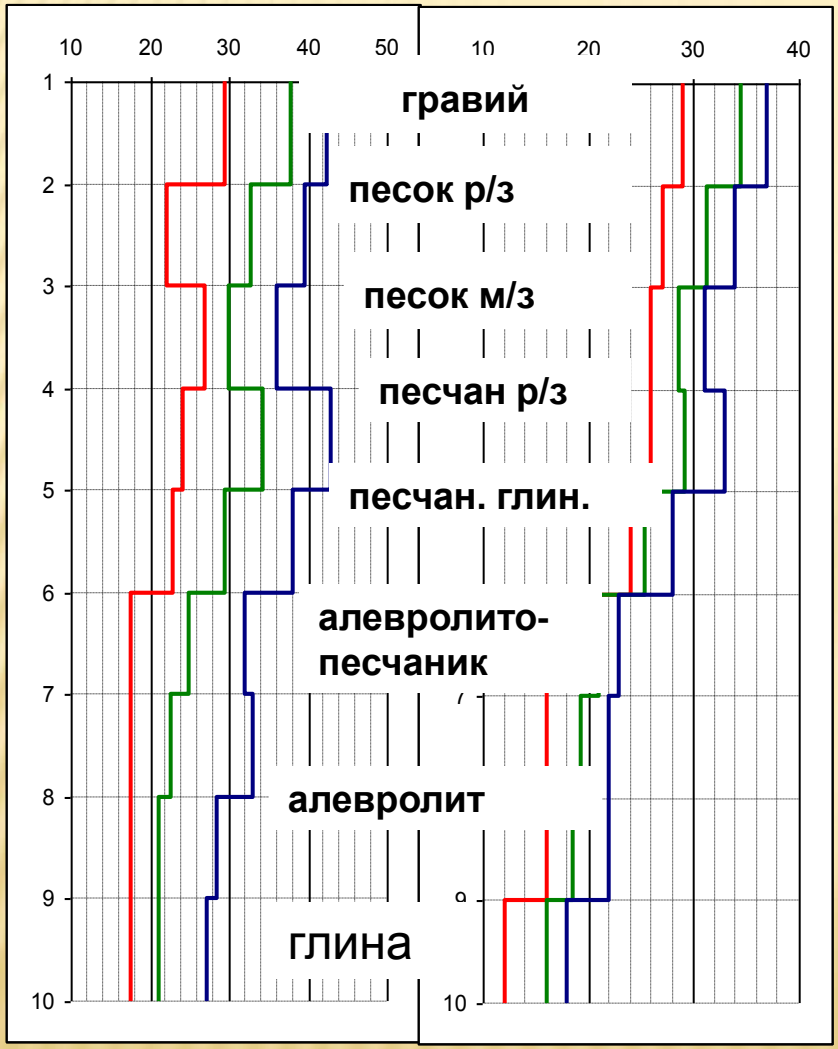
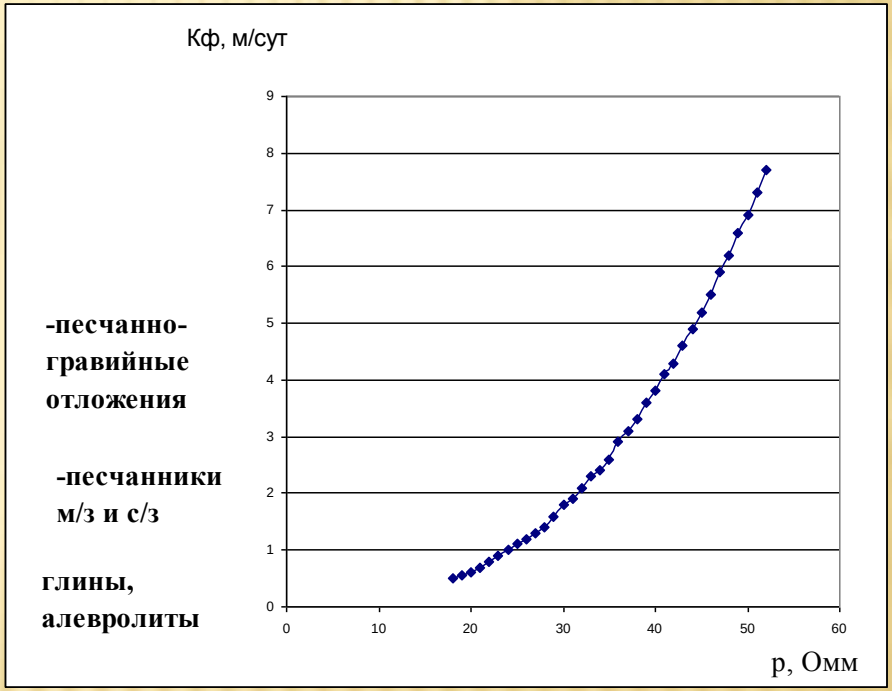
Istratov V., Kolbenkov A., Perekalin S., Panov V.

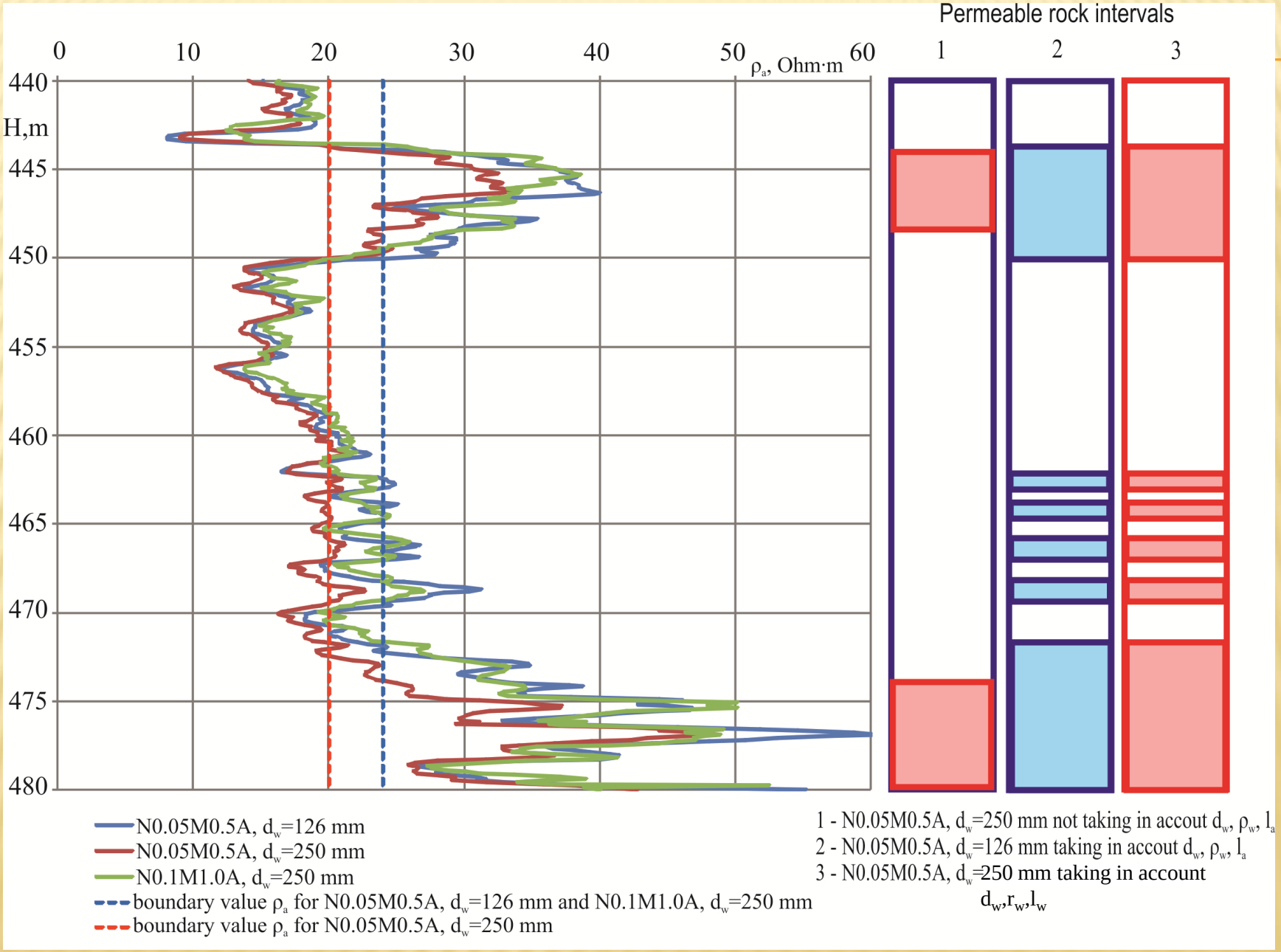
COMPLEX OF ELECTROMAGNETIC BOREHOLE APPARATUS AND METHODS FOR PROSPECTING AND PRODUCTION MONITORING OF HYDROGENOUS URANIUM FIELD

Resistivity dedendance of foration composition

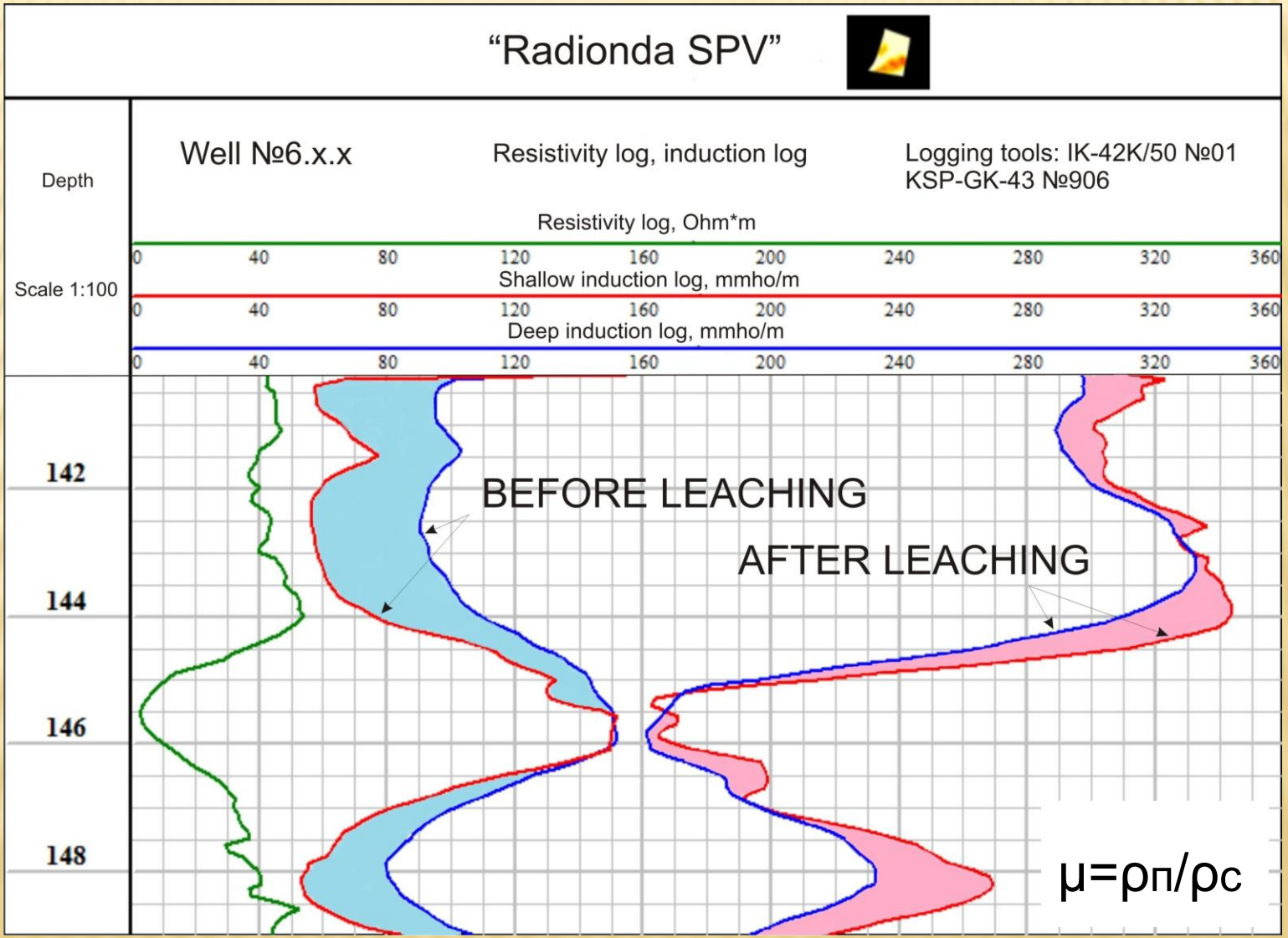




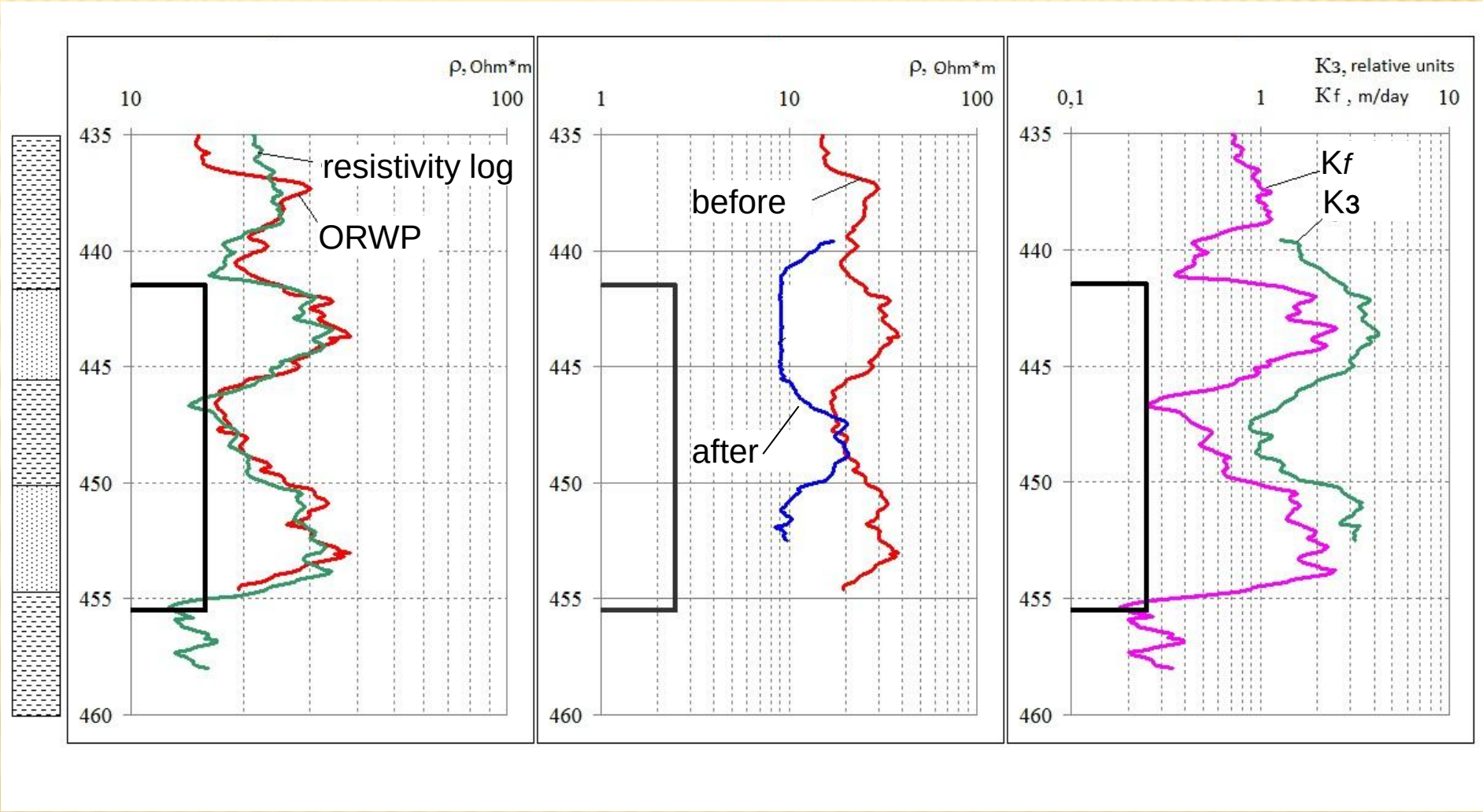
Resistivity log comparison



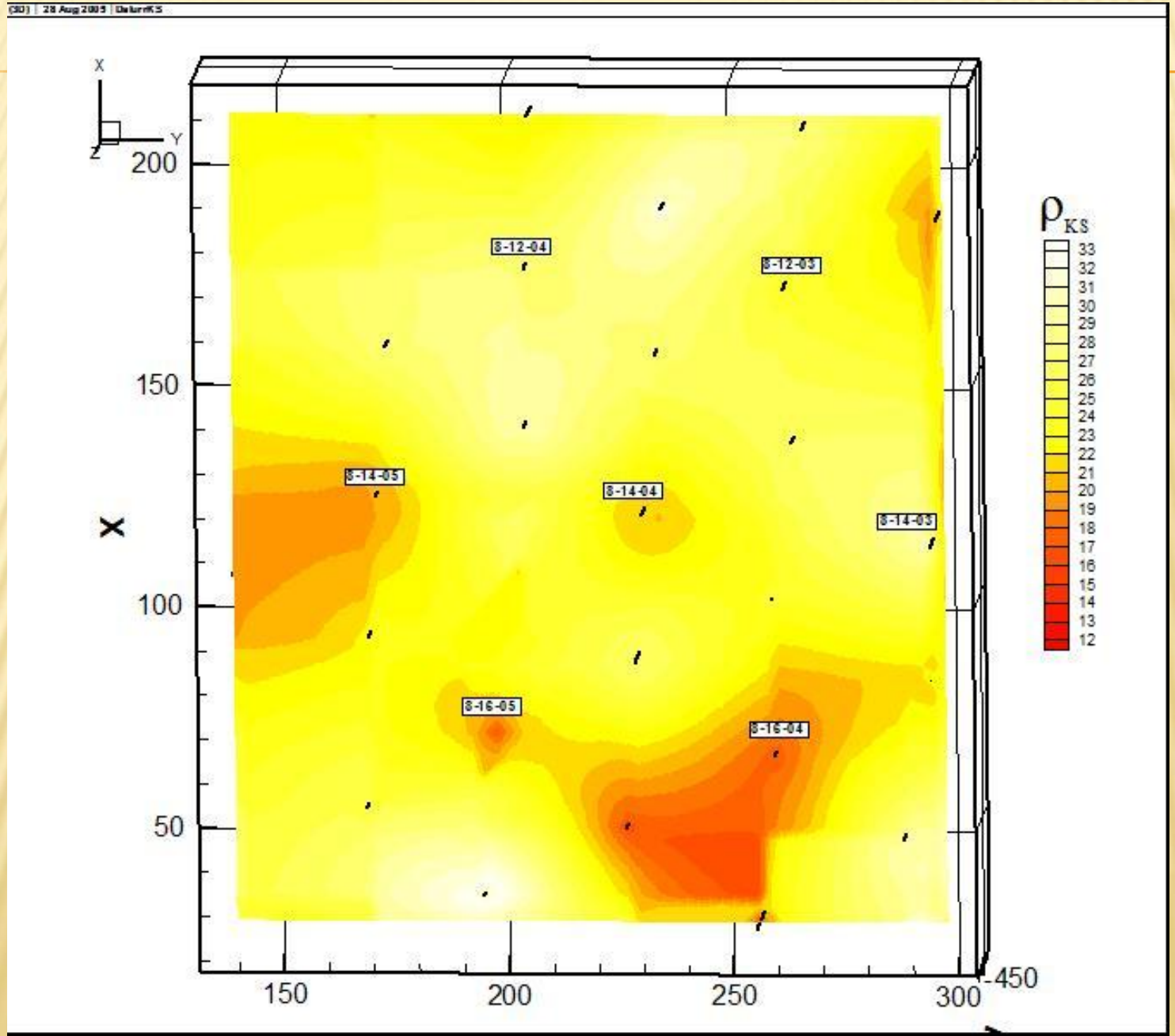
Dual induction loggging



Resistivity and ORWP logs



Resistivity map constructed by log interpolation



Radionda LTD

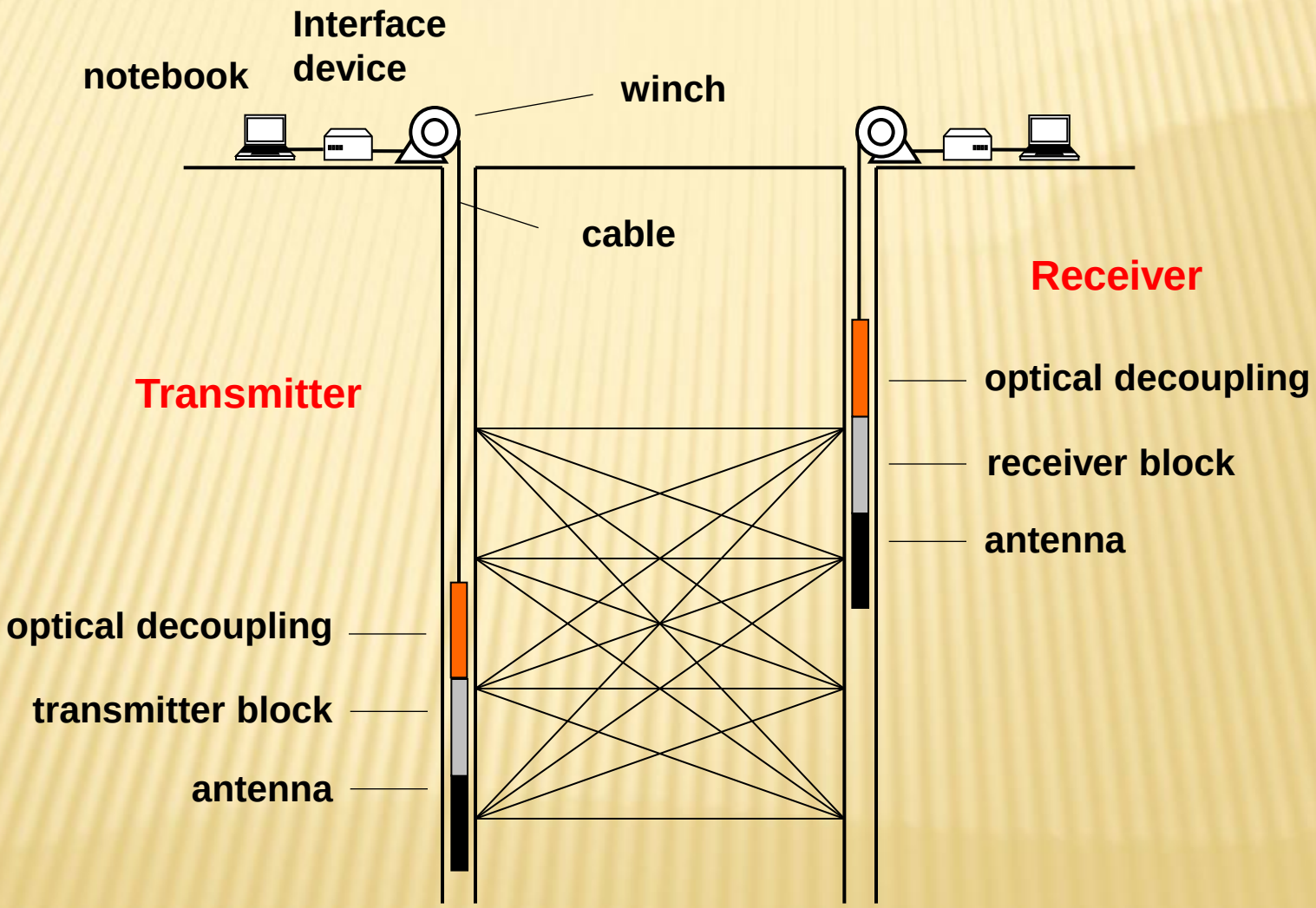
4D

RADIOWAVE GEOELECTRICAL MAPPING

OF INTERWELL SPACE:

SEARCHING & MONITORING OF DEEP-SEATED MINERAL DEPOSITS

RWGI MEASUREMENT SYSTEM



NEW RWGI TECHNOLOGY

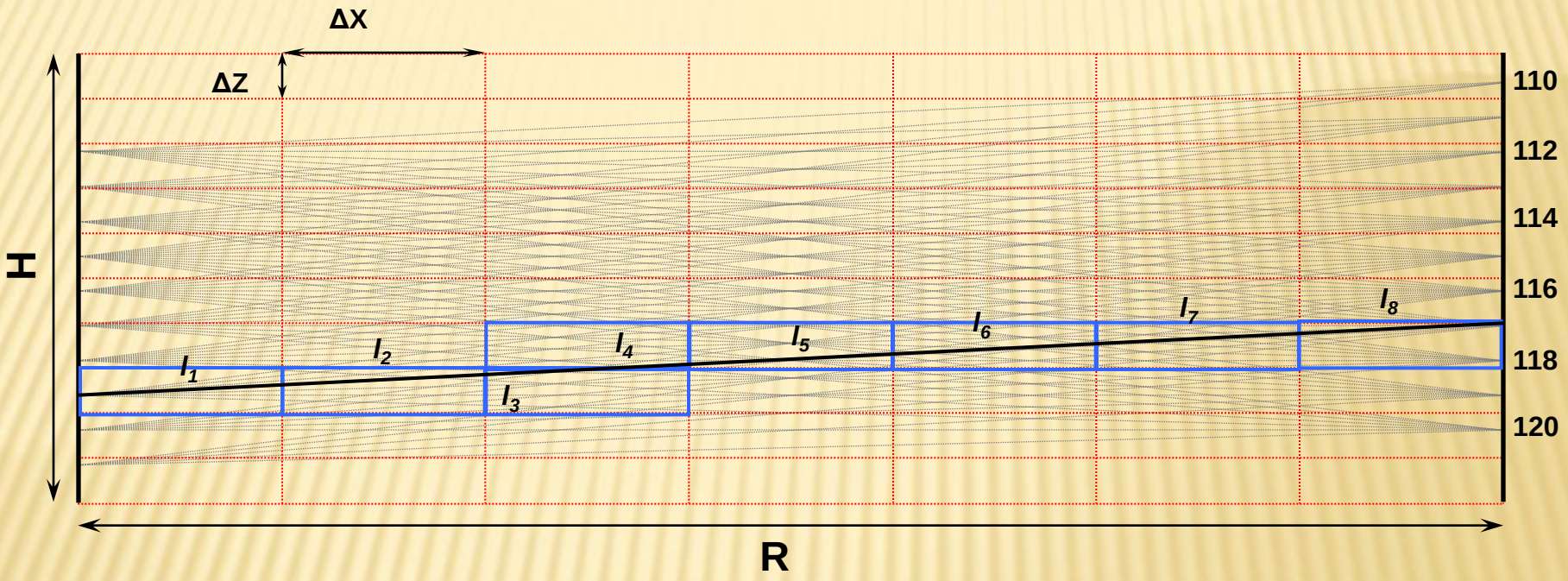
- Borehole array **control**
- Environment **adaptation**
- **3D** geoelectrical mapping
- **4D** time - space monitoring

RWGI EXTERNAL VIEW

Main RWGI survey parameters

Operating frequency	Rocks resistivity	Wave length	Fresnel zone diameter	Resolution	Accuracy of localization
(kHz)	(Ohm m)	(m)	(m)	(m)	(m)
61	30	70	37	11	4
	15	50	31	9	3
	5	29	24	**7**	**2**
156	30	44	30	9	3
	15	31	25	**7**	**2**
	5	18	19	6	2
312	30	31	25	**7**	**2**
	15	22	21	6	2
	5	13	16	5	2

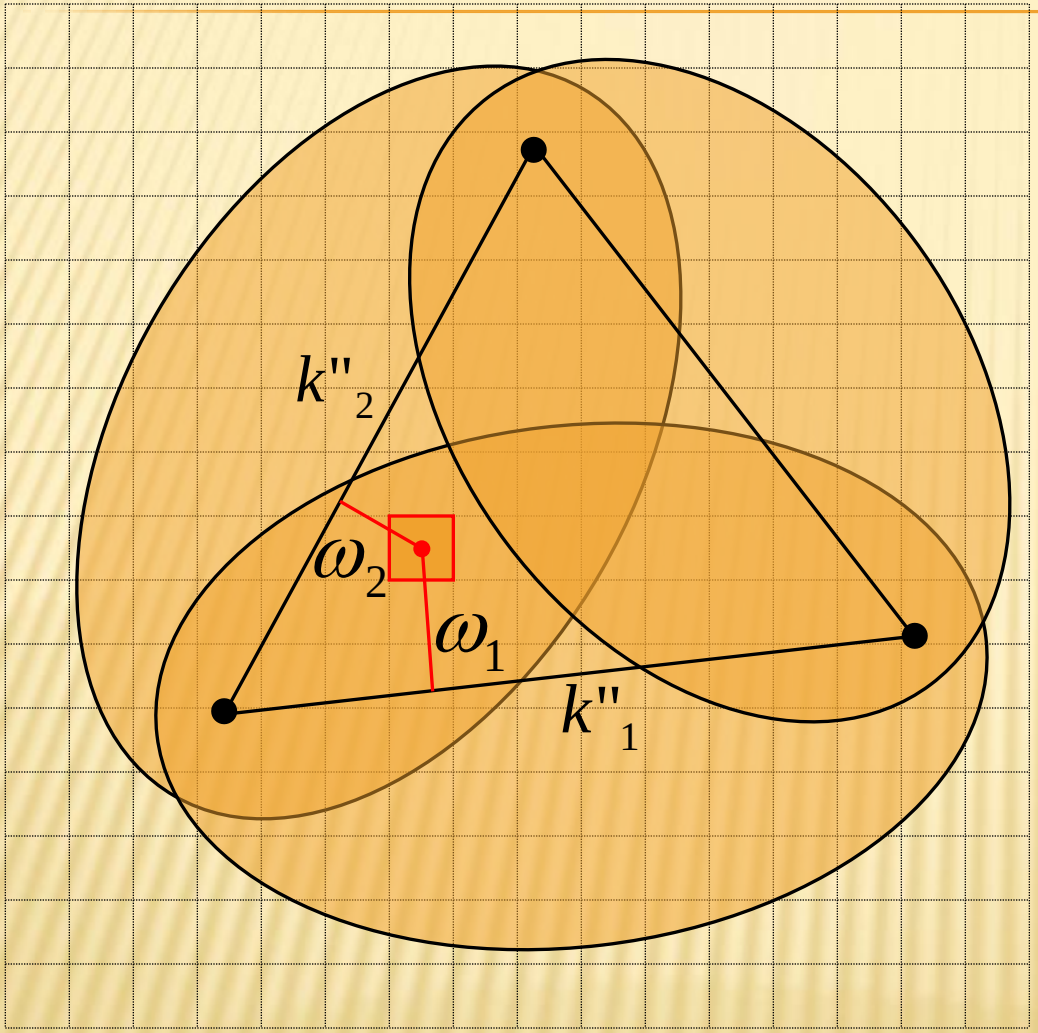
SIMULTANEOUS ITERATIVE RECONSTRECTION TECHNIQUE (SIRT)

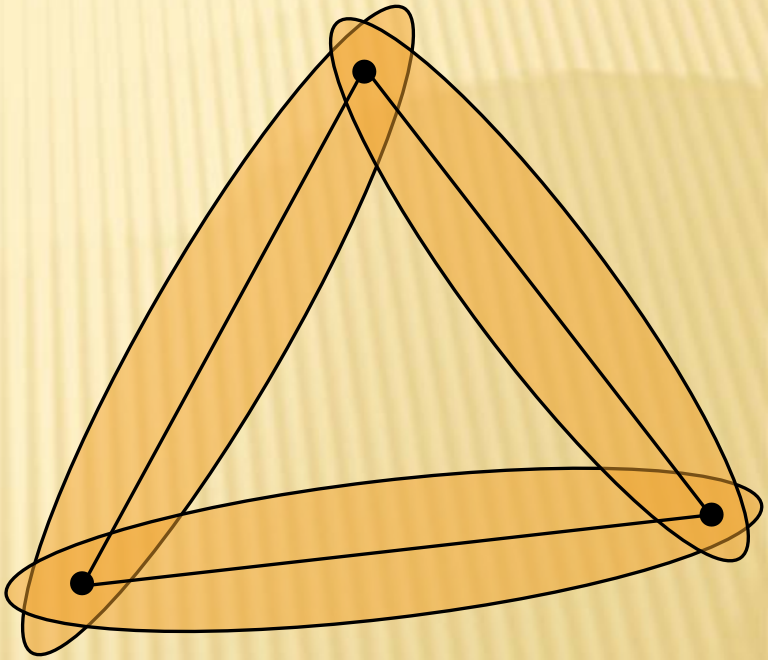


$$E_\theta = E_0 \frac{e^{-k''R}}{R} f(\theta)$$

$$k''\cdot R = k''_1\cdot l_1 + k''_2\cdot l_2 + k''_3\cdot l_3 + \ldots$$

WAVE RECONSTRUCTION TECHNIQUE (WRT)



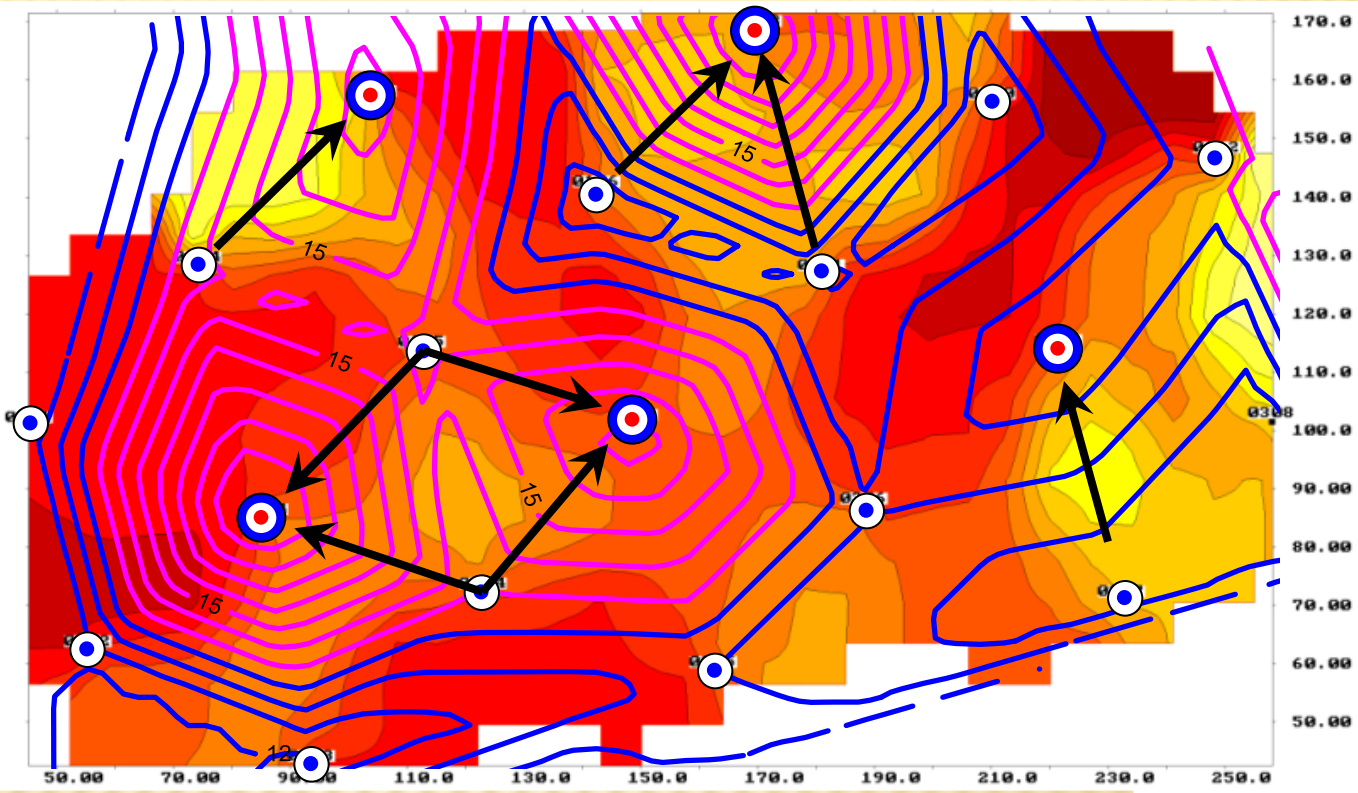


well

ray

$$k''_{av} = \frac{\sum_i k''_i \cdot \omega_i}{\sum_i \omega}$$

Horizontal slice (180m) of 3D geoelectrical map before leaching



well

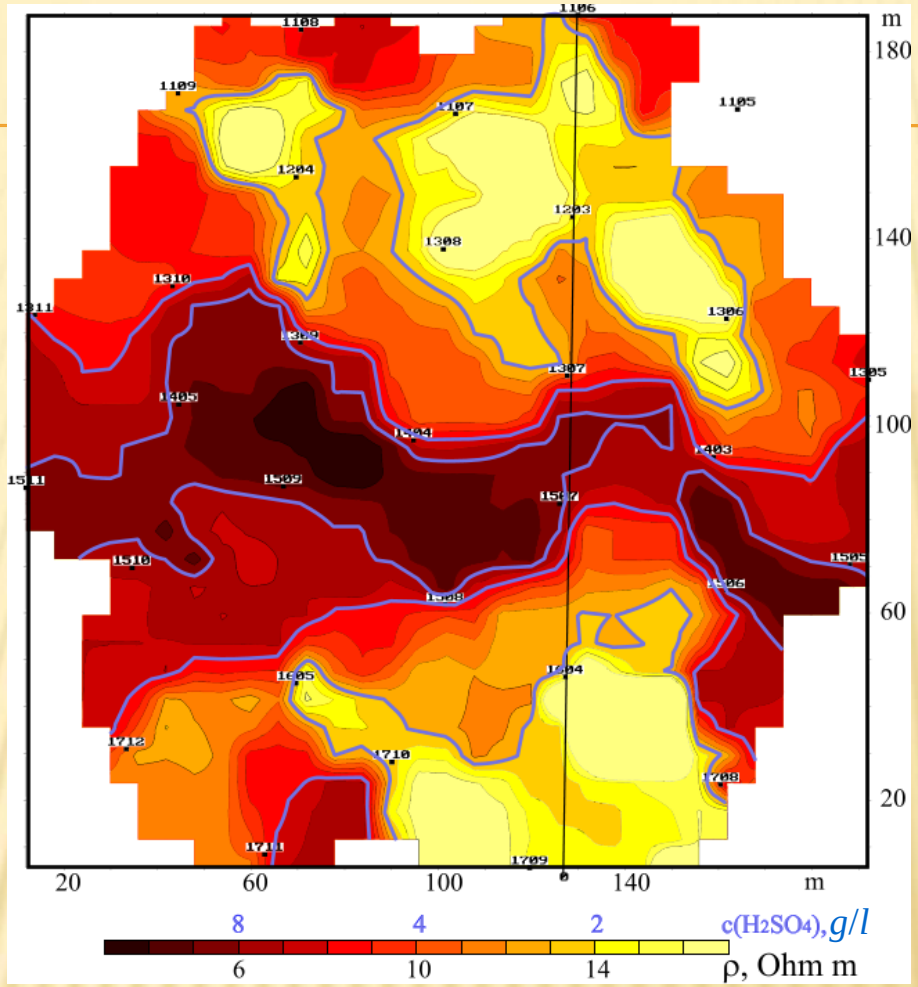
ejection well

Predicted direction of flow producing solutions

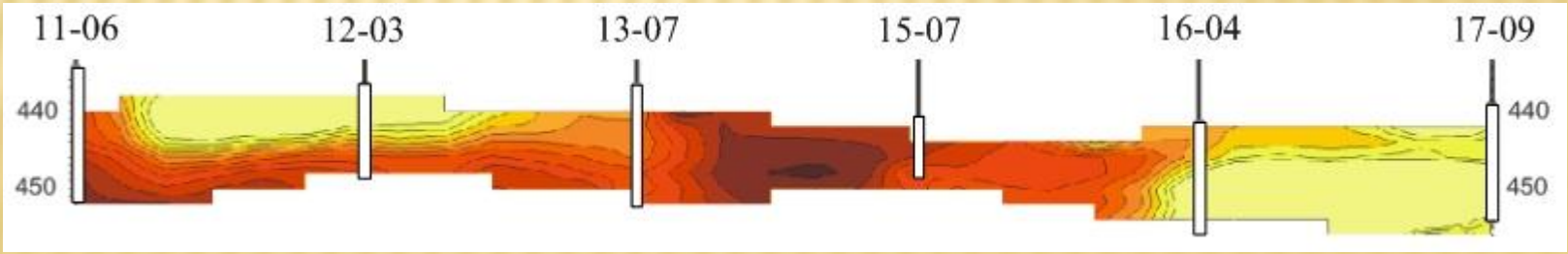
Isolines of flow rate 0.5 м^3/hour

Dalmatovo uranium field. 3D resistivity map

Plan. H=444 m

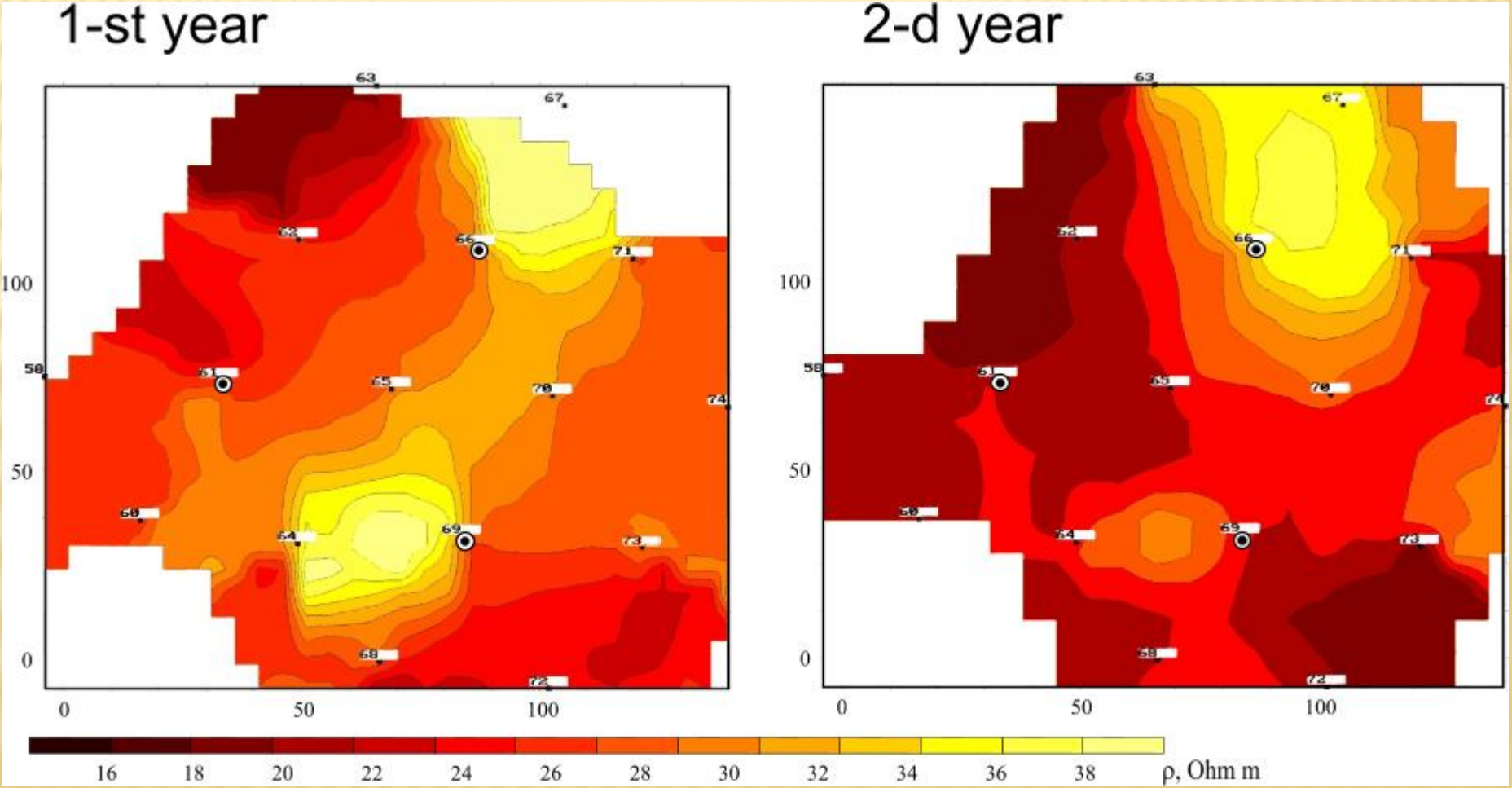


Vertical section



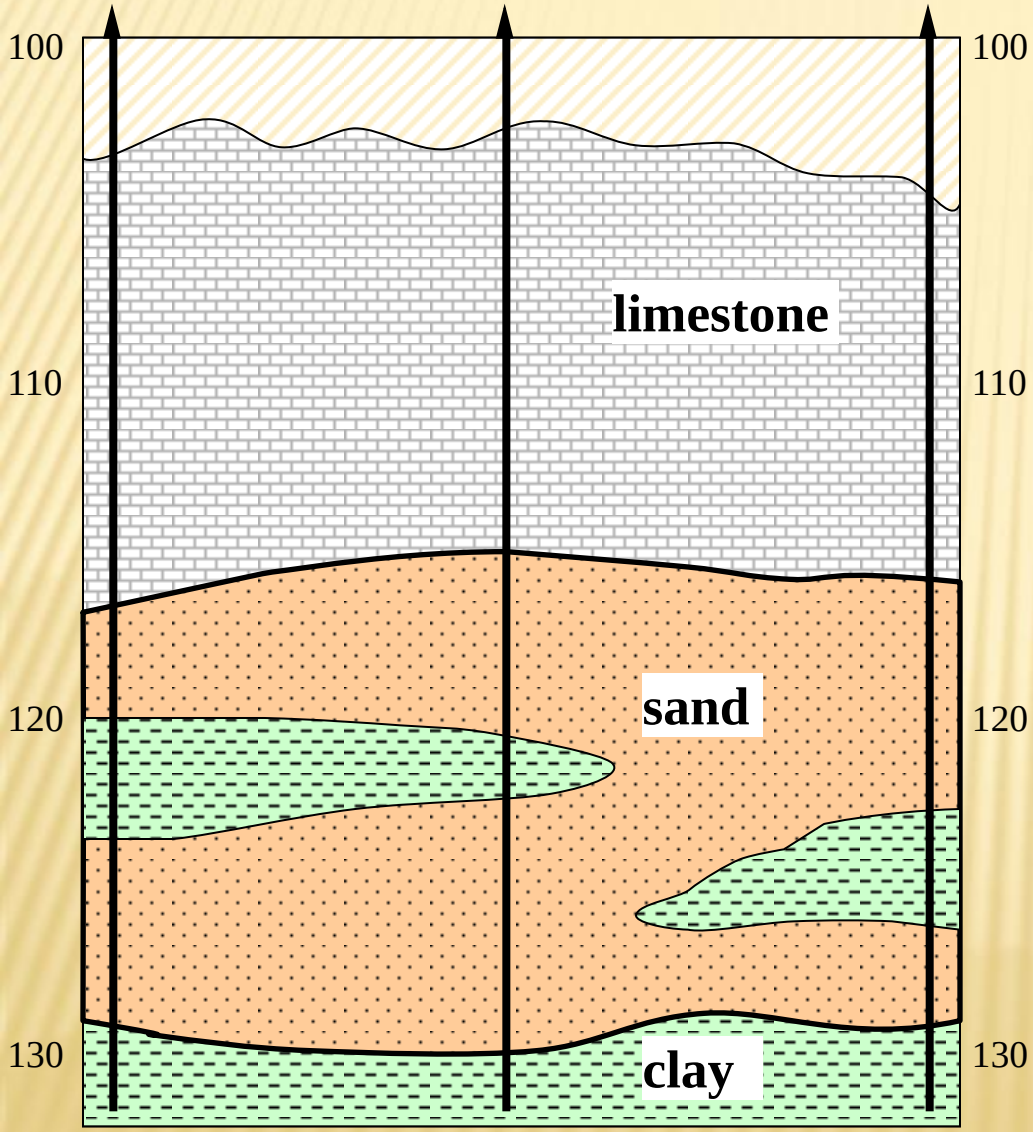
Khiagda uranium field. 4D geoelectrical mapping

Resistivity map after leaching

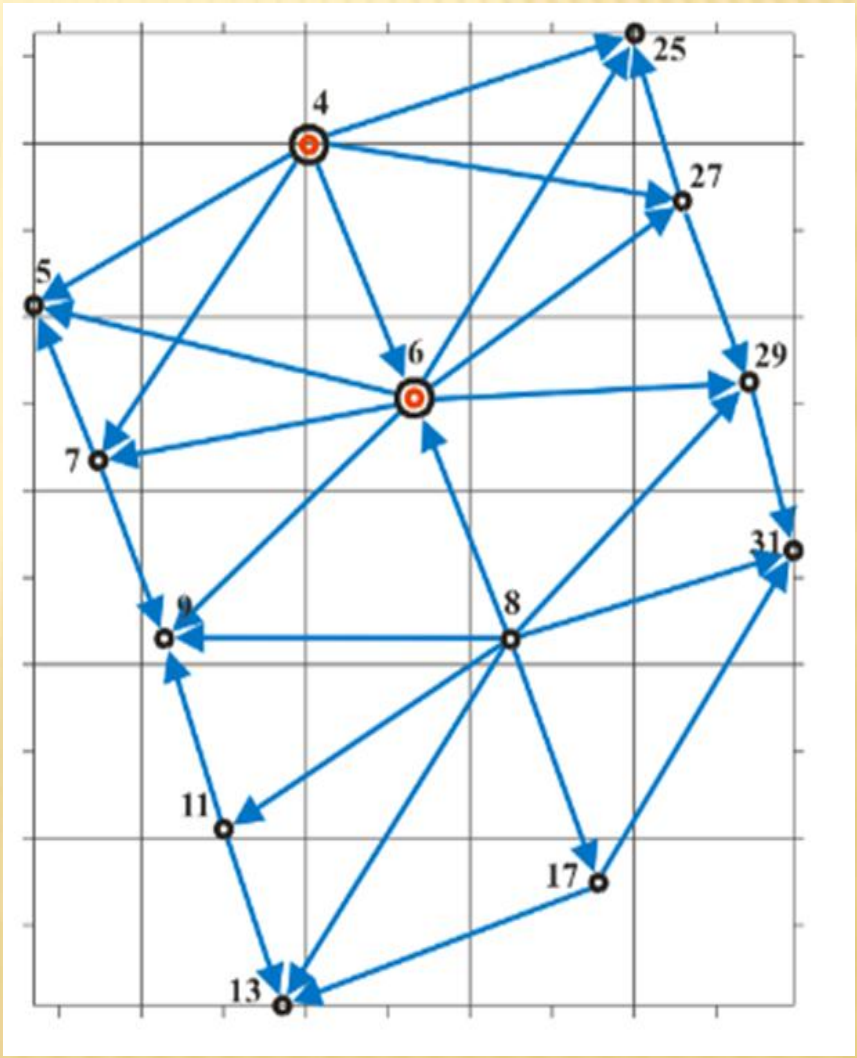


Uranium field. Uzbekistan

Geological scheme



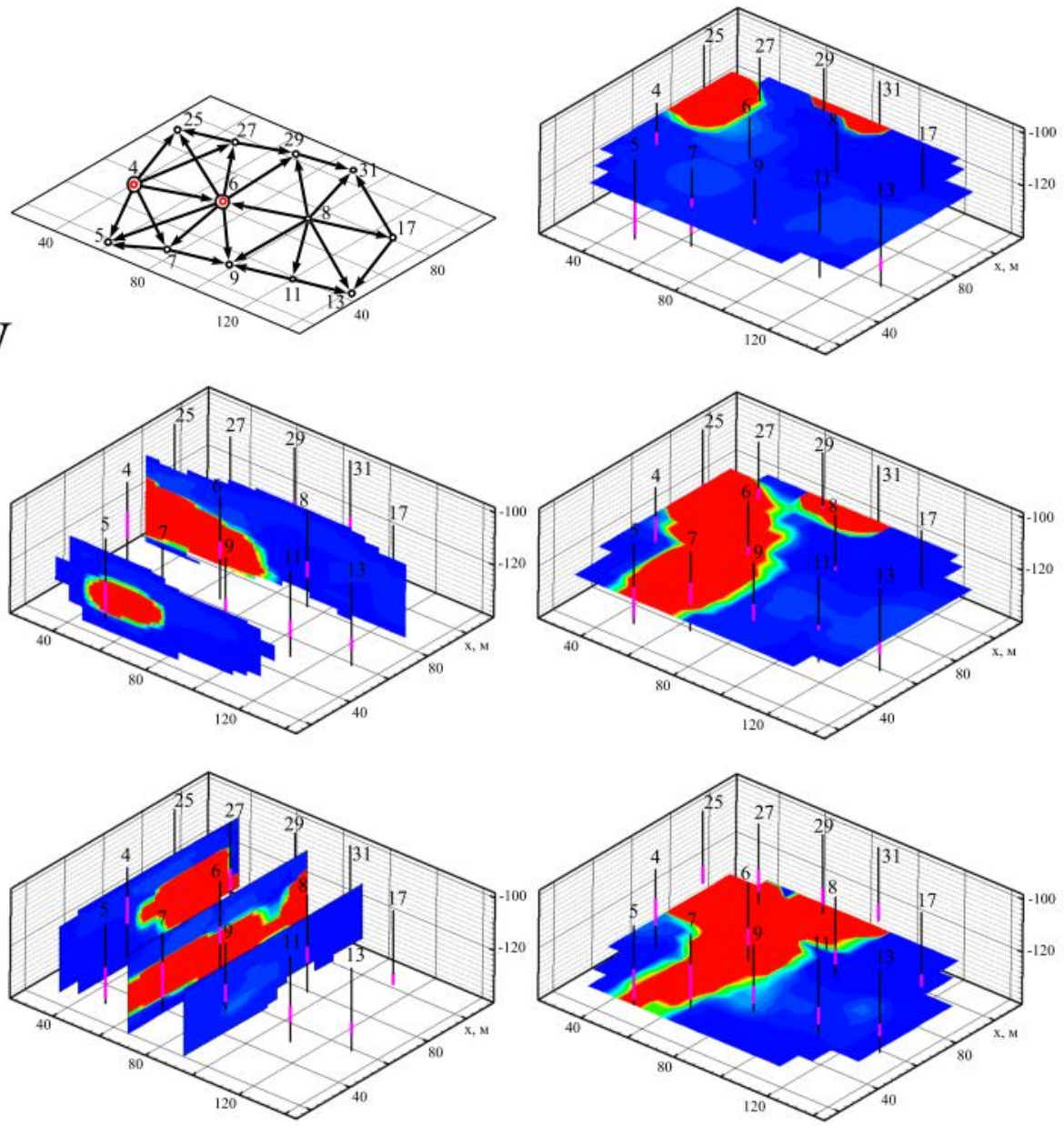
Well pattern

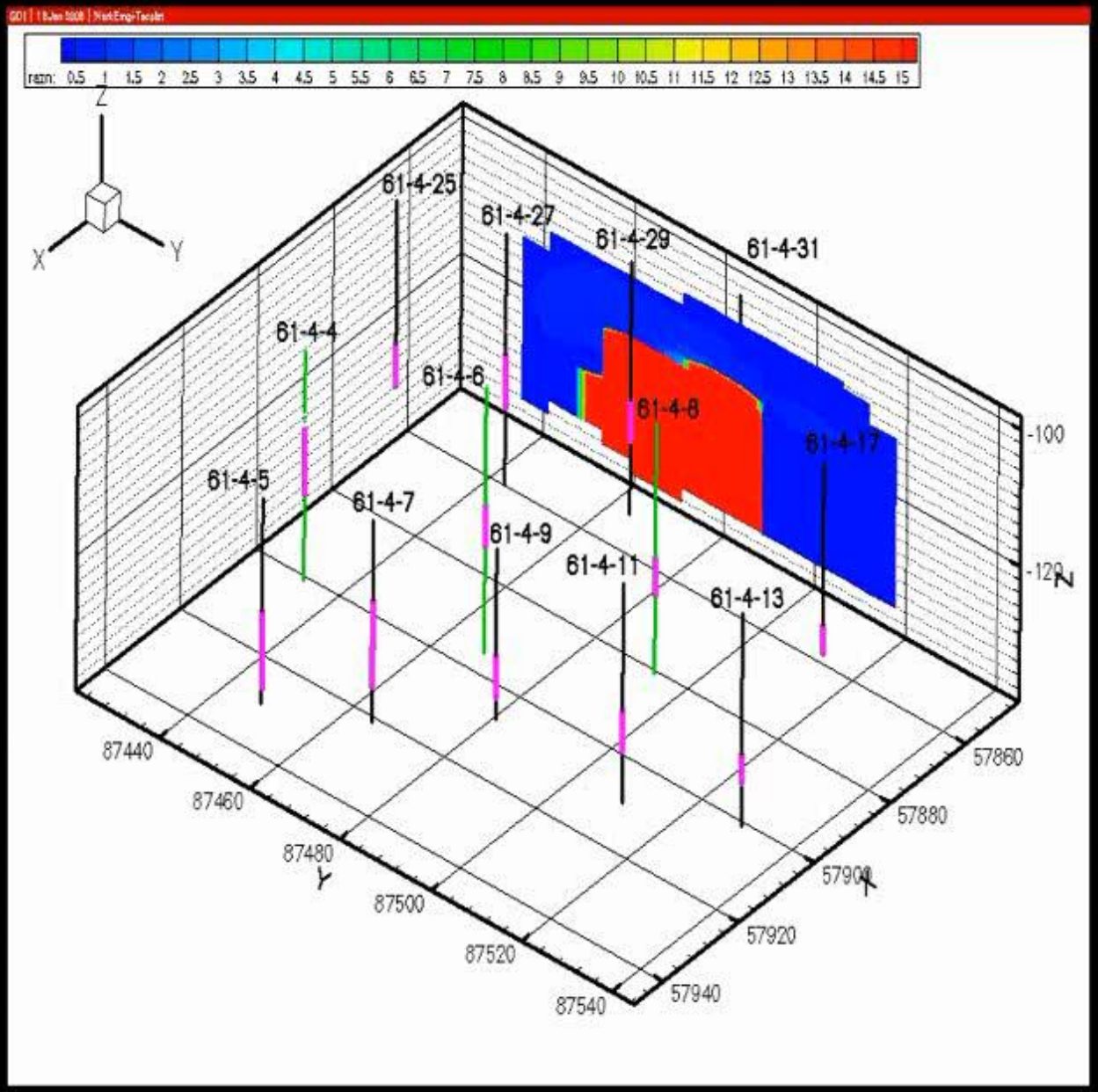


4D RWGI technology results

$$W = \frac{\rho_{after}}{\rho_{before}}$$

W>1

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Z
X
Y
61-4-25
61-4-27
61-4-29
61-4-31
61-4-4
61-4-6
61-4-8
61-4-17
61-4-5
61-4-7
61-4-9
61-4-11
61-4-13
-100
-120
N
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87480
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87520
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Y
57860
57880
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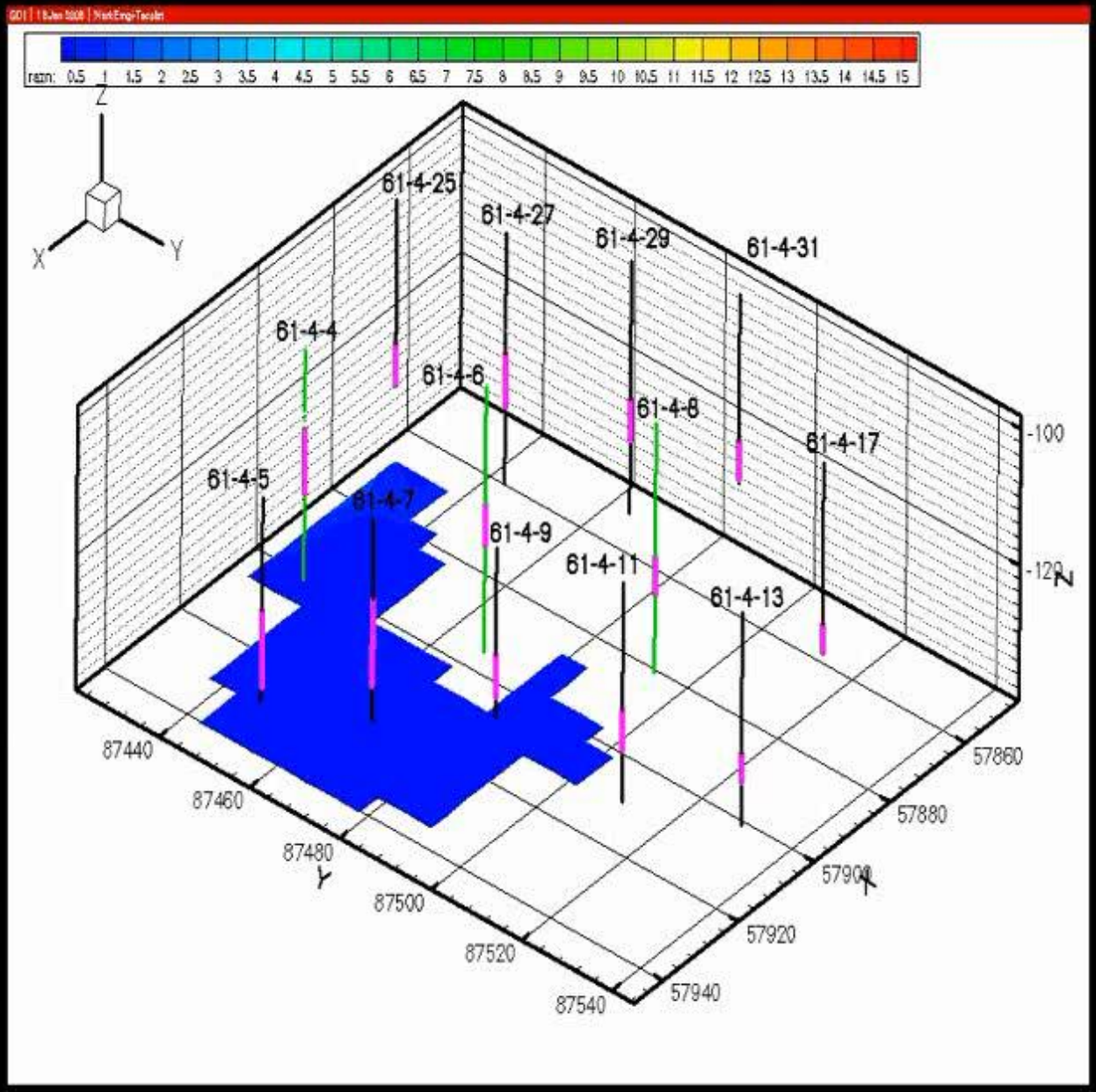
57920
57940
X


rezn: 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12 12.5 13 13.5 14 14.5 15
Z
X
Y
61-4-25
61-4-27
61-4-29
61-4-31
61-4-4
61-4-6
61-4-8
61-4-17
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61-4-9
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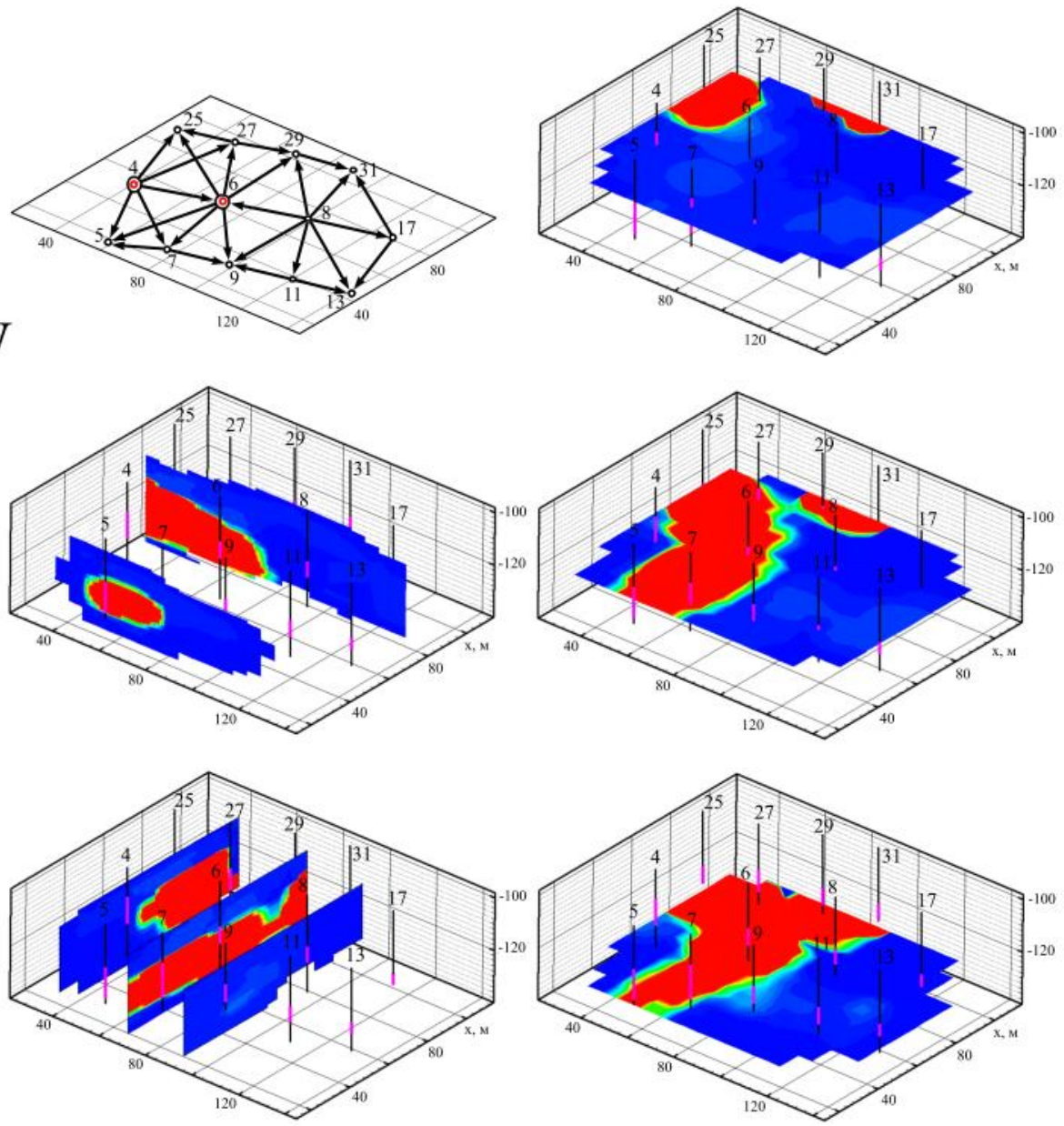
61-4-13
-100
-120
N
87440
87460
87480
87500
87520
87540
57860
57880
57900
57920
57940

4D RWGI technology results

$$W = \frac{\rho_{after}}{\rho_{before}}$$

W>1



Acknowledgements