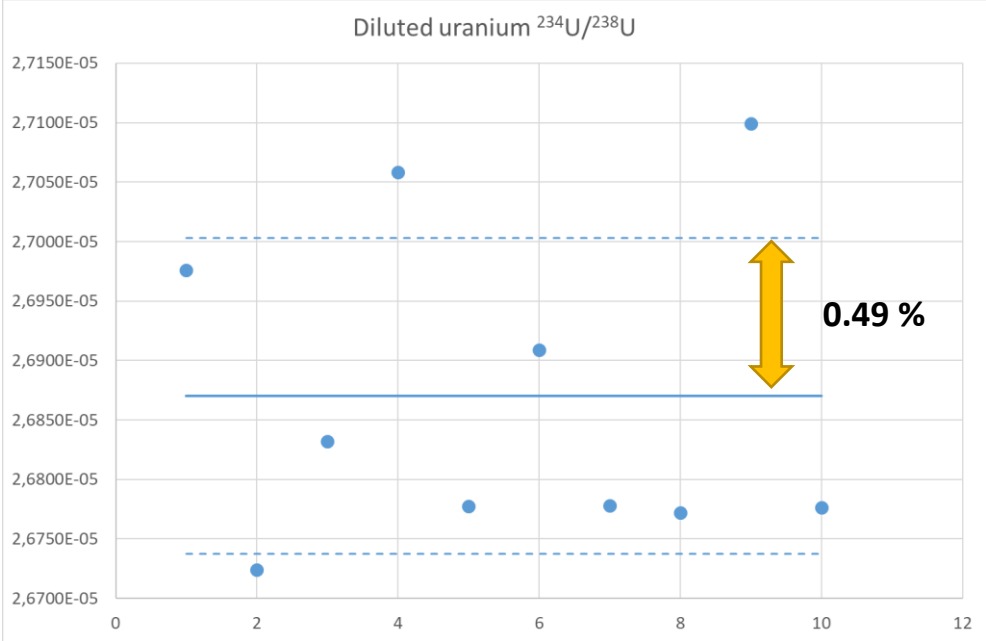
- wet or dry plasma
- laser ablation



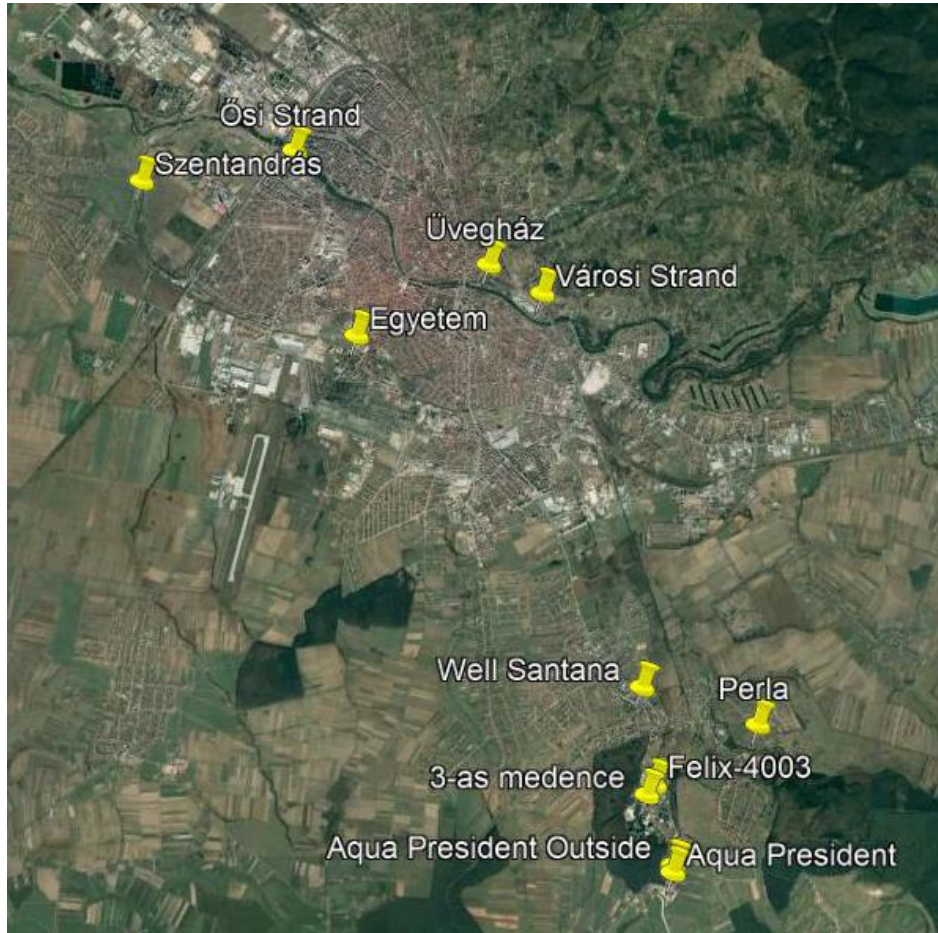
Neptune Plus: multicollector inductively coupled plasma ion source mass spectrometer



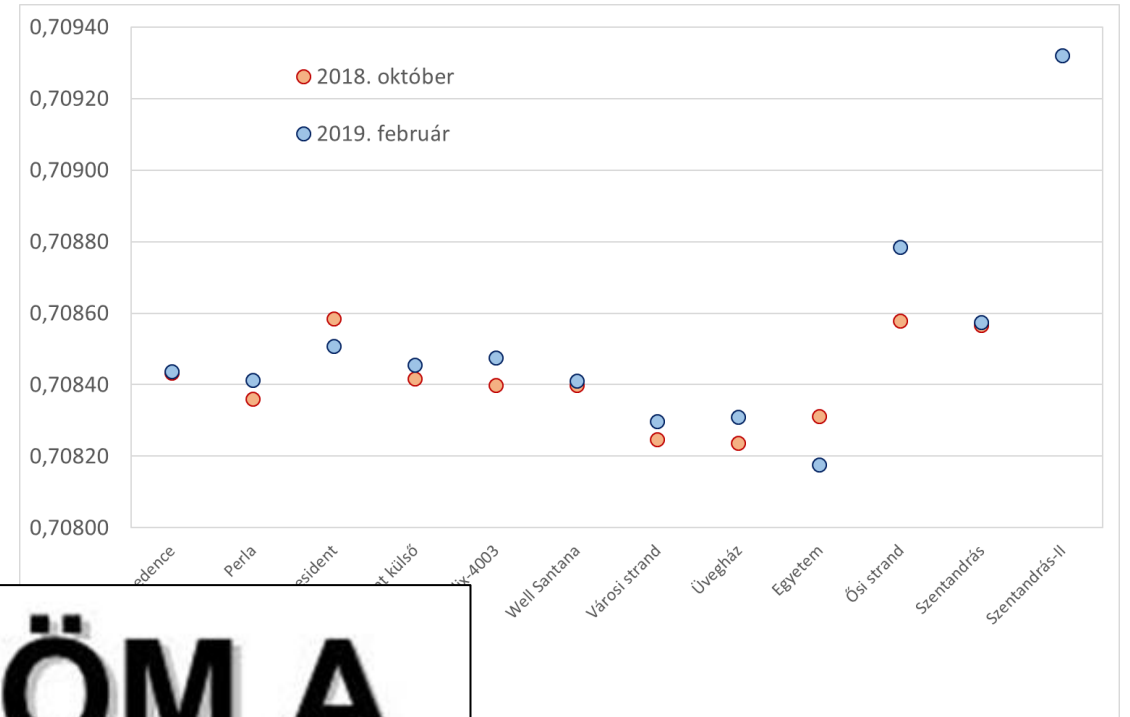
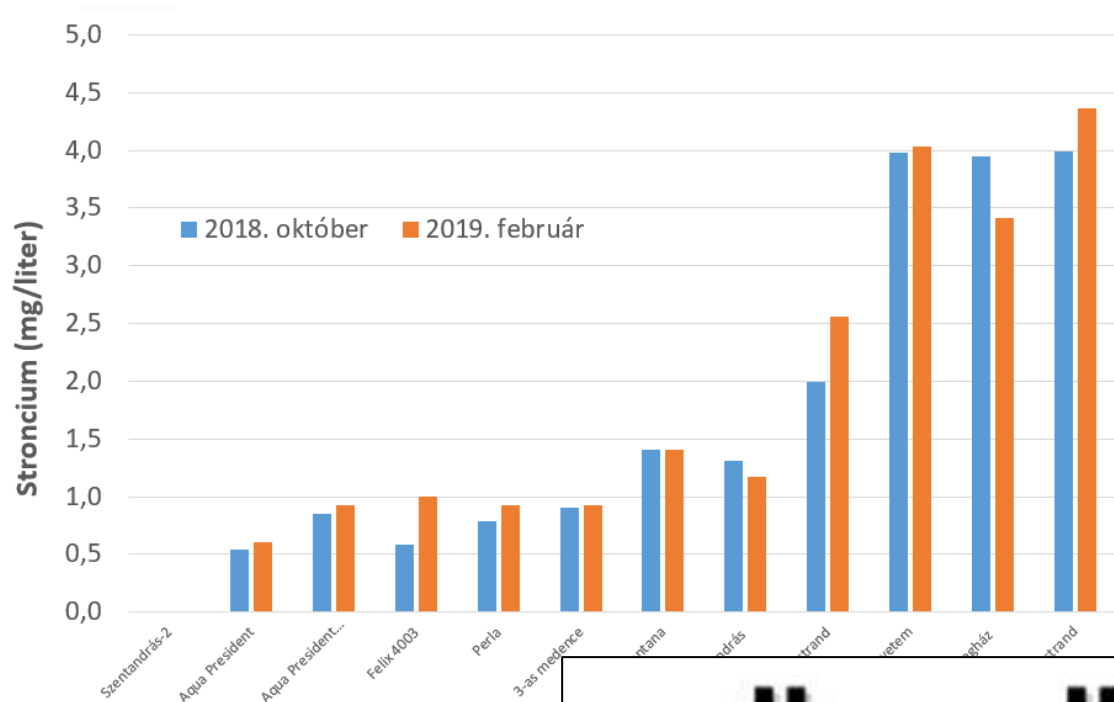
Neptune Plus: multicollector inductively coupled plasma ion source mass spectrometer



Vízmintavételi helyszínek (ROHU projekt)



Sr-U izotóparány paramétertér



**KÖSZÖNÖM A
FIGYELMET!**