

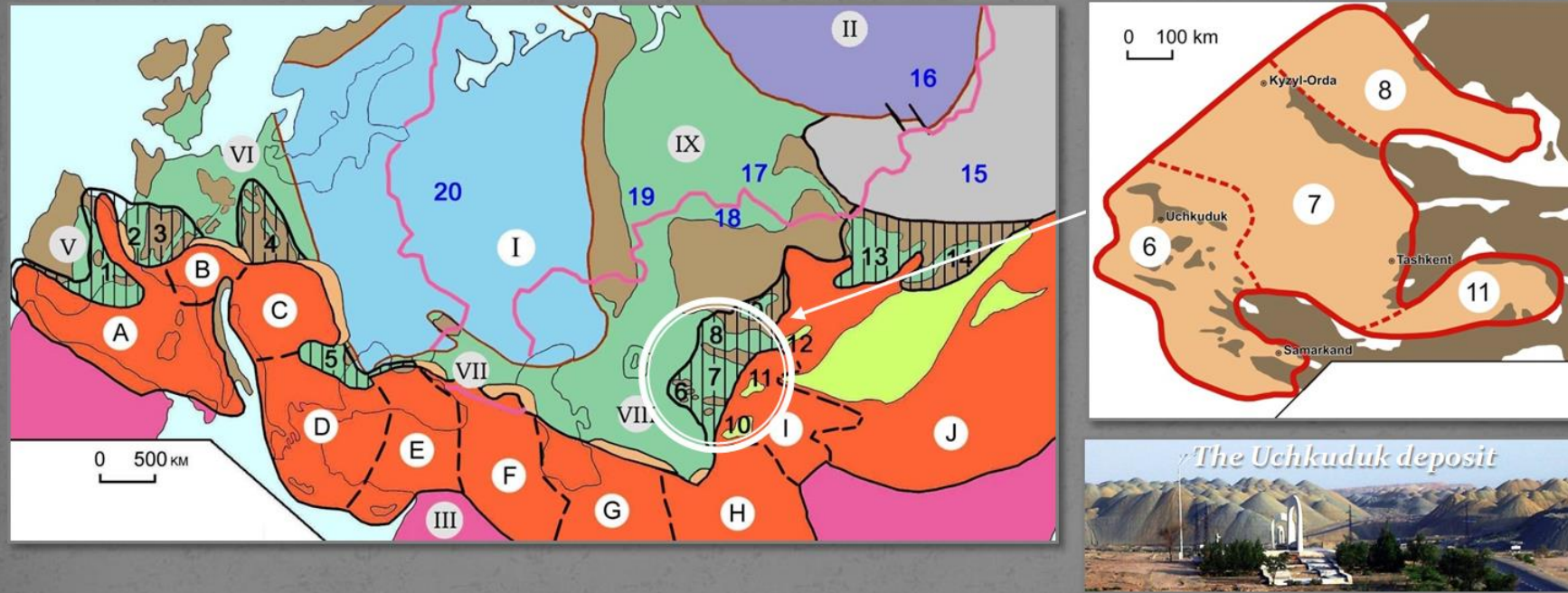
# SANDSTONE URANIUM DEPOSITS OF EURASIA – FROM GENETIC CONCEPTS TO FORECASTING AND NEW DISCOVERIES

---

Igor Pechenkin, Grigoriy Mashkovzev

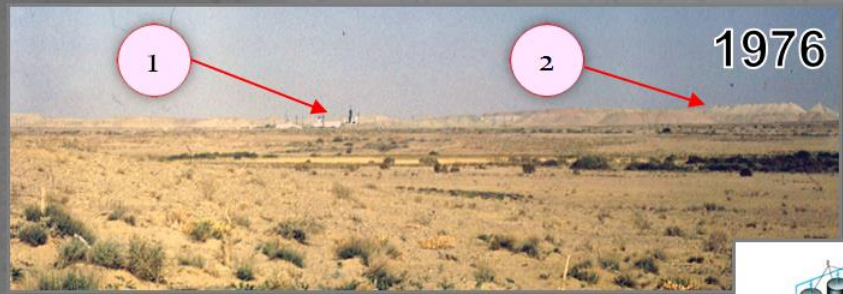
*All-Russian Scientific-Research Institute of Mineral Resources,  
Moscow, Russia. vims@df.ru*

# Uranium ore-bearing of the northern face of the Alpine-Himalayan mobile belt

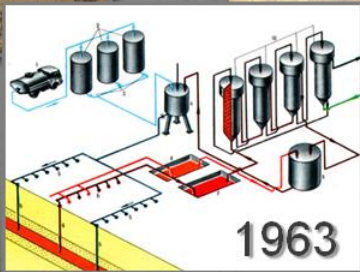


*Uranium ore province and districts:* 1, Area of the Iberian Riviera; 2, Area of the Aquitanian Depression; 3, The Central French region; 4, The Laba region; 5, The East Radopi region; 6, The Central Kyzylkum Province; 7, The Syr-Darya Province; 8, The Chu-Sarysu Province; 9, The Balkhash region; 10, The South Tajik region; 11, The Fergana region; 12, The Yili region; 13, Area of the Junggar depression; 14, The Turpan Hami region; 15, The Choiren region of Mongolia; 16, The Vitim region; 17, The West Siberian Area; 18, The Semizbay region; 19, The Trans-Ural Area; 20, Area of the Moscow Basin

# The Uchkuduk deposit

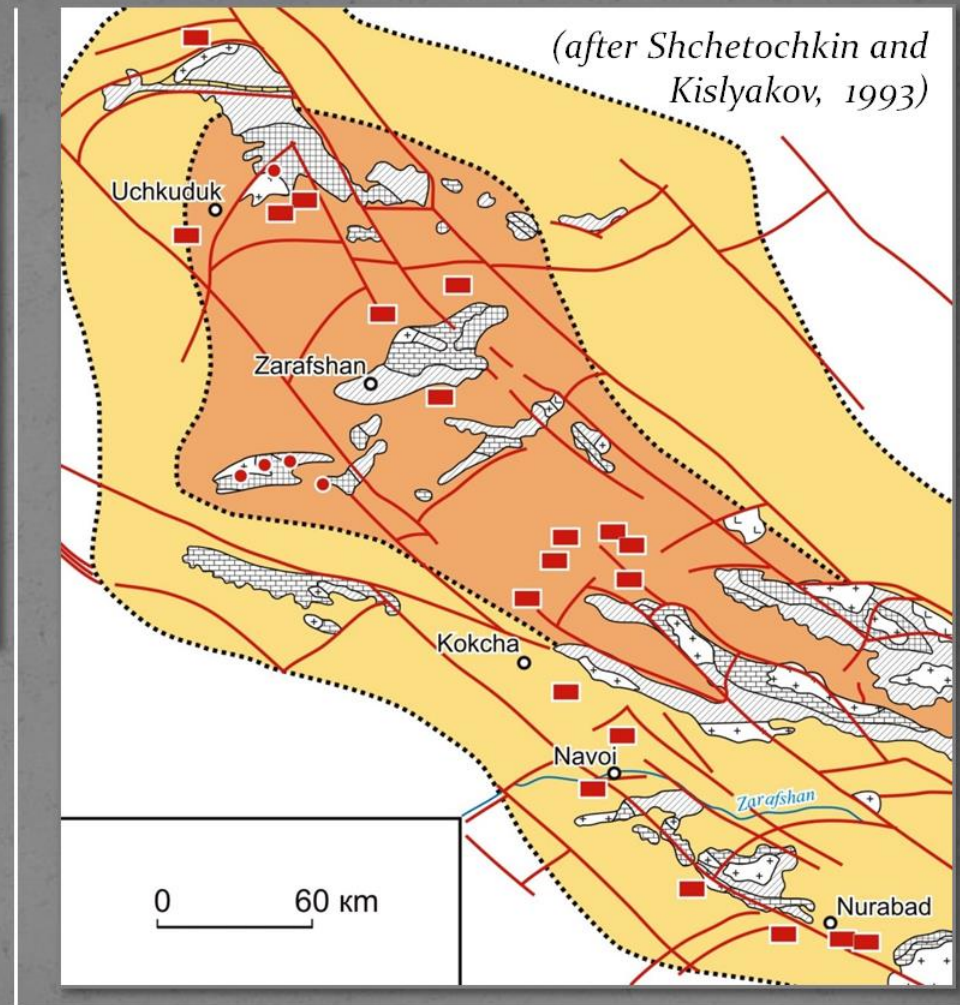
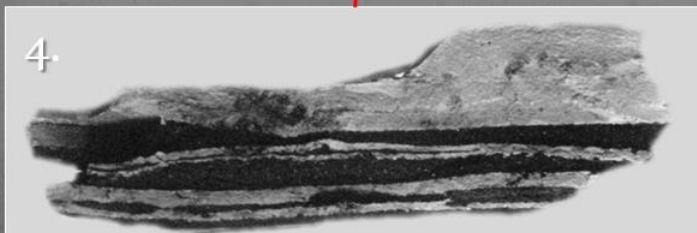
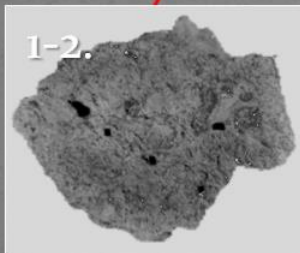
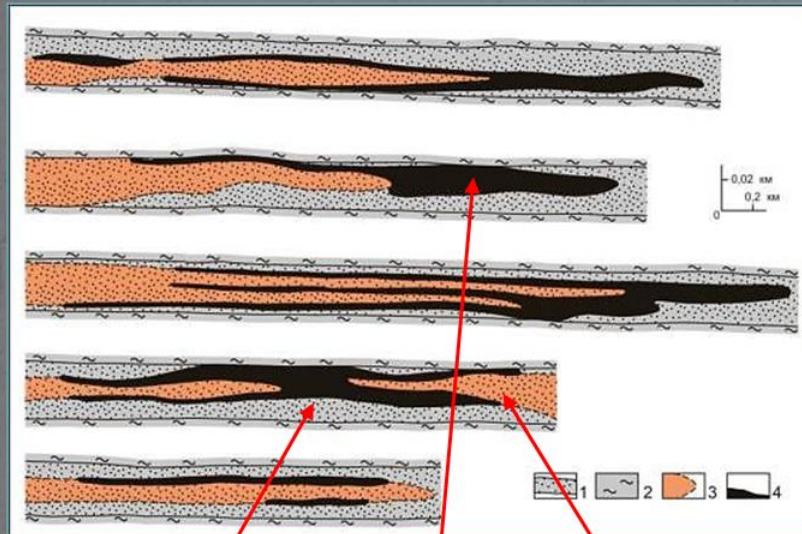


*Before 1963 uranium was done in the mines (1) and in pits (2). After 1963 uranium mined with ISL.*



# The Central Kyzylkum uranium province

Ore-forming oxidized zone  
(examples of ore bodies morphology at Uchkuduk)



1-2, primary gray-colored rock: sand (1), clay (2); 3, secondarily oxidized rock; 4, finely dispersed oxide uranium ore in sandstones 4

# Geological forecasting

TYPE OF WORK	STAGES OF WORK	
	I - (regional)	II - (large-scale with verification drilling)
SCALE	1:2 500 000-1:500 000	1:200 000
WELL PATTERN	Without drilling	12,8 × 6,4-3,2 km (100-50 m)
MAIN OBJECTIVES	Assessment of the prospects of major ore-bearing regions on the basis of specialized mapping.	Assessment of the prospects of potentially mineralized areas and ore fields.
CURRENT TASKS	Space allotment for forecasting and exploration on the basis of a complex model created for the exploration of a potential mineralized area or its ore fields.	Creation of a complex geological forecasting model and assessment of forecasting <i>Speculative resources</i> on its basis.

# Exploration work

TYPE OF WORK	STAGES OF WORK		
	I	II	III
SCALE	1:100 000	1:50 000	1:25 000
WELL PATTERN	Wireframe: 6,4 × 6,4 km	Profile drilling: 3200 × 1600-50 m	Selective detalization: 1600 × 800-50 m
MAIN OBJECTIVES	Mapping of potentially mineralized pinch-out limits of strata oxidation zones in all aquifers of prospective areas.	The pinch-out of the strata oxidation zone is enclosed within a gripping “fork”. The density of drillholes in the profile has to ensure one point of ore intersection.	Establishing the morphology of ore-bearing areas in plan and in section. Ensuring of 25-30 % of verification of <u>Prognosticated resources</u> from <u>Speculative resources</u> .
CURRENT TASKS	Establishing the general configuration of the pinch-out limits of strata oxidation zones and assessing the possibility of detecting of industrial mineralization.	Determining the situation of the mineralization in the pinch-out of the strata oxidation zone. Preliminary identification of its properties. Assessing the width of ore deposits.	Establishing the mode of occurrence of the mineralizaion, its morphology and quality. Carrying out geotechnological laboratory experiments.

# Exploration and assessment

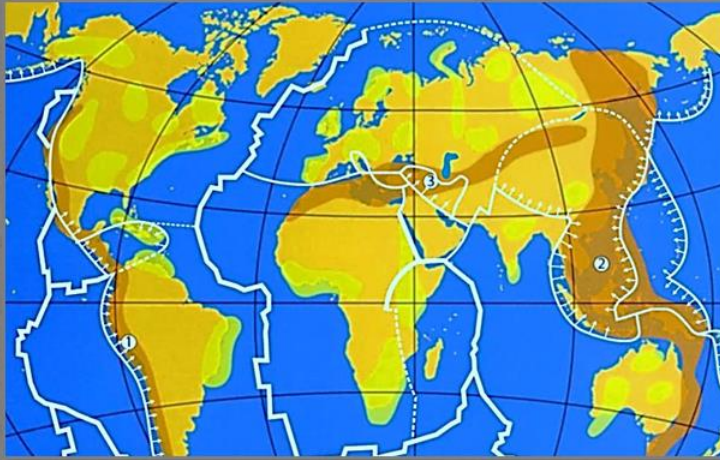
TYPE OF WORK	STAGES OF WORK		
	I	II	III
SCALE	1:10 000		
WELL PATTERN	Wireframe: 1600 × 1600m	Profile drilling: 800 × 400 m	Detailization: 800 × 50 m
MAIN OBJECTIVES	Study of ore-bearing strata oxidation zones identified during exploration within the confines of local units and assessment of their forecasting <u>Prognosticated resources</u> suitable for in situ leaching (ISL). Some of the <u>Prognosticated resources</u> transferred to the <u>Inferred resources</u> .		
CURRENT TASKS	Rejection of objects of no industrial value and setting the standards of profitability for the development of potentially productive objects. Experiment in in-situ leaching based on a two-hole model.		

# Prospecting

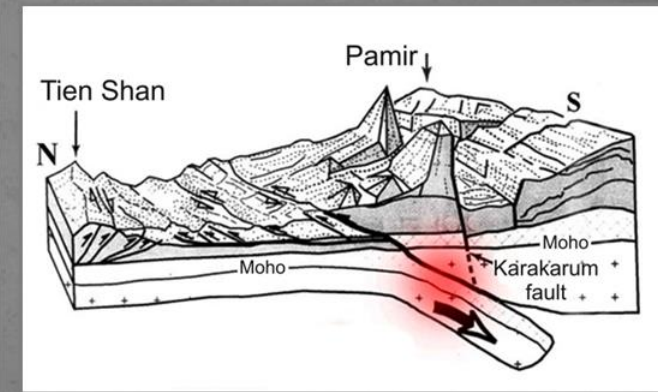
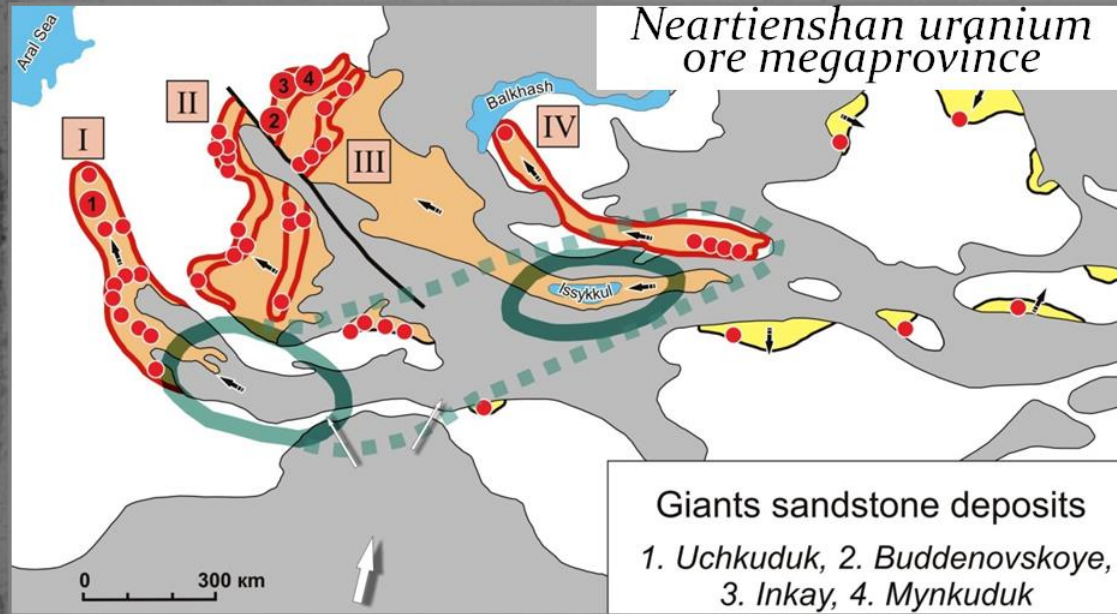
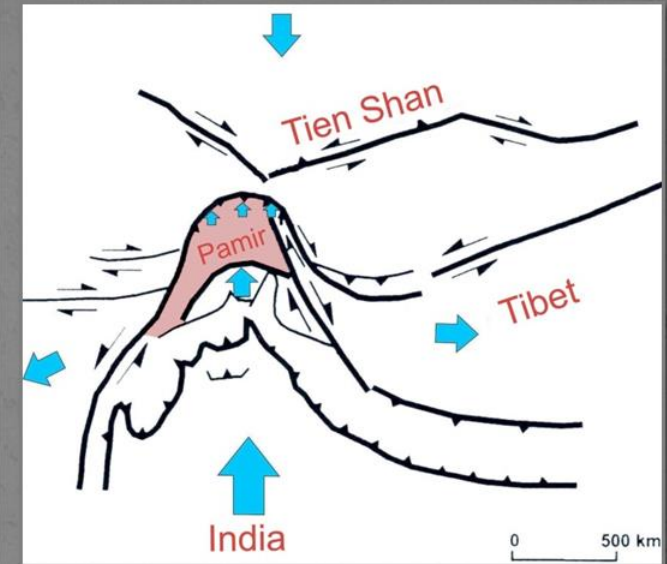
TYPE OF WORK	Reconnaissance	Detailed exploration
WELL PATTERN	Densening : 400-200 × 100-50 m	Densening: 200 × 50 or 100 × 50-25 m
MAIN OBJECTIVES	Delineation of ore deposits and the first assessment of <u>Inferred resources</u> . Obtaining information for an accurate assessment of the possibility of ore processing using in-situ leaching	Obtaining data on geotechnology of ore in the deposit during the experimental industrial in-situ leaching. Transfer of <u>Inferred resources</u> into <u>Reasonably Assured resources</u> ones.
CURRENT TASKS	Field experiment using in-situ leaching. Technical and economic calculations determining the sequence of the industrial development of the deposit.	Drawing up design parameters. Estimation of final resources.



## Planetary ore belts on the background of plate-tectonic processes



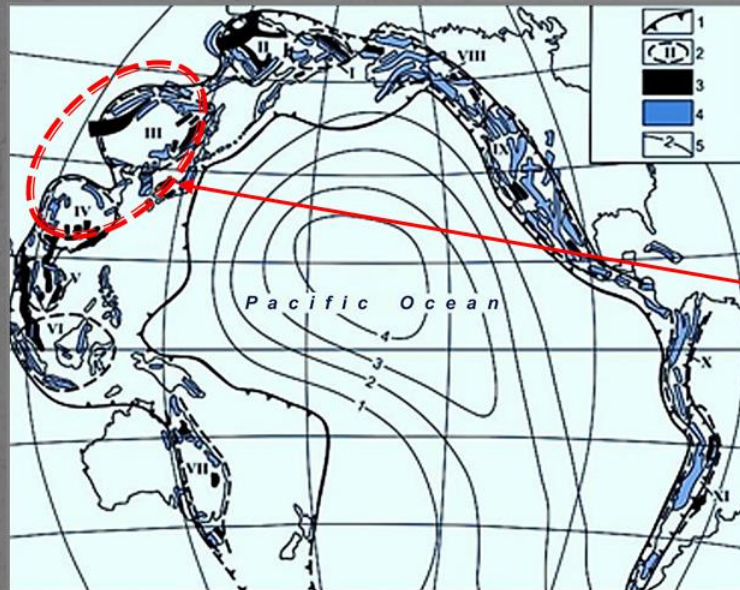
## Theoretical area of concentration of the mantle source of uranium



Metallogenic zones: I - Central Kyzyl Kum, II - Mynkuduk-Karamurun-Karaktausкая, III - Kanzhugan-Chayanskaya; IV - Dzhegestay-Ily

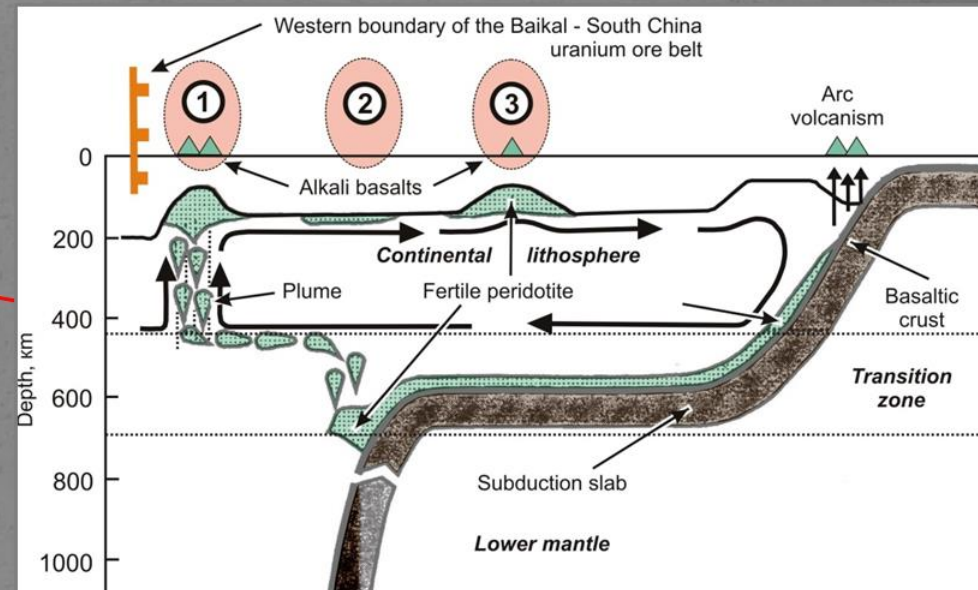
# The Pacific ore belt

**Metallogenic zones of the Pacific belt**  
(by E. Radkevych, 1977)



1, Borders of the Pacific ore belt; 2, Ore-magmatic systems; 3-4, Metallogenic zones: lithophilous type (3), chalcophilic type (4); 5, Relief of surface "lower mantle - core of the Earth" (km)

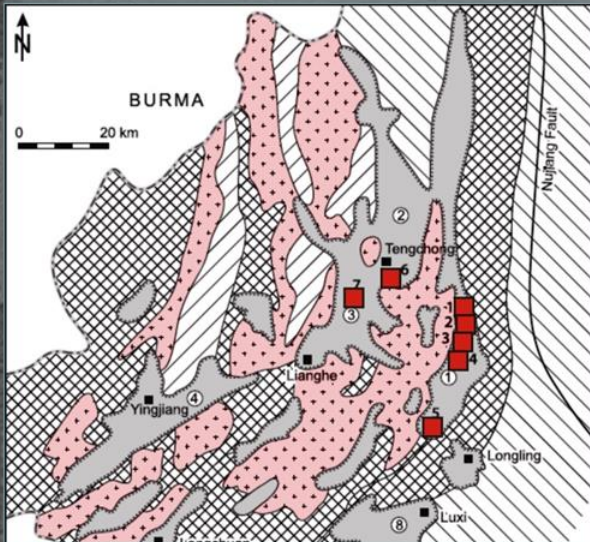
**Model of formation of upper mantle plume**



1, Basalts of Cenozoic, that controlling of the Vitim type deposits; 2, Others types of sandstone deposits; 3, Calderas of Mesozoic, that controlling endogenous mineralization

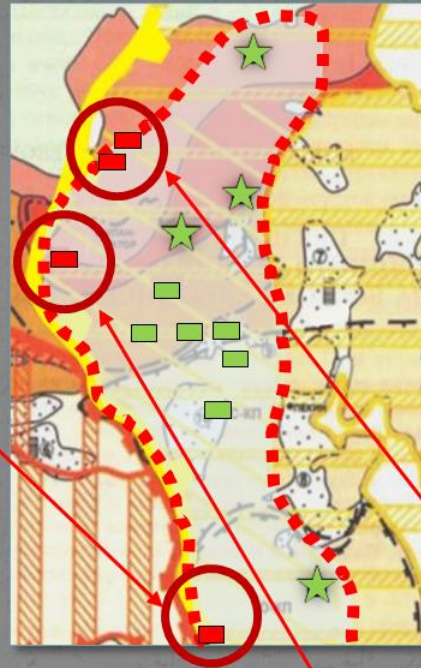
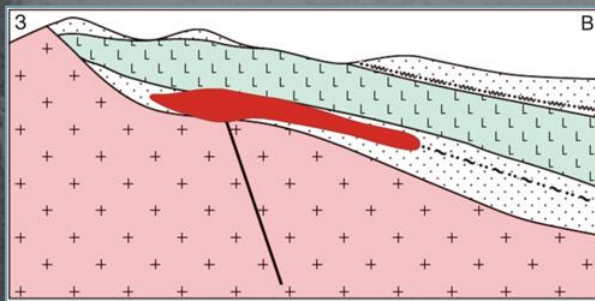


## Gaoligong uranium ore region, West Yunnan

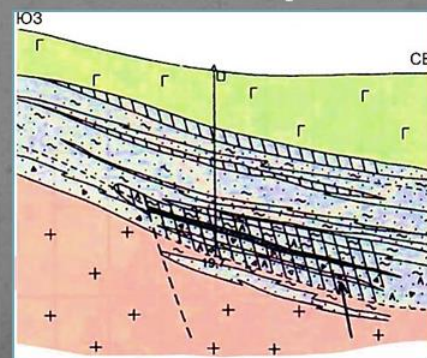


- 1, Wujiazhai; 2, Yanzitou; 3, Chengzishan; 4, Gejiazhai; 5, Tuantian; 6, Shuiyingsi; 7, Shapo

### Chengzishan deposit

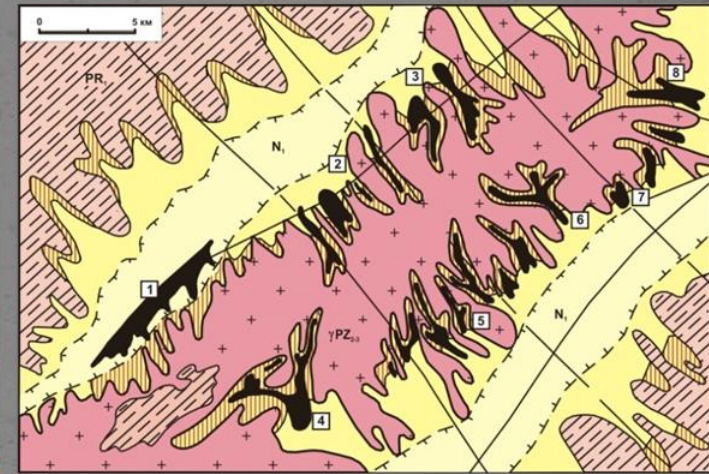


### Mongolia Sul (show of ore)



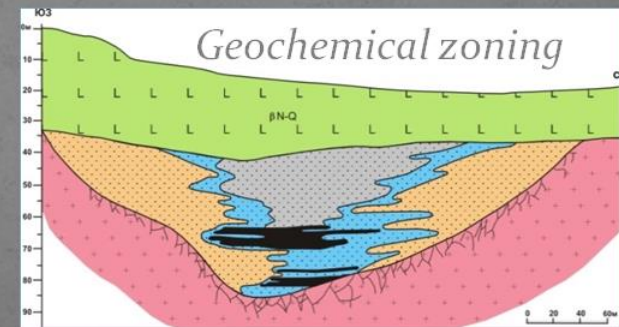
# The Pacific ore belt (exogenous uranium deposits)

## The Vitim uranium ore district



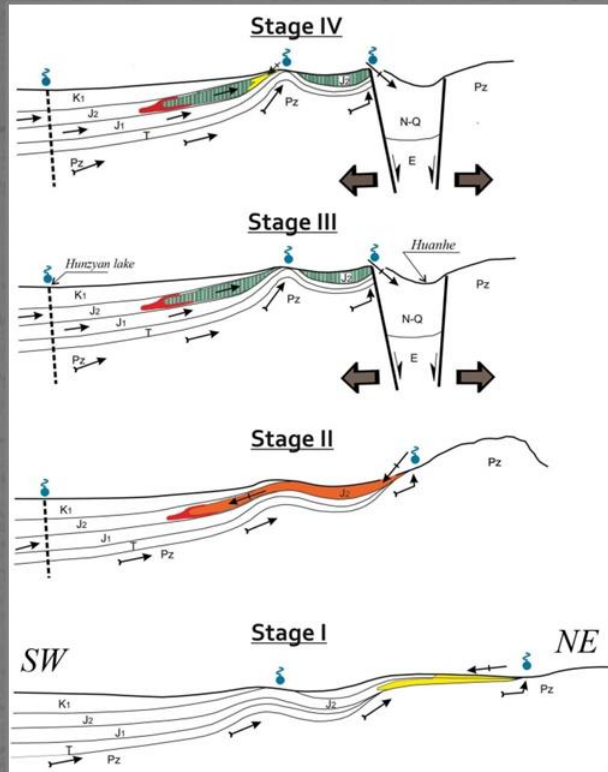
- 1, Dybryn; 2, Namaru; 3, Koretkonde; 4, Tetrakhskoye; 5, Khiagda; 6, Vershinnoye; 7, Istochnoye; 8, Kolichikan

### Geochemical zoning



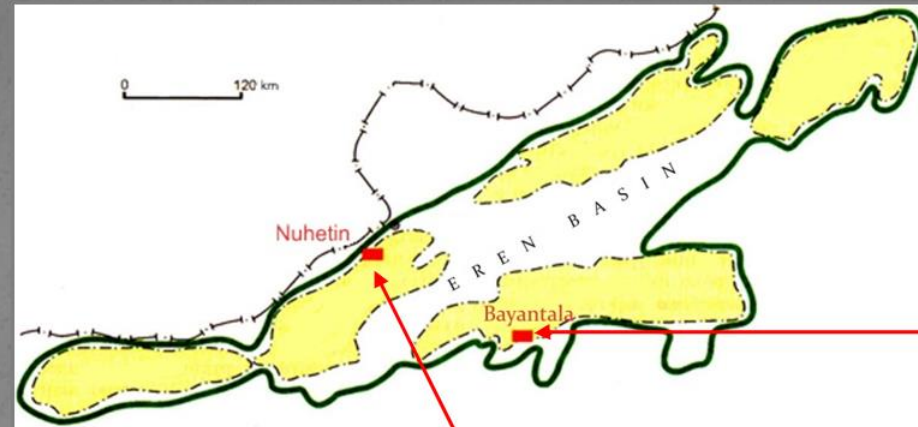
# The Ordos basin

## The Dunshen deposit

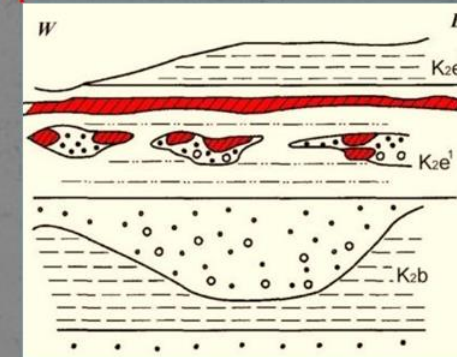


- I. Pre-concentration (groundwater oxidation zone)
- II. Interlayer water infiltration with uranium ore
- III. Ore preservation exerted by reducing fluids
- IV. Groundwater oxidation without ore

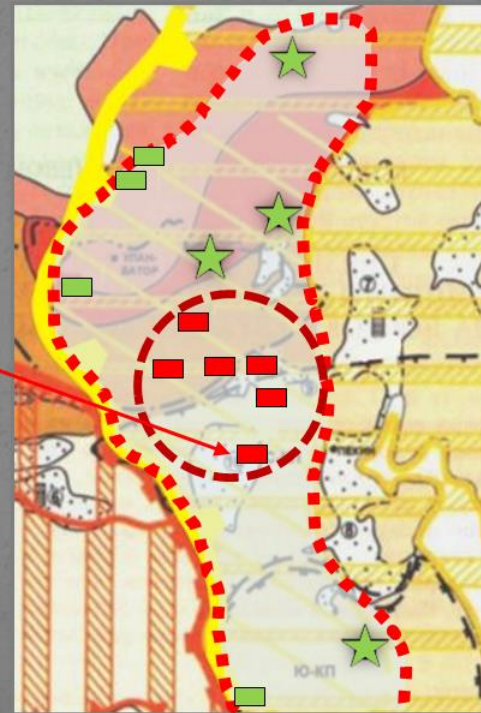
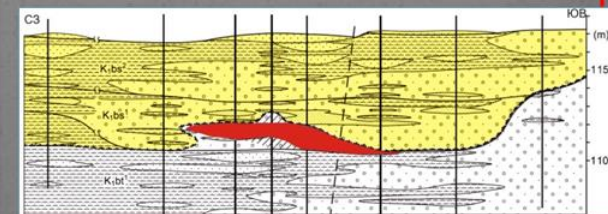
# The Eren Basin



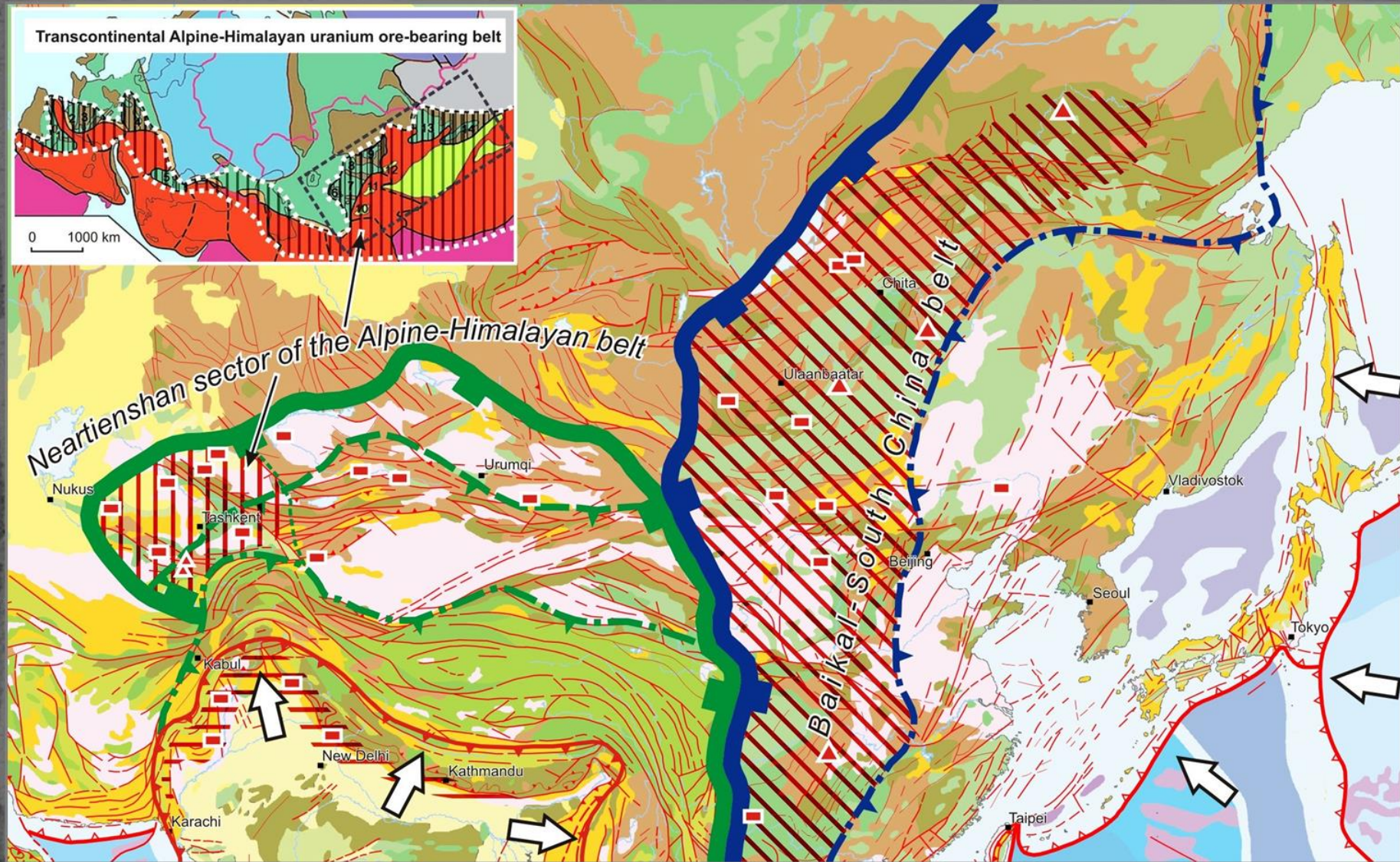
## Nuhetin deposit



## Bayantala deposit



# Uranium ore belts of East and Central Asia



# Conclusion

- The given material bears evidence of a close spacial connection between part of sandstone uranium deposits and endogene uranium deposits
- Both types of uranium deposits belong to the same ore metallogenic zoning which is entirely dependent on the global geodynamic processes taking place in the crust and mantle on the fringes of the Eurasian continent
- This makes it possible to increase the prospects for the future of many parts of the World

**URAM  
2014**

Thank you for your attention!

*vims@df.ru*