REMOTE SENSING METHODS FOR INVESTIGATING OUTGOING INFRARED RADIATION OF RECENT LARGE REGIONAL FAULTS AND ITS TERRESTRIAL HEAT FLOW AND GEOCHEMICAL HALOES

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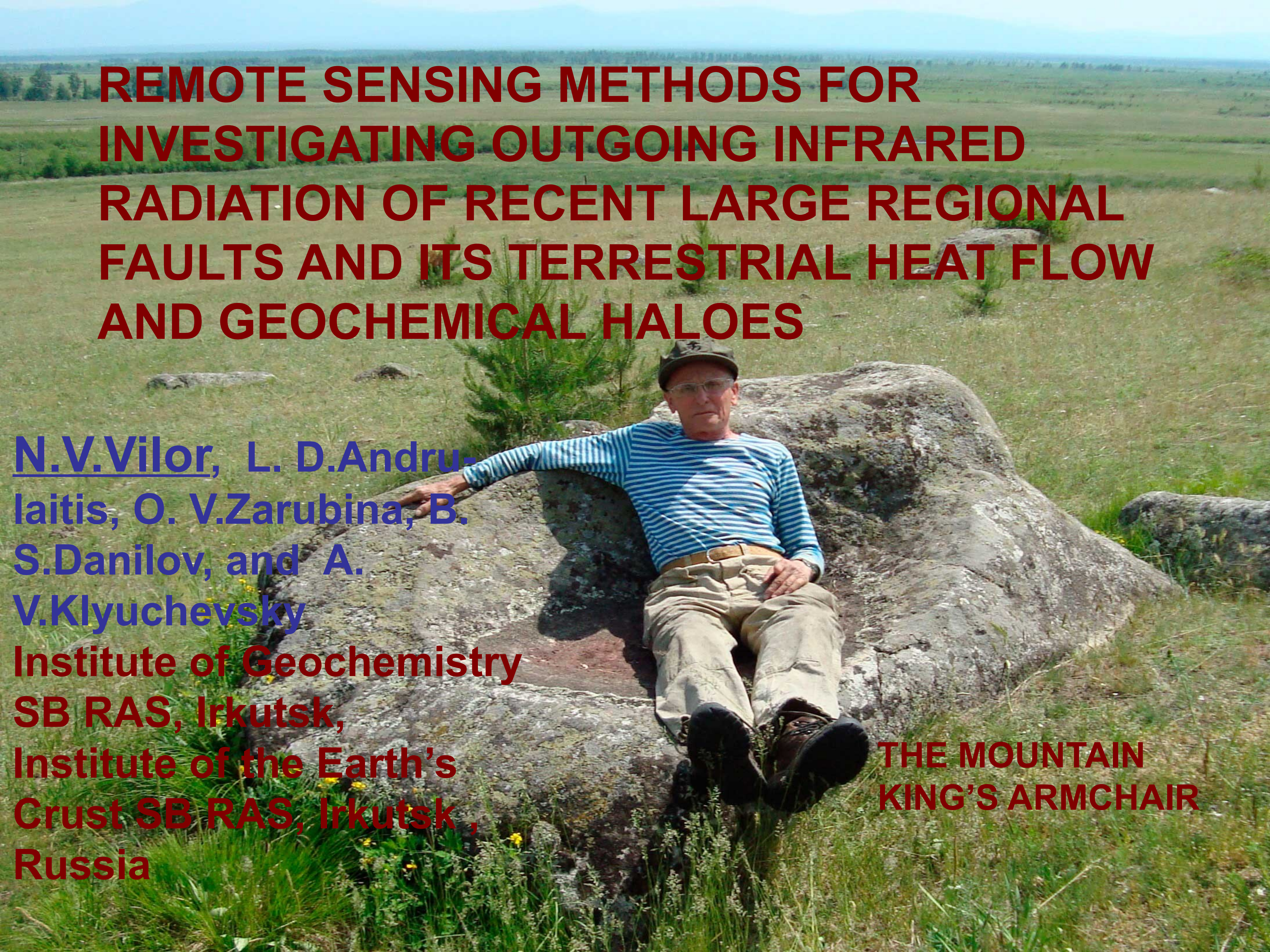


THE MOUNTAIN KING'S ARMCHAIR

Purpose

·**Determination of intensity** of outgoing IR radiation flow of large seismoactive regional faults, which are expose by surface heat flows by remote sensing method and correlation this flow with transfer of mobile chemical elements and its geochemical flows

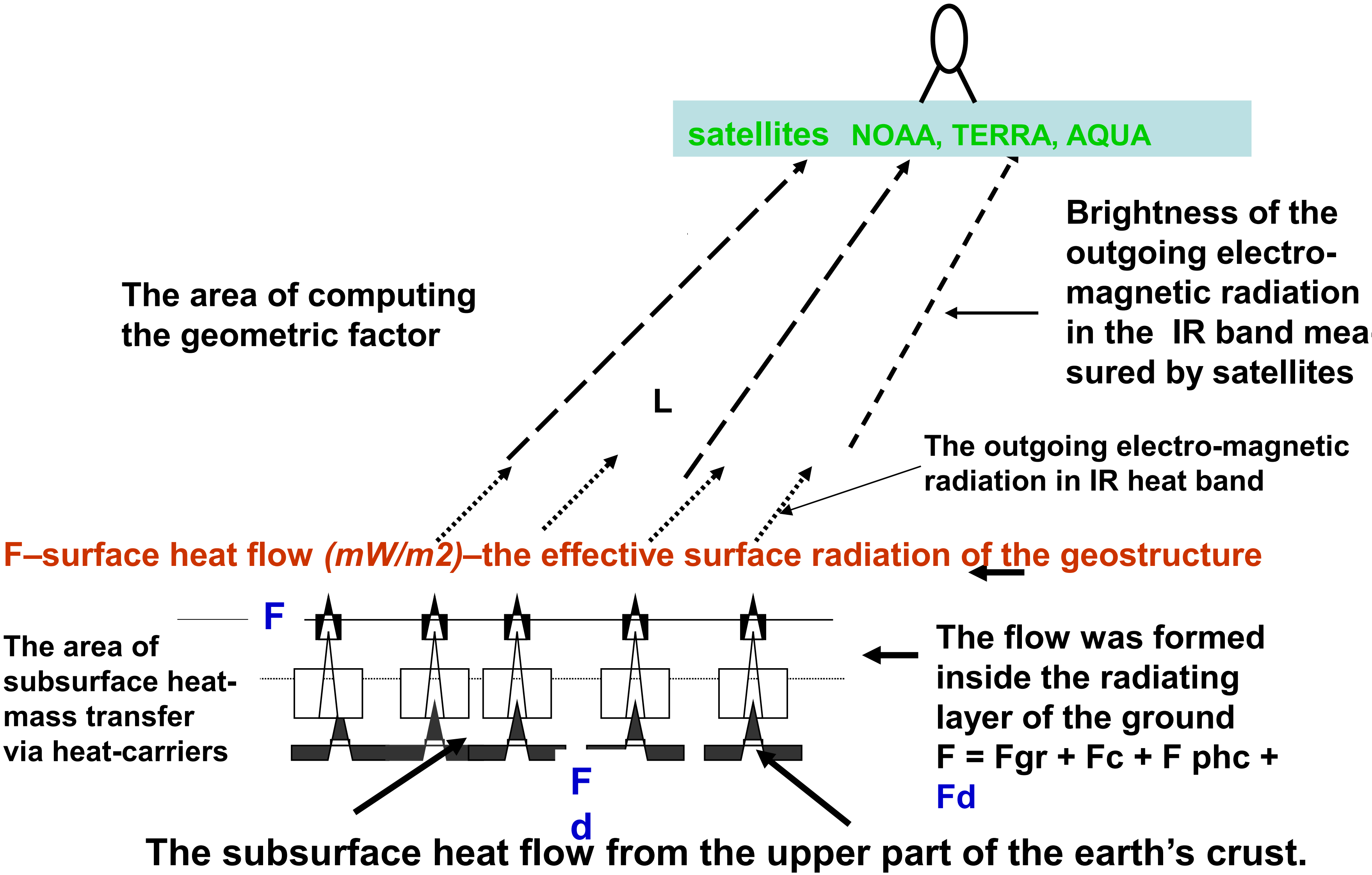
Items

· **the remote sensing method of mapping** of distribution of intensity of outgoing IR radiation flow for different geodynamic situation_

· **the investigation of nature** of surface outgoing IR radiation flow_

· **the investigation of distribution** of mobile chemical elements into surface formations of regional faults _

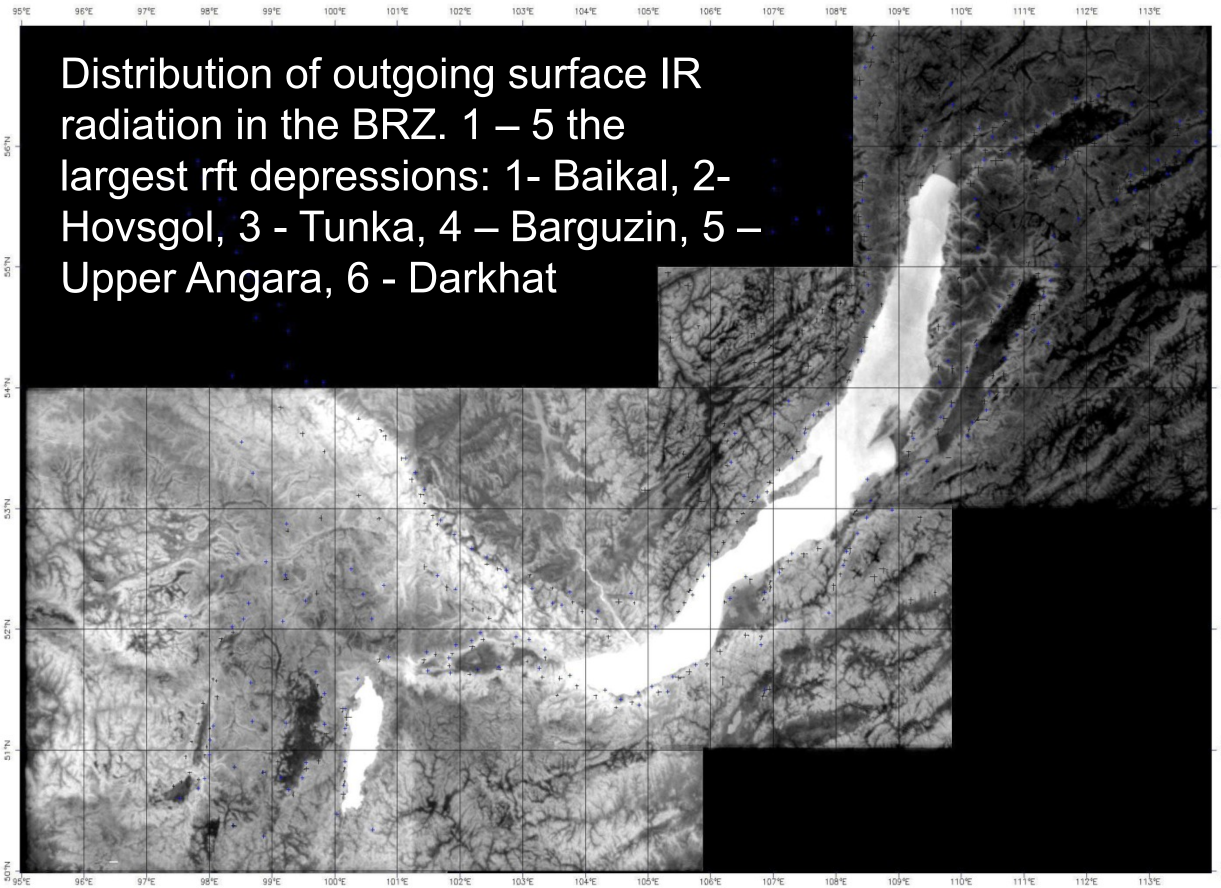
· **the calculation of its geochemical flows** by using the conception of geochemical barriers

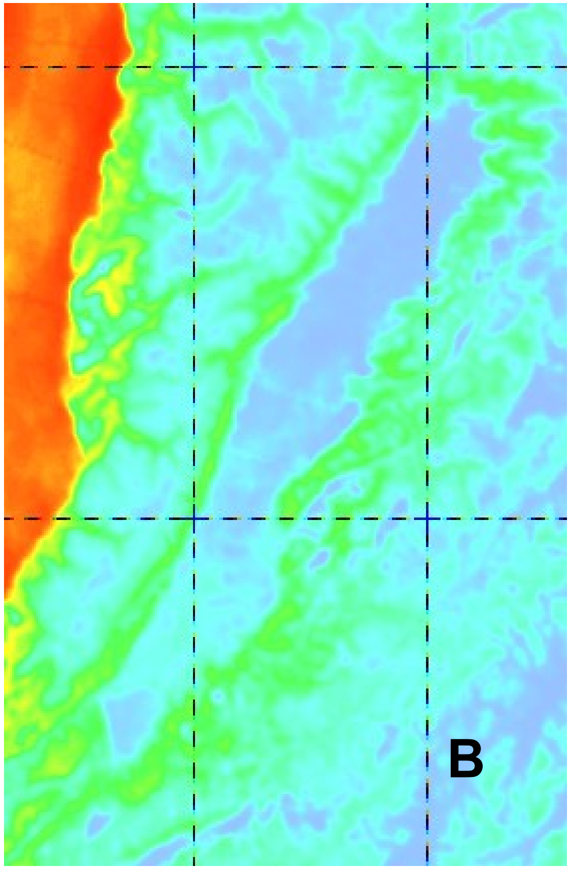


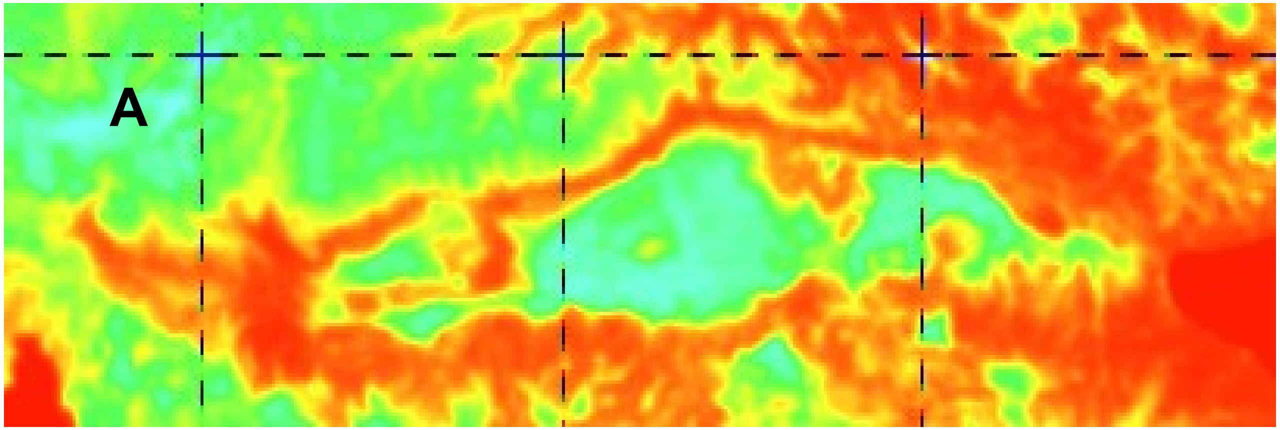
THE SCHEME OF THE ORIGIN OF THE SURFACE INFRARED RADIATION OF THE LARGE REGIONAL FAULTS

Geodynamical situations of manifestation of outgoing surface IR radiation flow of large seismoactive regional fault

Type of regional deformation	Region
Tention, rifting	Baikal rift zont (BRZ), Rhine graben, “Afar triangle” + Eastern – African rift
Displacement	San – Andreas transform fault system
Collision	Himalayas, Western- Copetdag structural arc
Block compression, ramp situation	Tarim basin and its folded frame



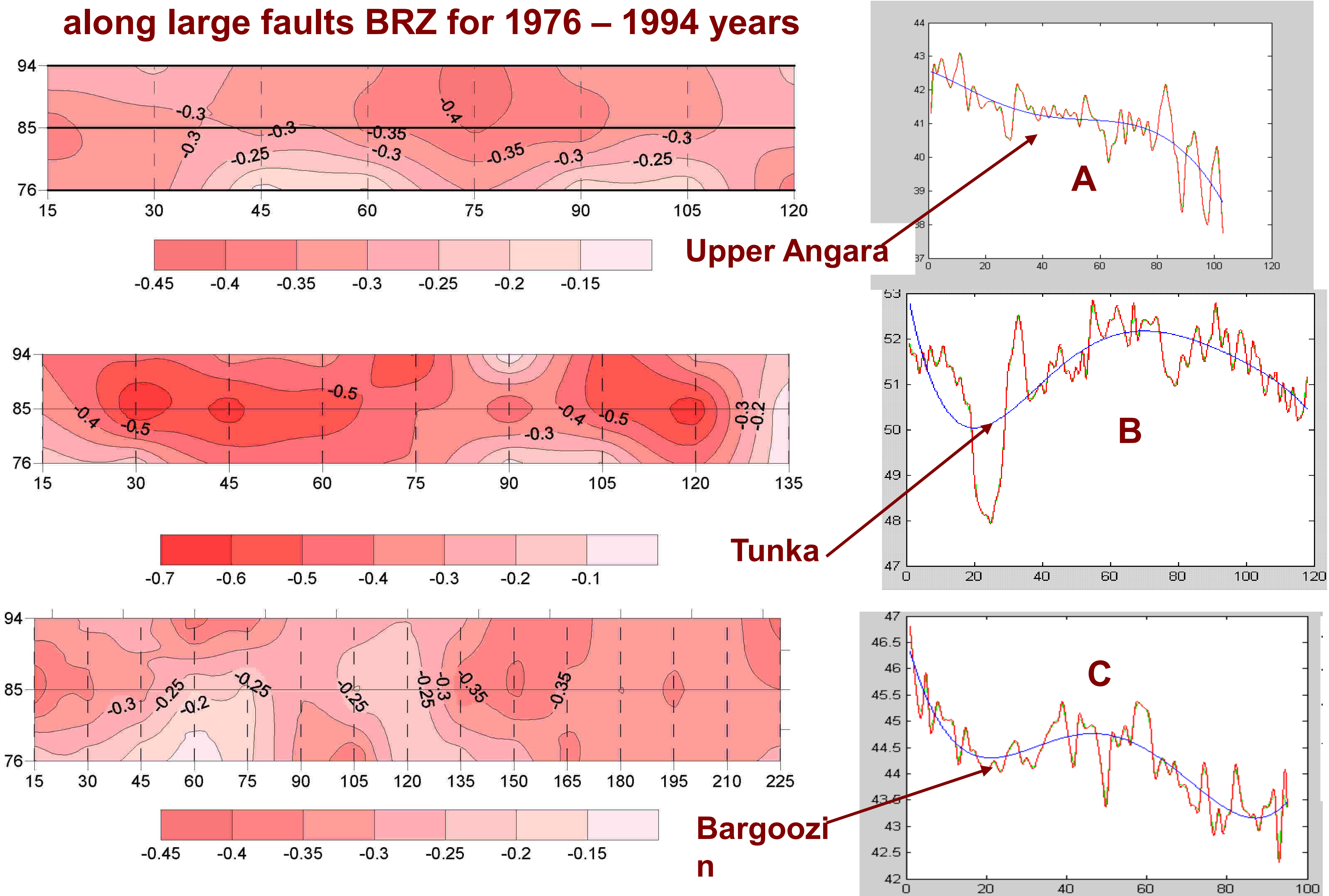




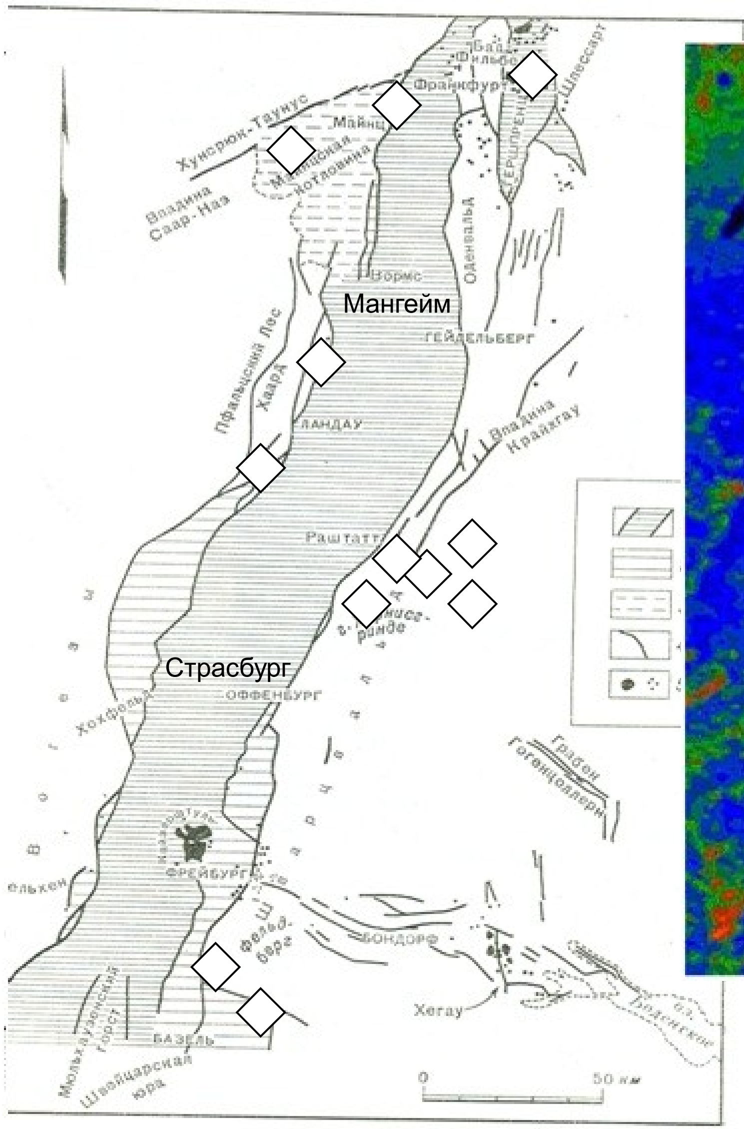
Rift situation.

Outgoing surface IR flow large tectonic depressions BRZ. A. Tunka depression. B. Bargoozin

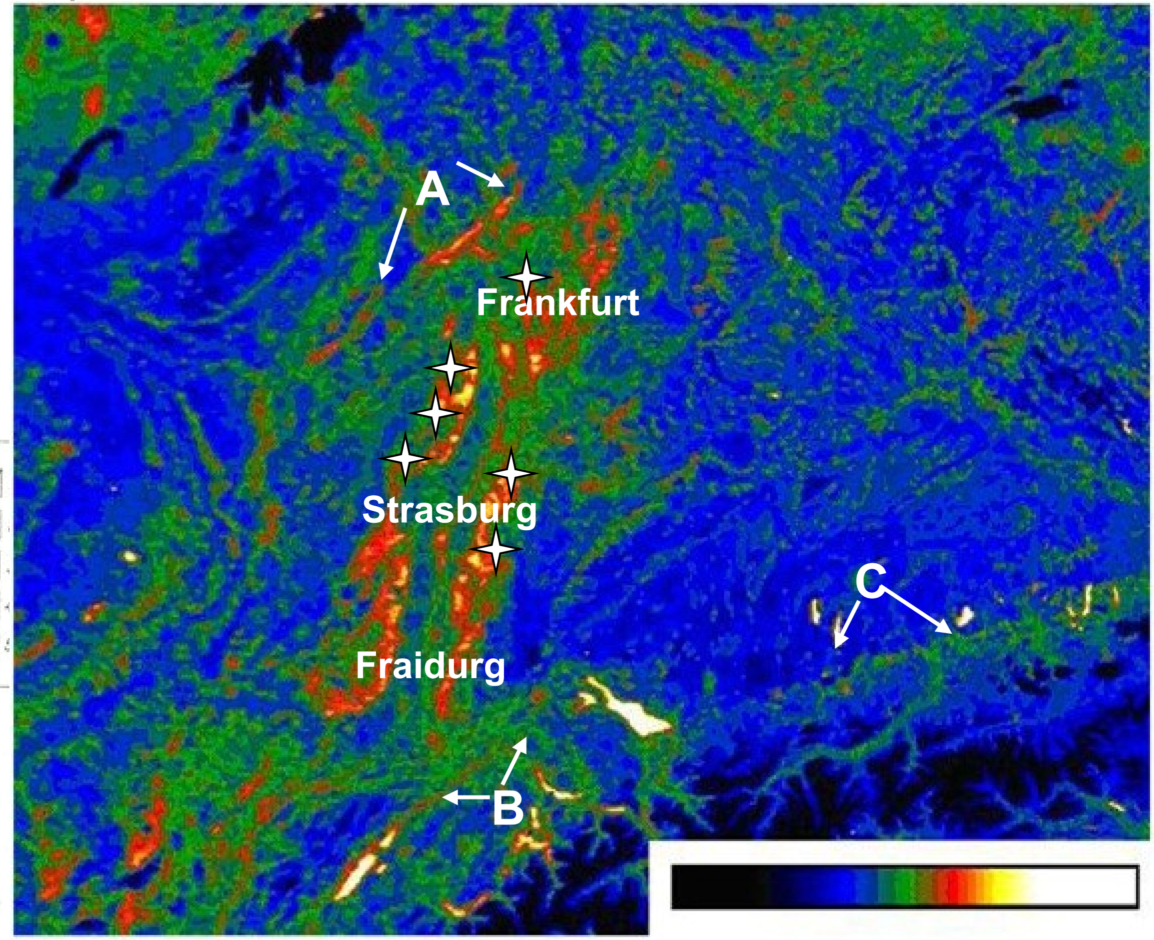
The temporal maps of regional permeability along large faults BRZ for 1976 – 1994 years



The low length wave of geometric component of plots of outgoing surface IR flows of BRZ'largest

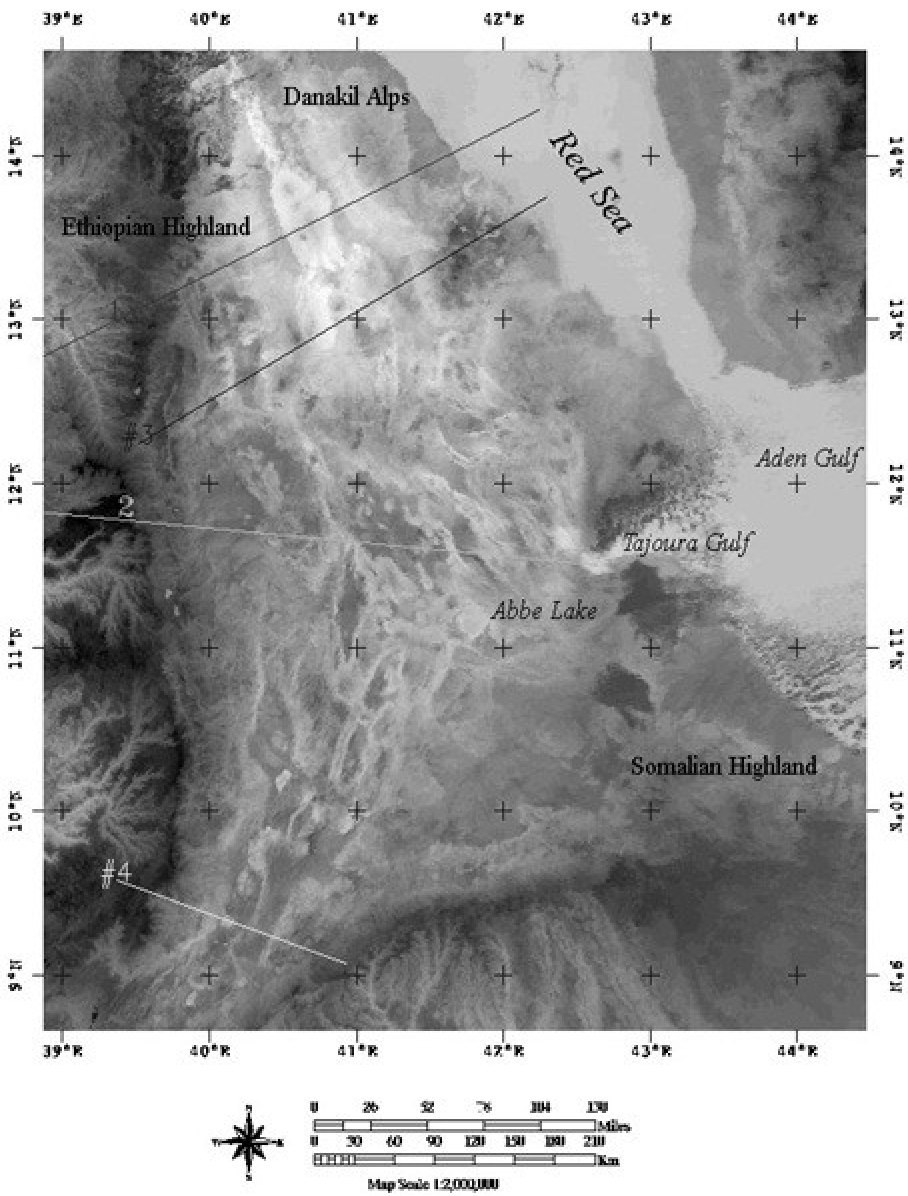


The structural map of Rhine graben. ◇ thermal water springs (after Friedrichsen,1981



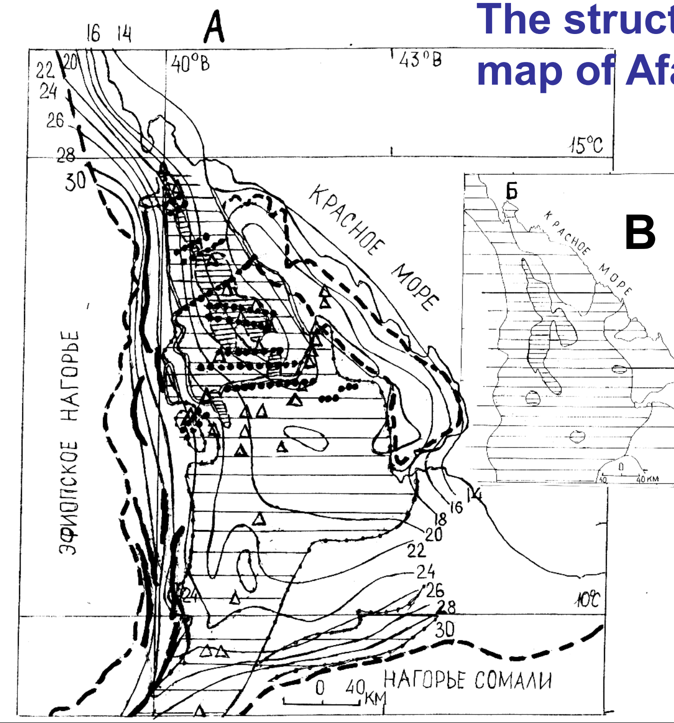
Outgoing surface IR flows map of Western Europa part with Rhine graben. A, B, C – large regional faults (after Gorni V.I. 2007)

✧ famous water spring



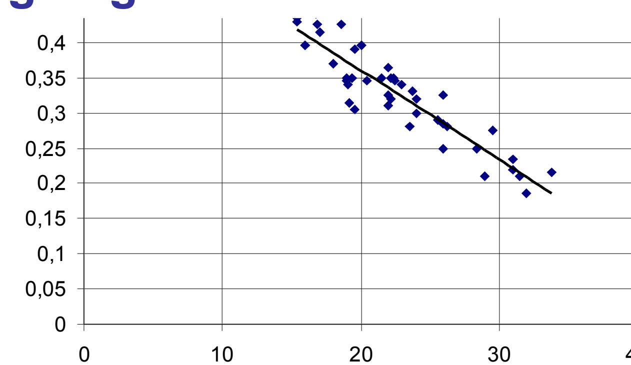
The outgoing surface IR flow map of Afar depression and mouth of Eastern African rift

The structural map of Afar

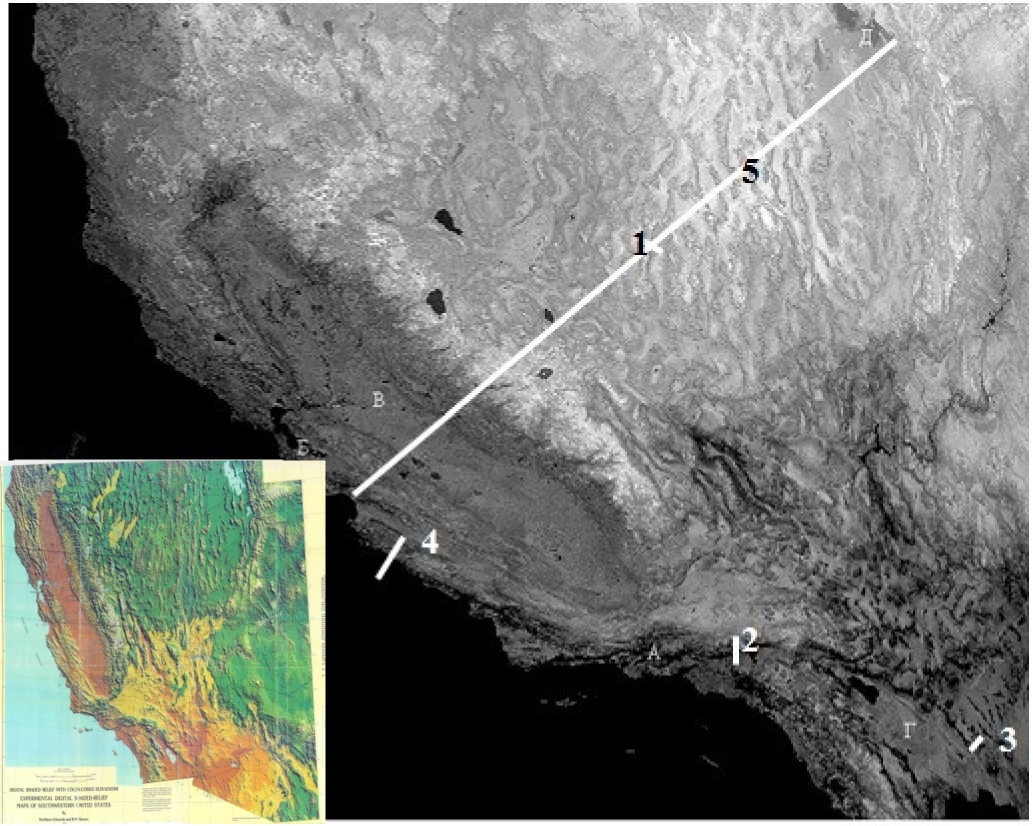


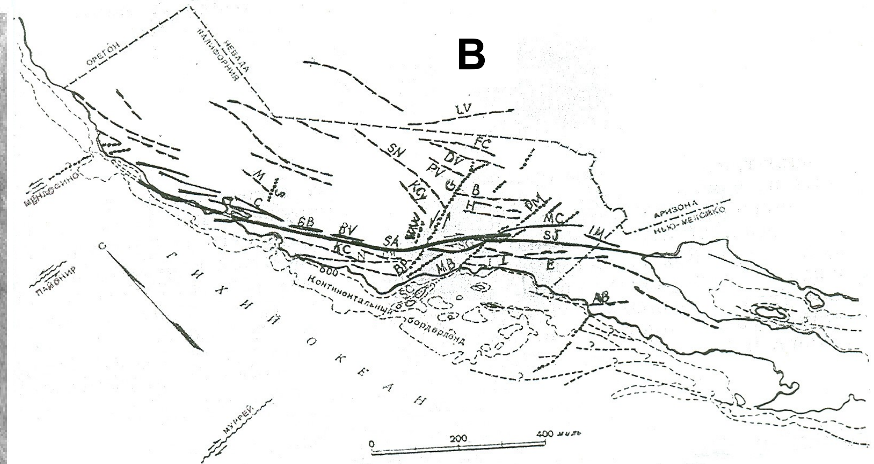
The correlation of the depth of bedding of Moho surface and outgoing IR flow

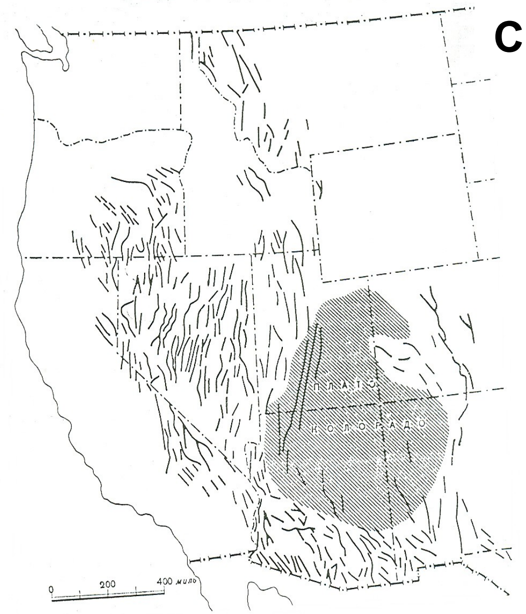
The IR flow



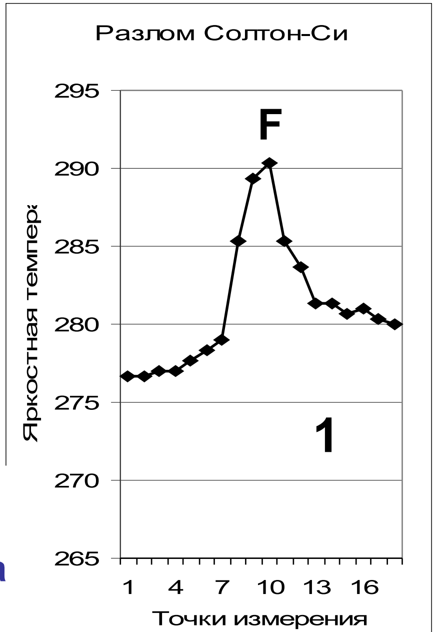
The depth of bedding of Moho surface, km

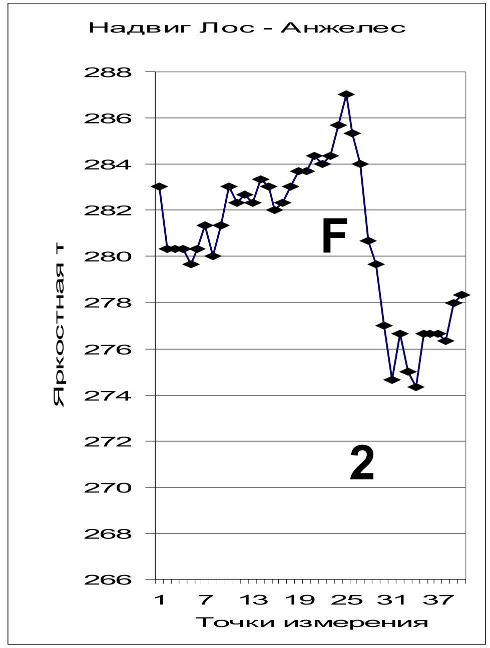


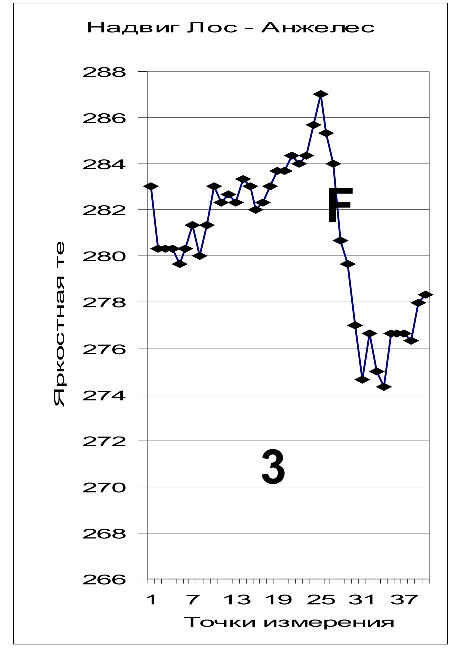




<u>The displacement geodynamic situation</u>. IR radiation distribution on western part of USA(A) and structural maps of San-Andreas transform fault (B) and Big Basin province (C) (after R.L.Cook andJ.A.Thomson, 1970)

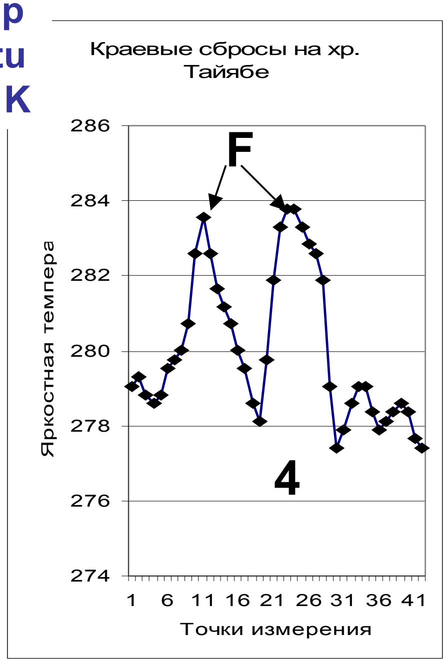


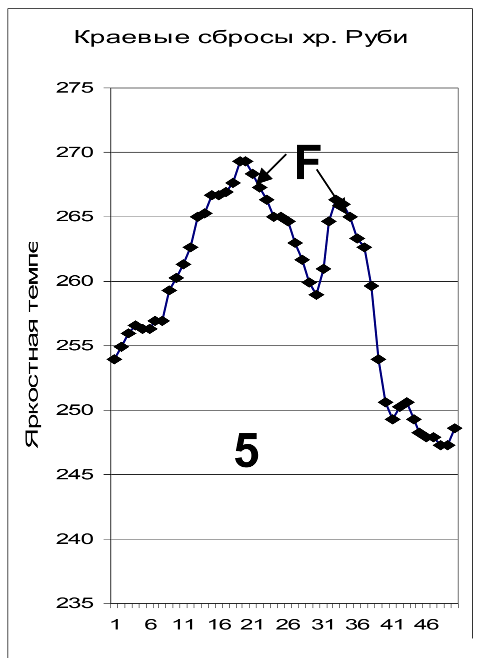


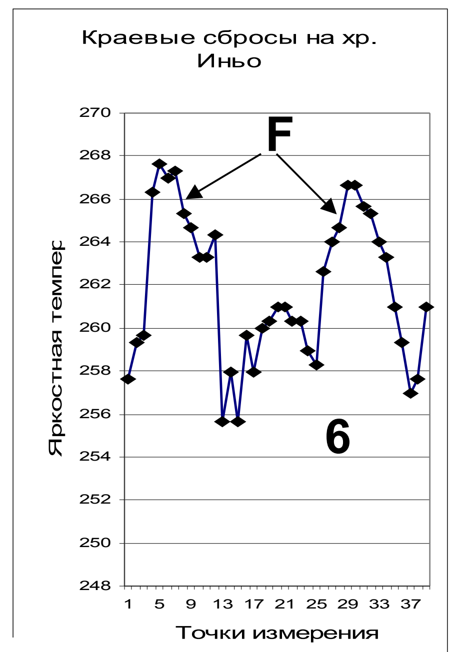


IR radiation anomalies of the surface of large faults of San Andreas system (1-3) and on faults of Big Basin province (4-6) F – fault's tracks

IR radiation temperature, K

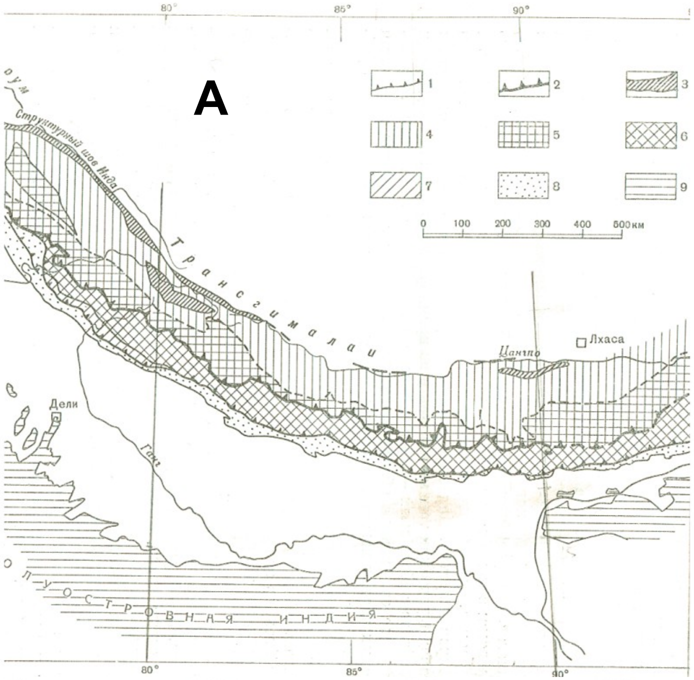


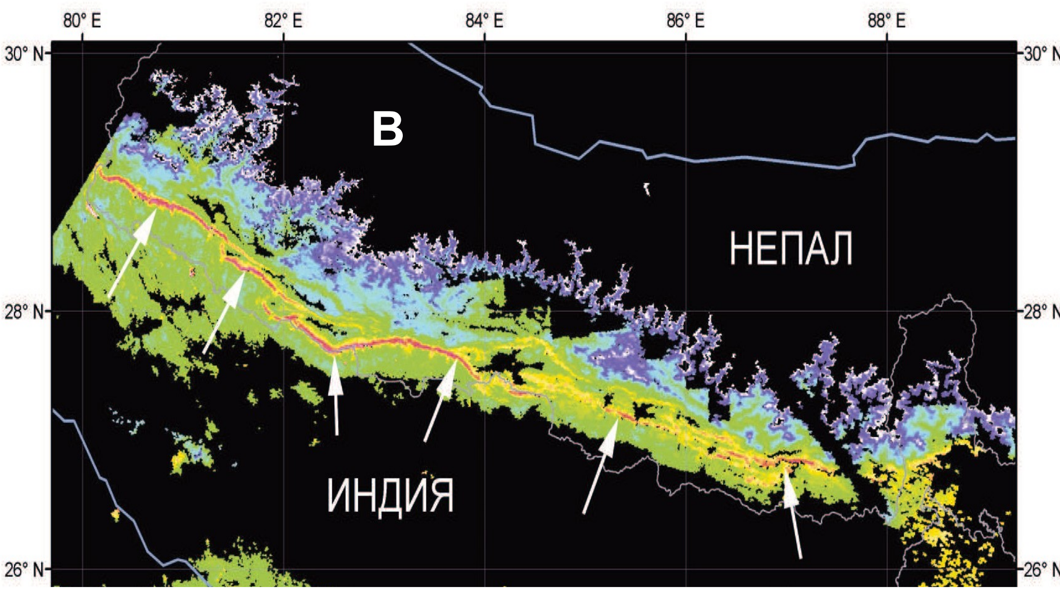




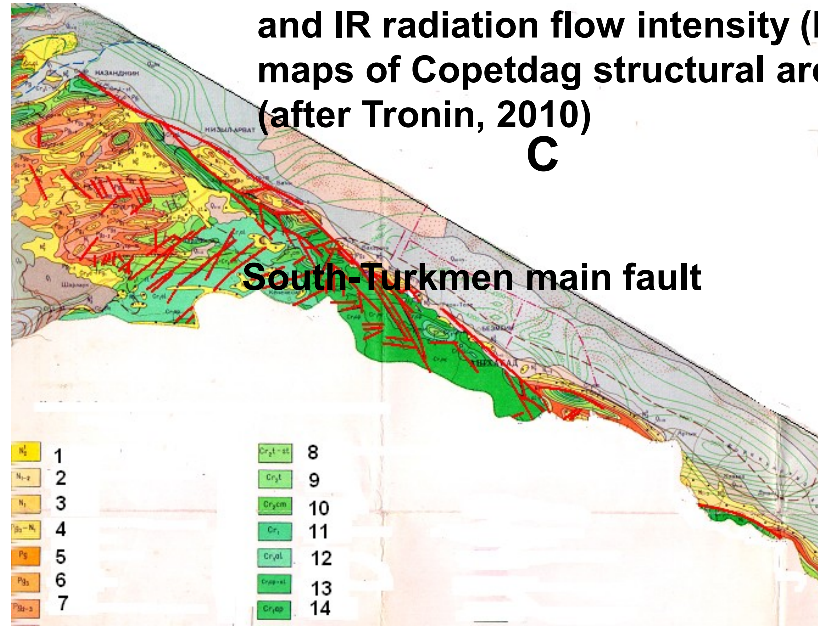
Points of dimention

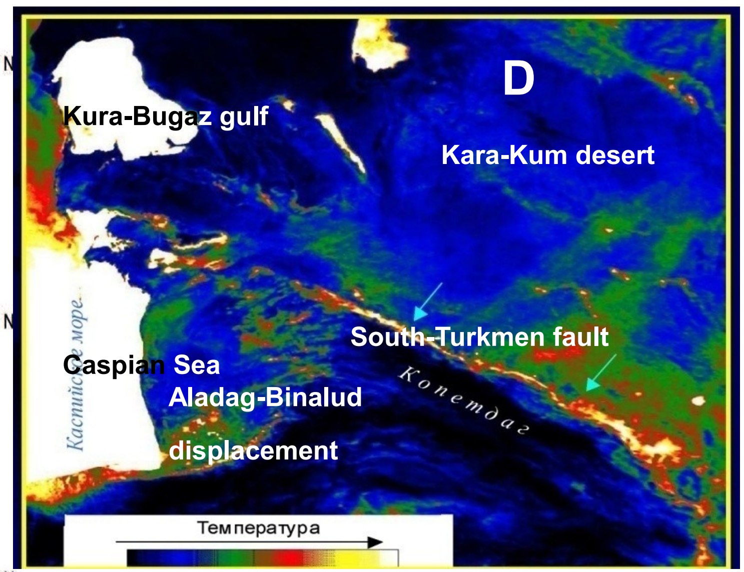
Collision situation. Structural (C) and IR radiation flow intensity (D) maps of Copetdag structural arc (after Tronin, 2010)



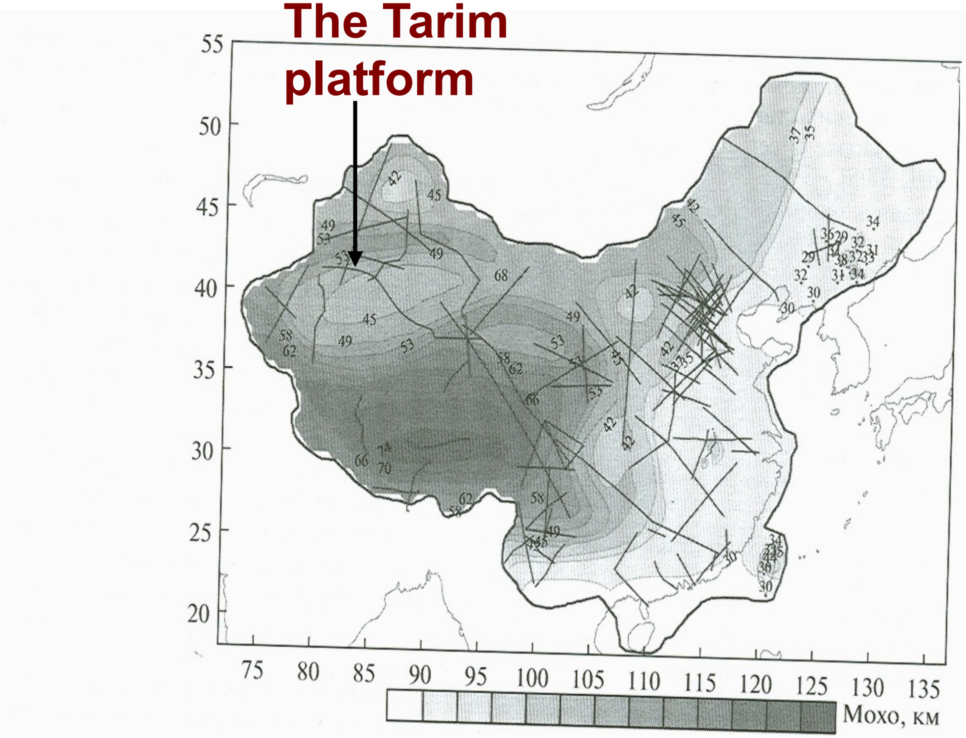


Structural (A) and IR radiation flow intensity (B) maps of the main bord er





The Tarim platform



The new map of Moho surface for Chinese territory

by Baranov, @Earth Physics, N1, 2009

Remote sensing and investigation of leaving regional faults infrared radiation and its geophysical and geochemical components

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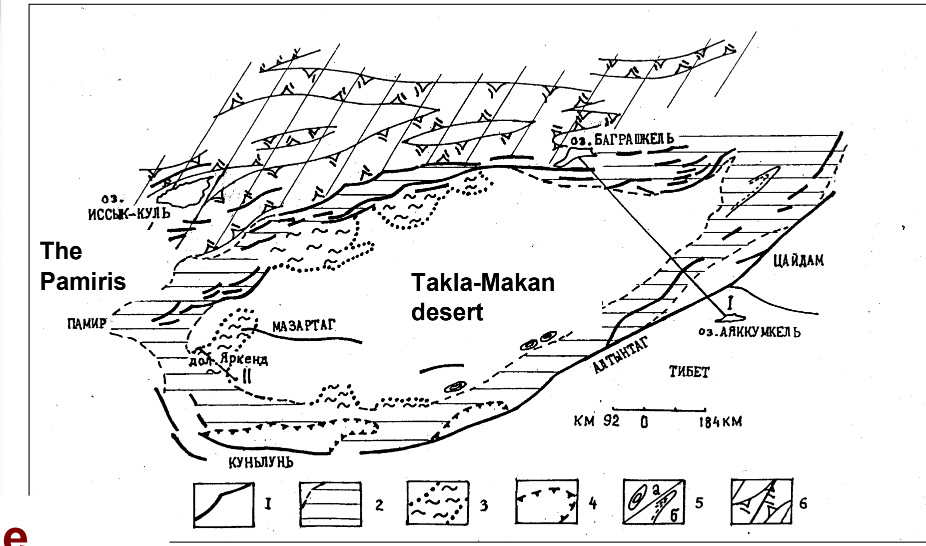
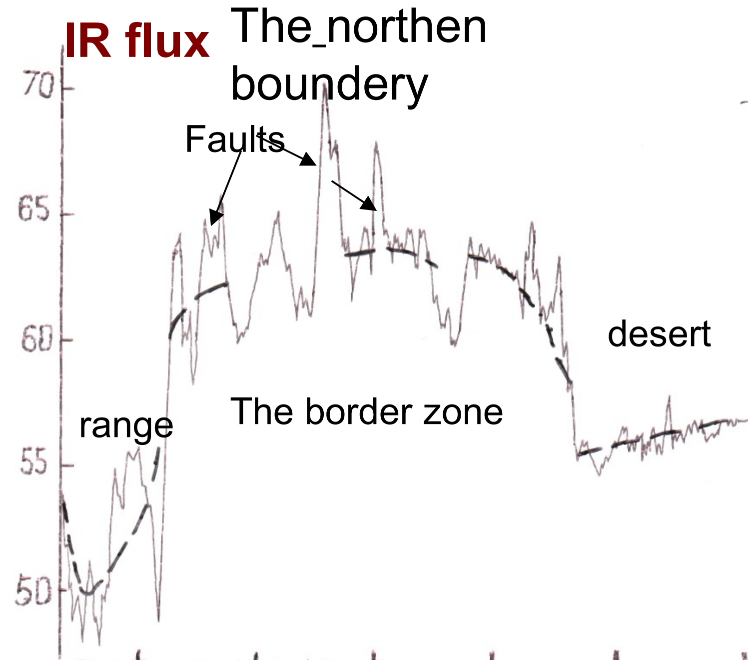
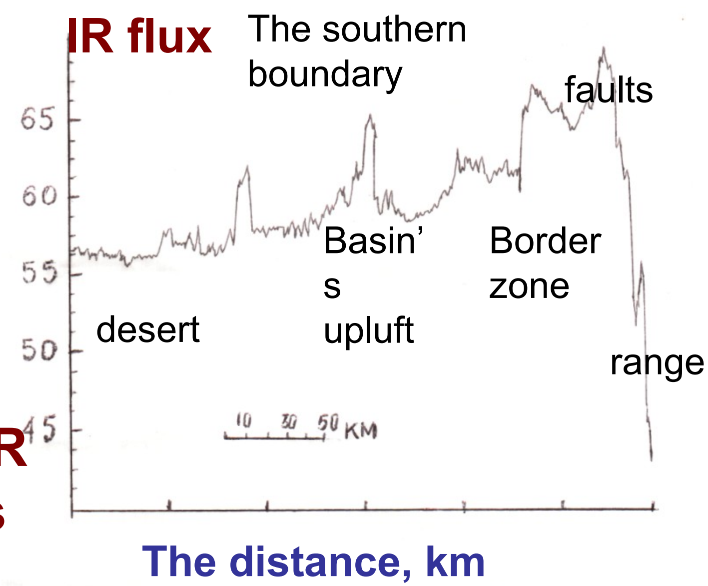
Fig.3 Location of regional faults on the Tarim platform and its folded margins, the compression structure



Ramp situation

›pes of the uplifted block of the upper crust, which corres-ponds to the massif of the Tarim platform.





Brightness of the contrast outgoing surface IR flow for the Tarim platform and its framing (January 2001, night)

The distribution of IR flux intensity across Tarim platform

Remote sensing and investigation of leaving regional faults infrared radiation and its geophysical and geochemical components

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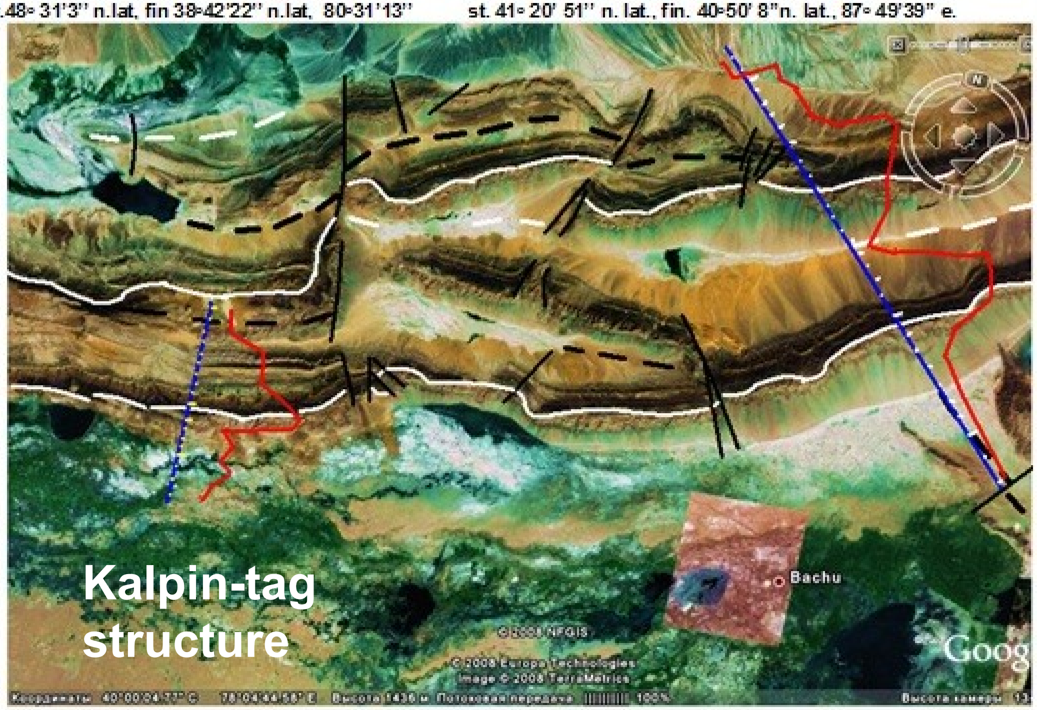
Distribution of outgoing surface IR flux on the elements of the Tarim platform geological structure on profiles 1 and 7. 1 is the center of the platform – Mazartag structure; 7 is the Upper Proterozoic uplift of the platform basement (Kuruktag)

Profile 1

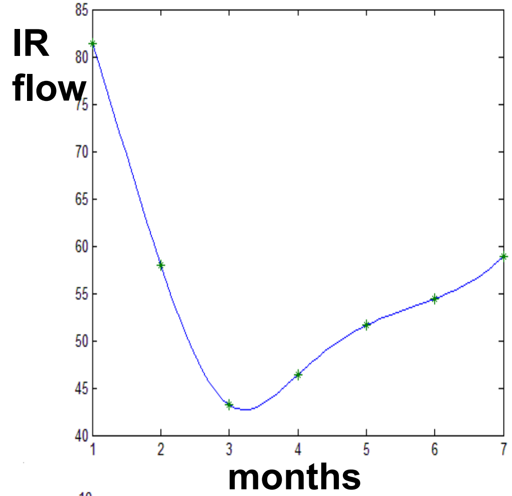
Profile 7

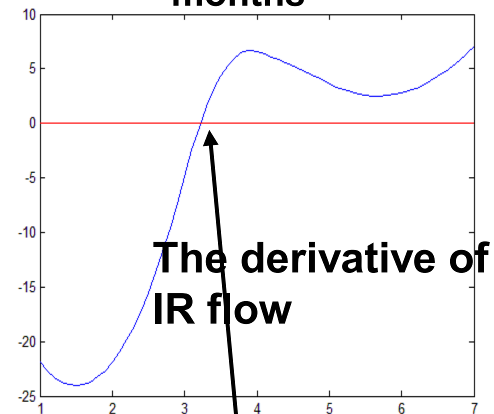
st.48◦ 31'3'' n.lat, fin 38◦42'22'' n.lat, 80◦31'13''

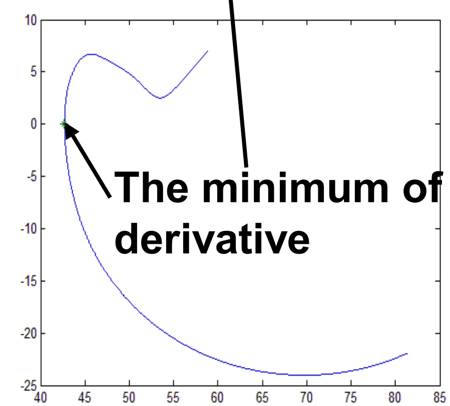
st. 41◦ 20' 51'' n. lat., fin. 40◦50' 8''n. lat., 87◦ 49'39'' e.



The calcula-tion of quasista-tionary IR flow







The transition to the values of brigthness measured for the surface IR flow can be made with the use of the following relation

F = L · G (Gossorg, 1980) (1),

were **F** - surface IR flow , **L** - brightness IR flow, **G** - geometric factor, which writes

G = π ·S · sin2 α = 6.8704 (m2. ster).

Hence the surface IR flow F computed by (1) makes: F = 6.8704 L (mW).

Values of **F** are added for the components, which form its **balance**. The addends of such a balance include: **Fgr** – heat flow of the active ground layer (the result of heat inertia), **Fc** – heat effect of the surface condensation or crystallization of water vapor, **F pch** – heat effect of the process of oxidation of gases coming from the ground in the upper part of the active layer, **Fd – component of the deep heat flow**. Hence, we have:

F = Fgr + Fc + F pch + Fd

The sub-surface **endogenic flow Fd** is the sum of influences of the conductive and **the convective components** upon the radiating layer. The difference between the value of the near-surface endogenic flow **Fd** and the near-surface conductive component **Fcnd** computed represents the share of the **convective component Fcnv** **Fcnv = Fd – Fcnd**

The calculated surface heat flow of large regional faults of BRZ

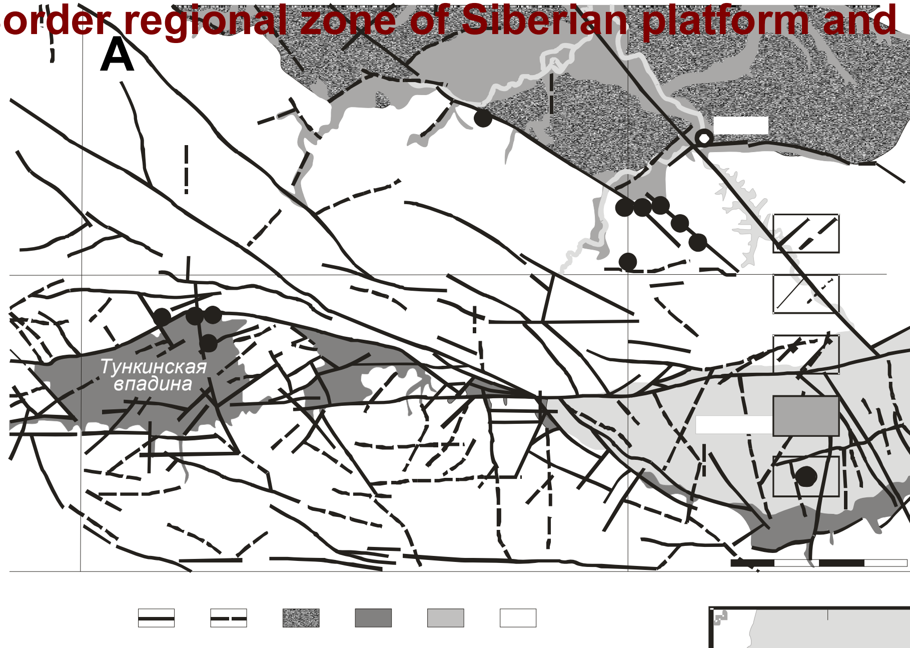
Fault	Brightness flow, *L* мW/м2. ср.μμм	Surface heat flow, **F** мW	Depth part of **F**, *F* ***dep***, мW	Portion of *F depth*, мW		The part of konvektive portion, %
				konductive *F conda*	konvective *Fconve*	
Tunka	103.027	707.84	323.37	25.46±4.14	297.86±4.18	92
Bargoozun	85.466	587.19	362.14	25.44±2.69	336.71±2.7	93
Near-sea	112.242	771.15	339.36	20.94±1.67	318.42±1.67	94
Border zone of platf.	103.64	708.09	289.62	18.79±0.8	270.86±0.77	94

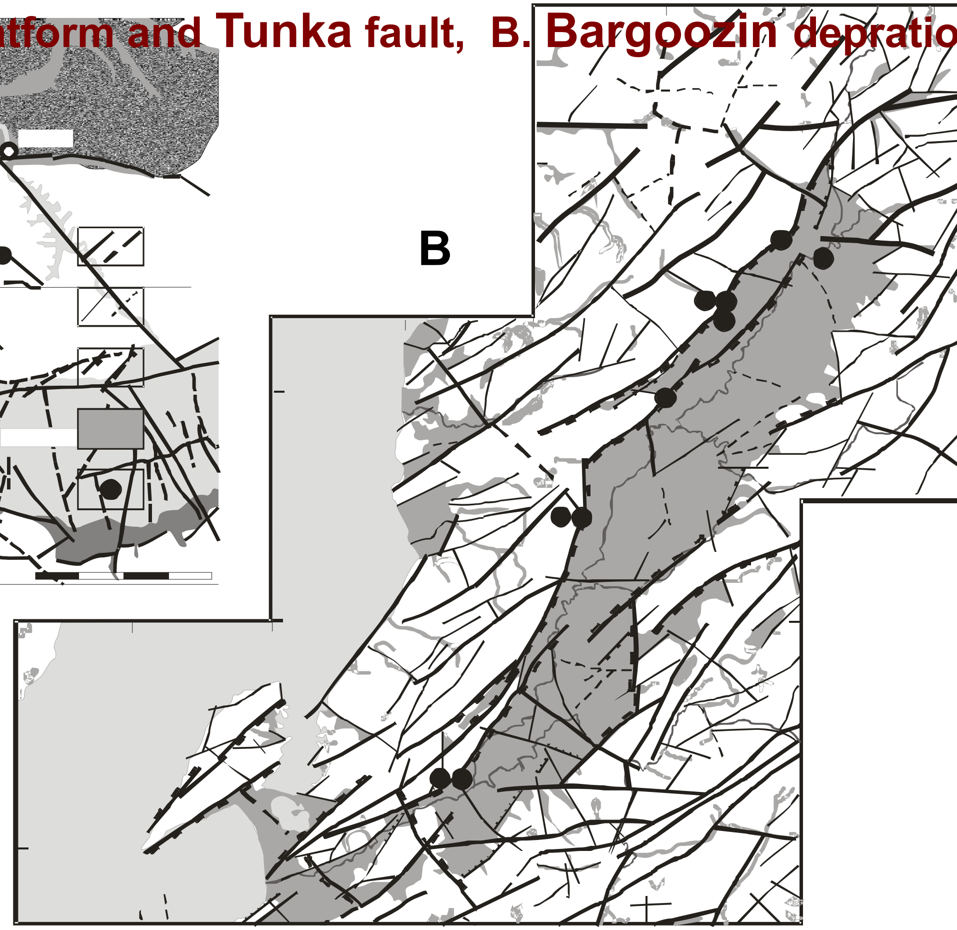
The calculated surface heat flow of large regional faults of Tarim basin and it folded frame

Fault structure	Surface heat flow **F**, mW	Depth conductive part of **F**, calulated	Portion of *Fdepth, mW*	
			konductive, *F conda*	konvektive, *F conve*
Mazartag	61.47	40	19.59	41..88 (68)
Kalpintag	196.56	40	19.59	176..97 (90)
Choltag	199.87	44	20.22	179..65 (90)
Kuruktag	186.86	45	20.38	166.48 (89.1)
Altuntag	256.56	43	20.06	236.48 (92)

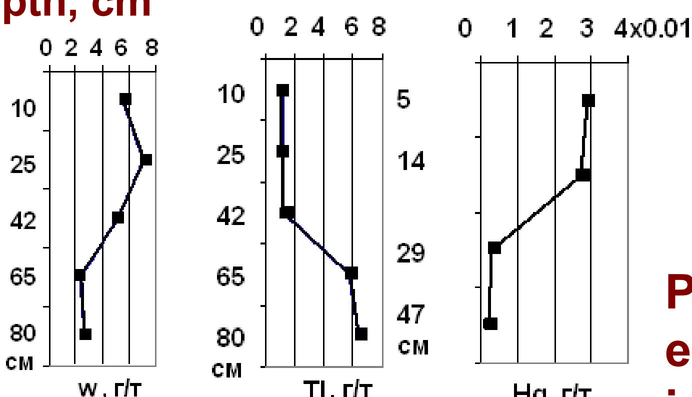
The set of geochemical samples on large seismoactive regional fault's trakcs of BRZ

A. Border regional zone of Siberian platform and Tunka fault, B. Bargoozin depration





Depth, cm



The concentration is g / t

Plots of volatile chemical ore element's concentration distribution into surface formations of Bargoozine regional fault

Geochemical indicators, associated with surface outgoing IR flow of large seismoactive faults of BRZ

Fault	n	Cm	B	Cu	Zn	Pb	As	Ge	Mo	Sn	Ag	Tl	Hg	Co	Cr	Ni	V
Tunka	88	X	**42.**	**34.2**	75.40	13.9	11.6	1.2	1.98	2.6	0.2	0.9	0.1	16.1	**81**	**68**	68.2
		±σ	2.0	1.32	1.12	1.31	1.62	0.4	1.35	0.9	0.2	1.0	0.1	1.3	1	1	1.3
Bargoo-zin	75	X c	14.3	25.9	**112.1**	17.9	6.14	1.2	1.55	3.1	0.2	0.7	0.1	16.7	51	39	**95**
		±σ	1.1	1.18	1.05	1.03	1.33	0.3	1.25	1.0	0.1	0.4	0.1	1.0	1	1	1
Border zone of platform	91	X	20.6	22.8	69.65	12.4	**17.4**	1.2	1.25	2.3	0.3	0.8	**0.6**	не определены			
		±σ	2.1	1.28	1.25	1.59	2.21	0.6	1.82	1.2	0.3	1.4	1.5				
Geotherm. field Kucheger		X	20.3	23.9	88.65	18.2	14.3	**3.9**	1.14	2.2	**0.74**	0.6	0.1	11.9	42	36	60.3
		±σ	1.1	1.33	1.19	1.1	1.61	1.7	1.09	1.1	1.5	0.4	0.2	1.1	1.1	1.2	1.1

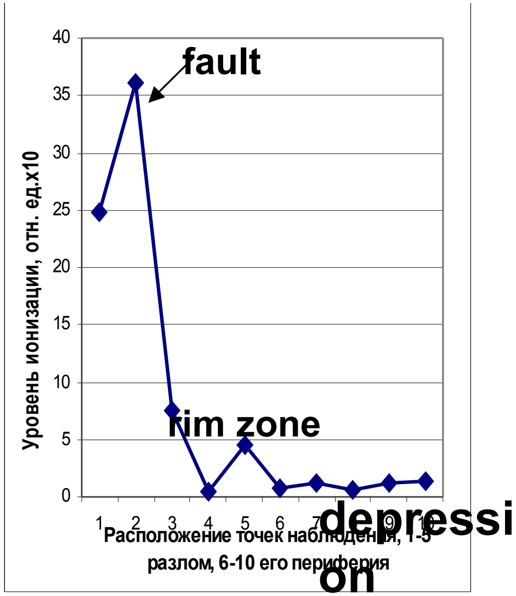
Fault	Indicators of geochemical specialization of faults						
	High concentration, **g / t**		According to dispersion		According to geochemical association		
	Cmax	Back-ground	9 elements F1/F2	15 elements, F1/F2	9 elements	15 elements	**Main** / secondary
Tunka	B, Cu, Cr	B, Cu	Ge, B / Tl, Mo	B / Mo	Tl, **Ag, Mo**, B	Hg, As, **Ag**, **Mo**	**Ag, Mo**/ Hg, As, Tl
Bargoozin	Zn, V	Zn, V	Ag, Cu / Pb, Tl	Ni, As / Pb, Mo	**Tl,** Cu, Ag,	Mo, As, **Tl**	**Tl** / Cu, Ag, As
Border zone of platform	As, Hg	Hg	Cu, Zn / Tl, Mo	Mo, As / Zn	**Mo,** Tl, **Ag**	**Mo,** Hg, As, **Ag**	**Mo, Ag** / Tl, Hg, As,
Geothermal field Kucheger	Ge, Ag	Ge, Ag	не расс-читано	Zn, Pb / V, Co	не рассчит.	**Hg, Ag**, Mo, **Ge**	**Hg, Ag, Ge** / Mo

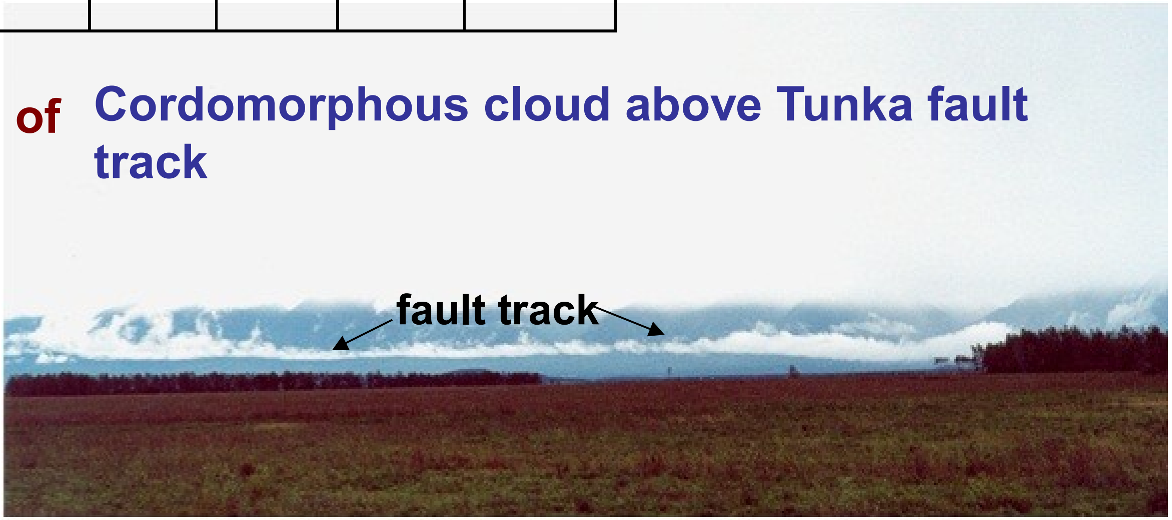
П, geochim. flow = [*C comp* : (*S* · t)] ·10 6 = kg/km2 · year.

Fault	geochim. flows, kg/km2 · year						SHF, мWт	F dep, мWт
	As	Tl	Hg	Ag	Mo	Ge		
Tunka	3.252	0.226	0.020	0.089	0.189	не оп	707.84	323.37
Bargoo-zin	0.879	0.139	0.013	не оп	не оп	не оп	587.19	362.14
Border zone	1.671	0.229	0.037 0.055	0.018	0.139	не оп	708.09	289.62
Thermal zone Ku-cheger	21.44	0.413	0.021	0.479	не опр	7.267	74 Wт/м 2	9.553 MW

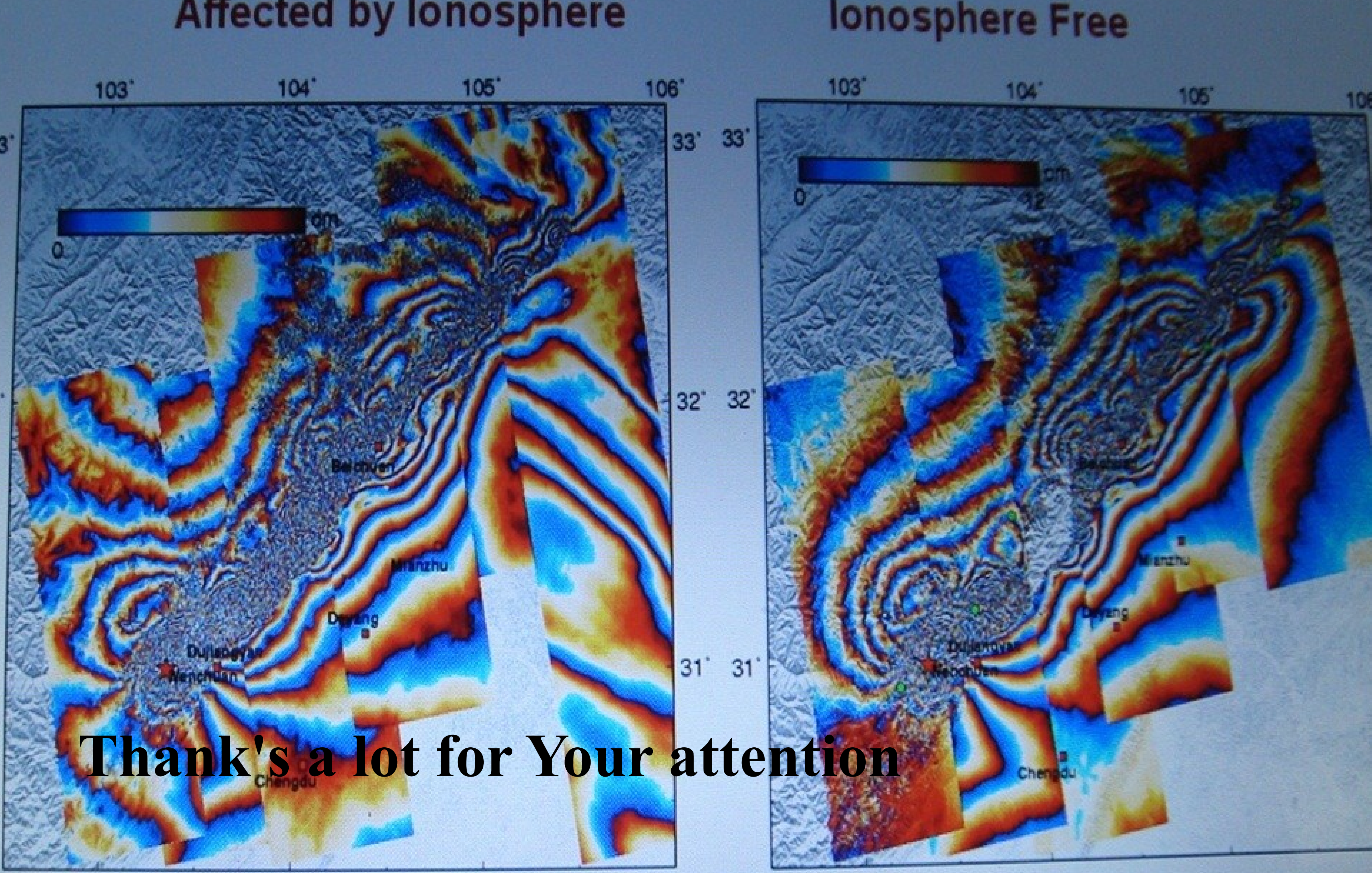
Geochemical flows of large seismoactive regional faults of BRZ

Surface ionization level of near ground air for Tunka fault track





Cordomorphous cloud above Tunka fault track



Thank's a lot for Your attention

Ionospheric perturbations above large seismoactive fault, associated with Wenchuan Mw=8.0 earthquake on 12 May 2008 in Sichuan, China (after Xiao-Li Ding