

The International Conference on the 120th Anniversary of the Bulnay Earthquake
Ulaanbaatar, Mongolia
August 11 - 17, 2025

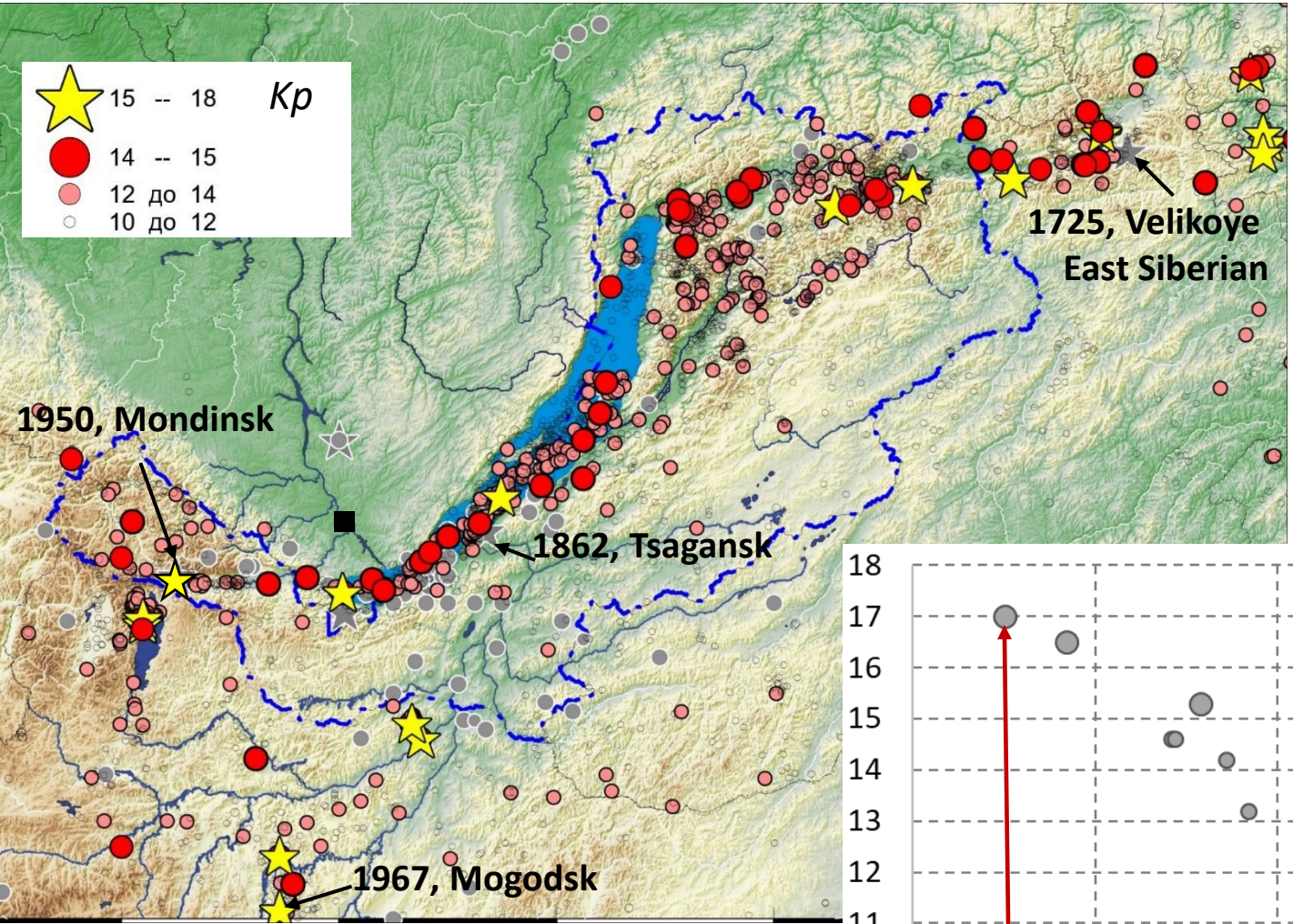
Variations in seismicity parameters of the Baikal rift zone during the instrumental observation period

Darima Sanzhieva*, Ts. Tubanov*, E. Kobeleva**

* - Dobretsov Geological Institute SB RAS and
Buryat Division of the Geophysical Survey RAS, Ulan-Ude, Russia

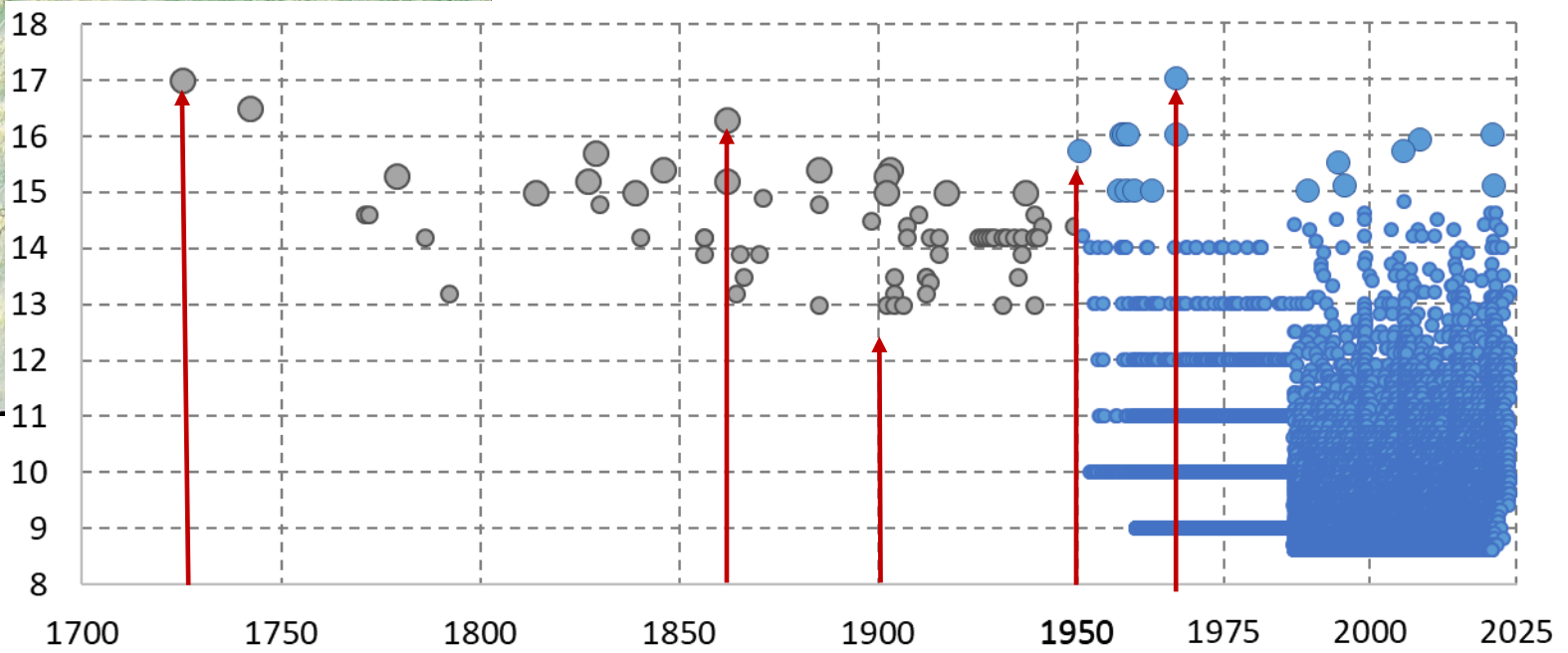
** - Baikal Division GS RAS, Irkutsk, Russia



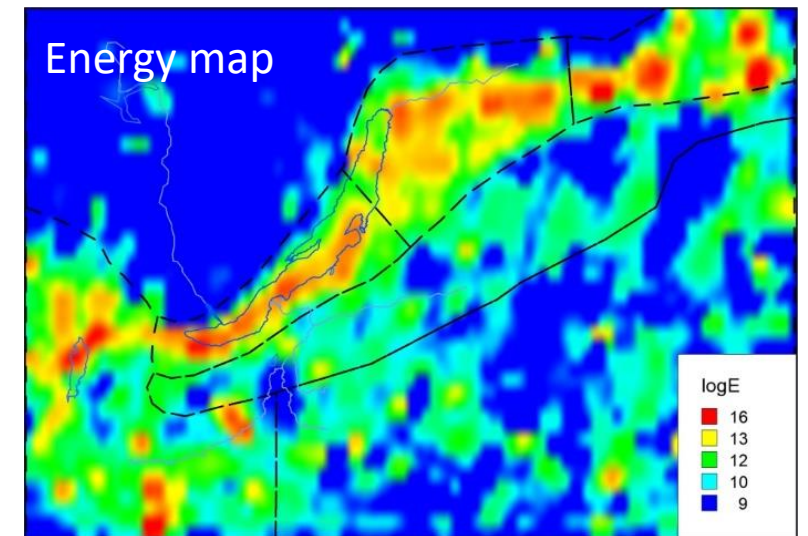
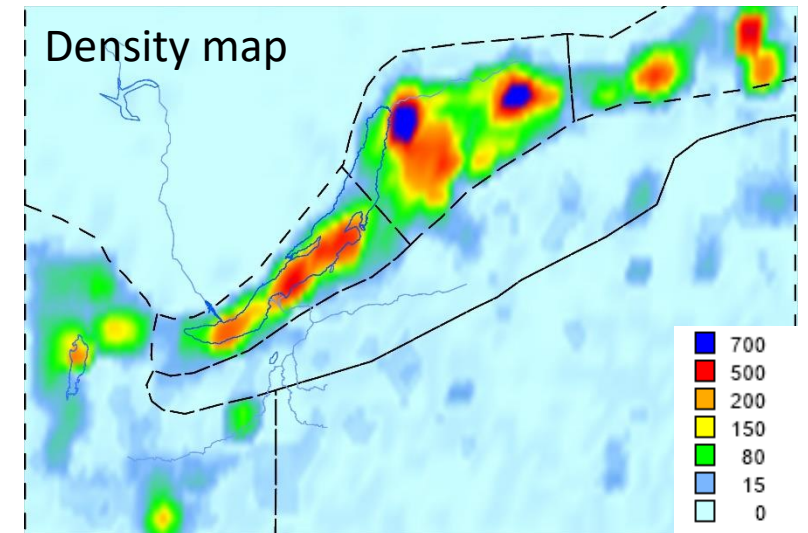
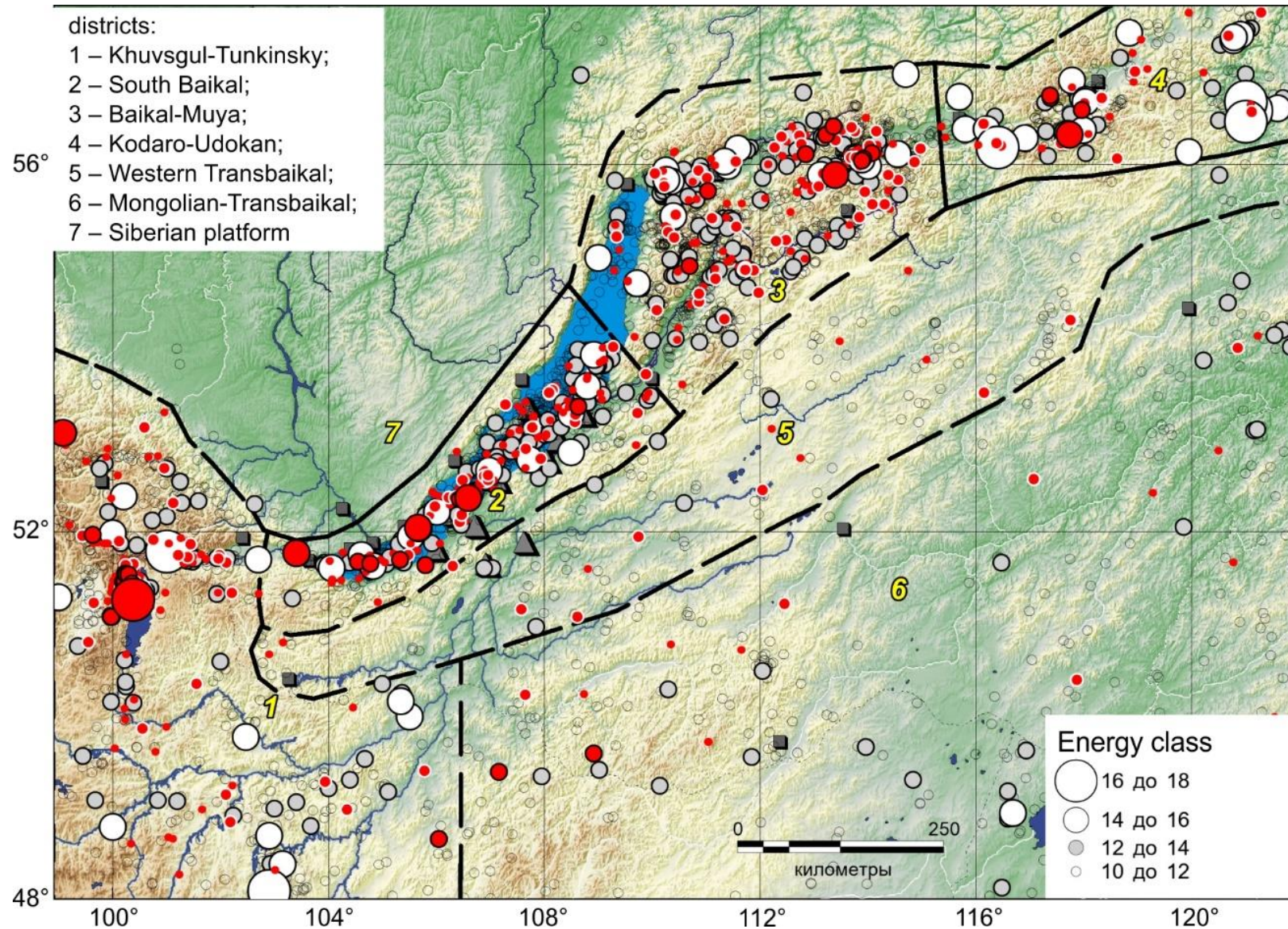


gray marks - earthquakes before 1950
colored - since 1950

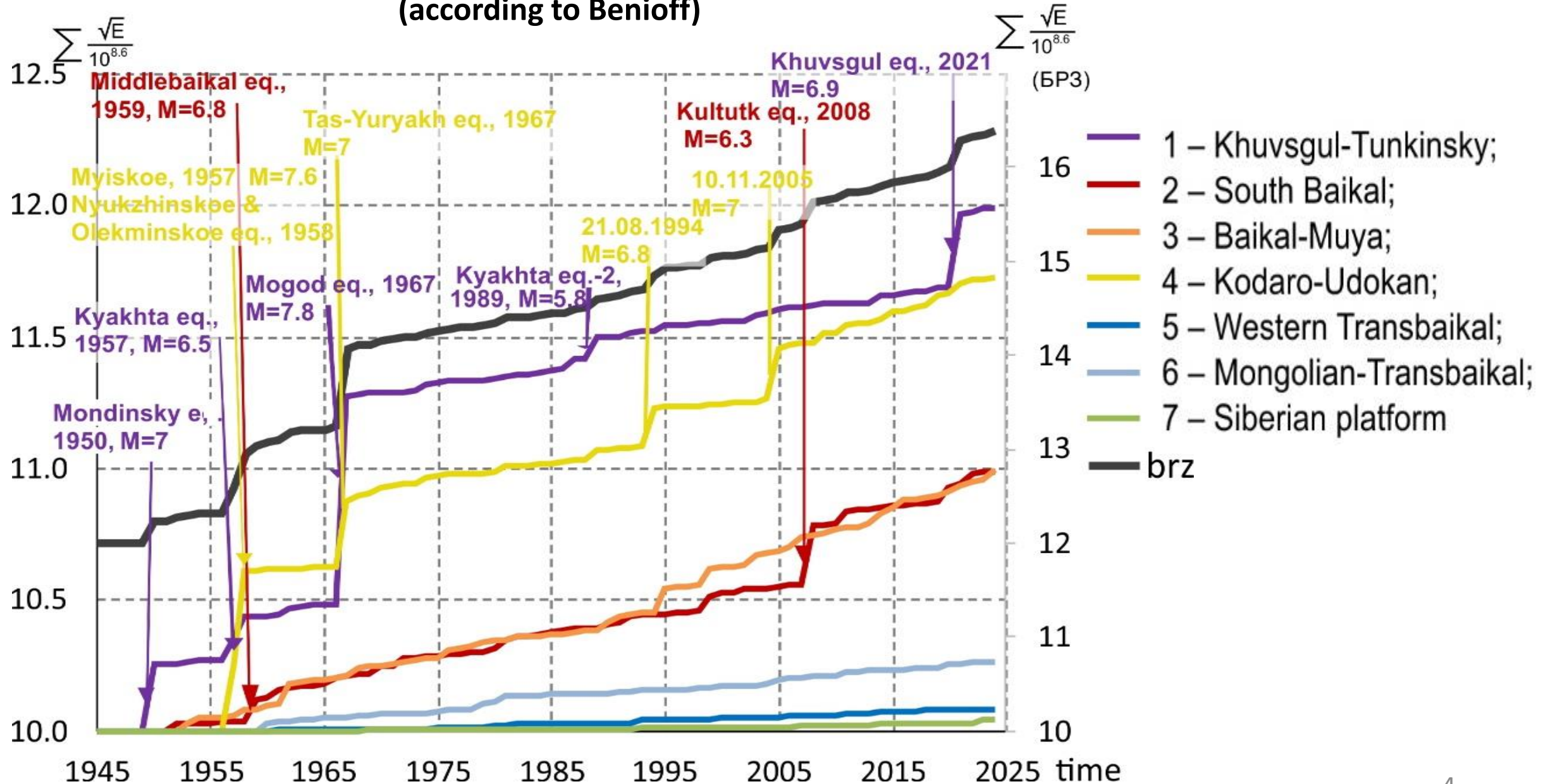
Seismicity of the Baikal region



Earthquakes, 1950-2023

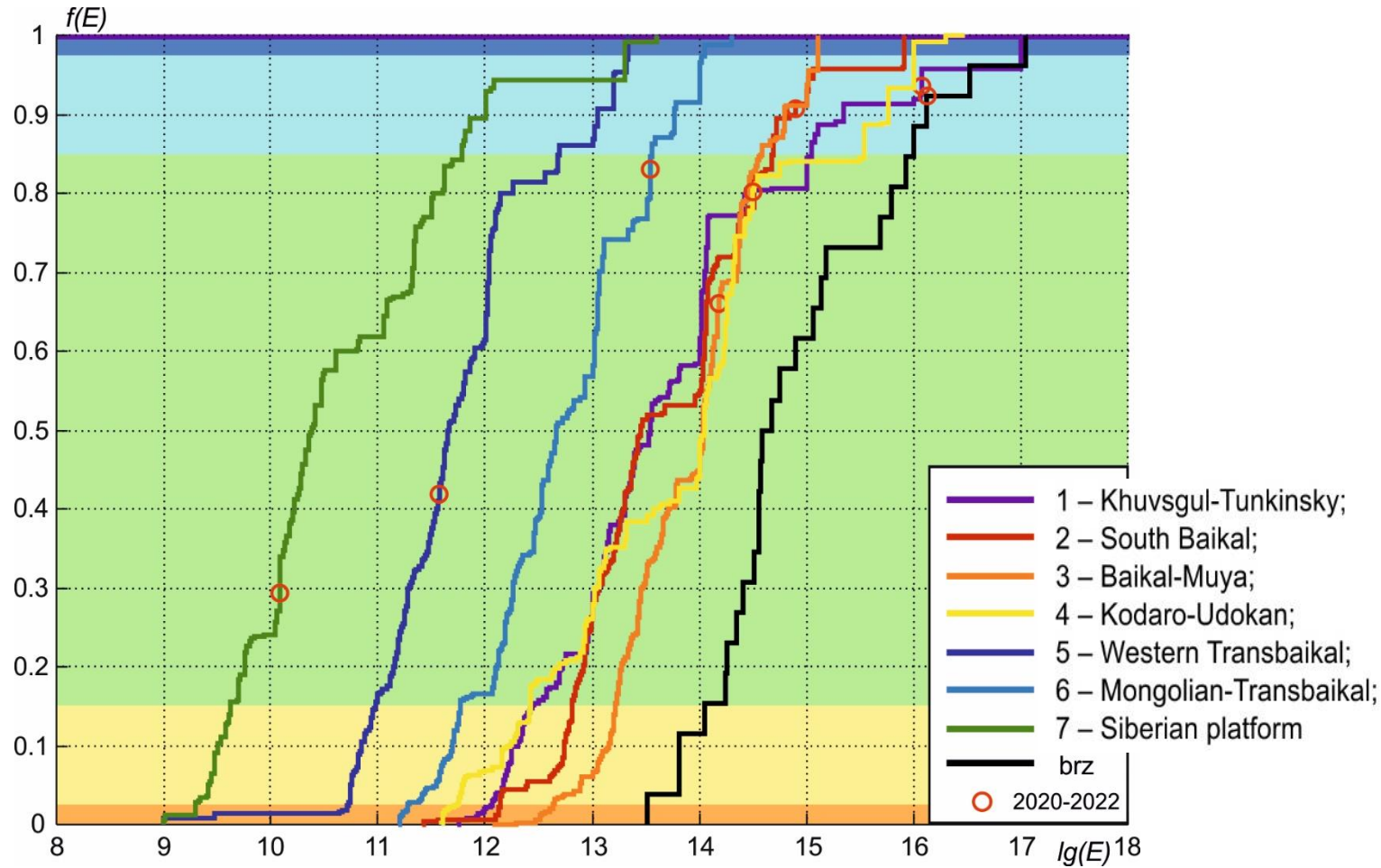


Schedule of removal of conditional elastic deformations (according to Benioff)



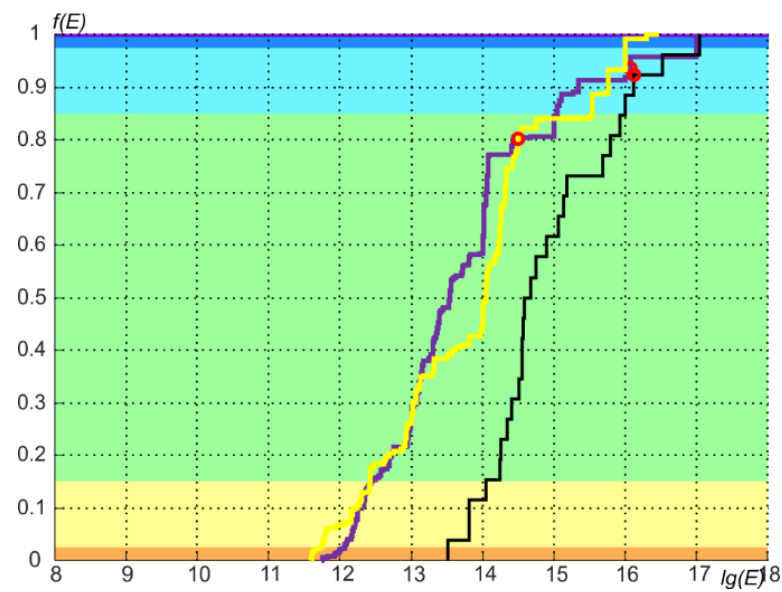
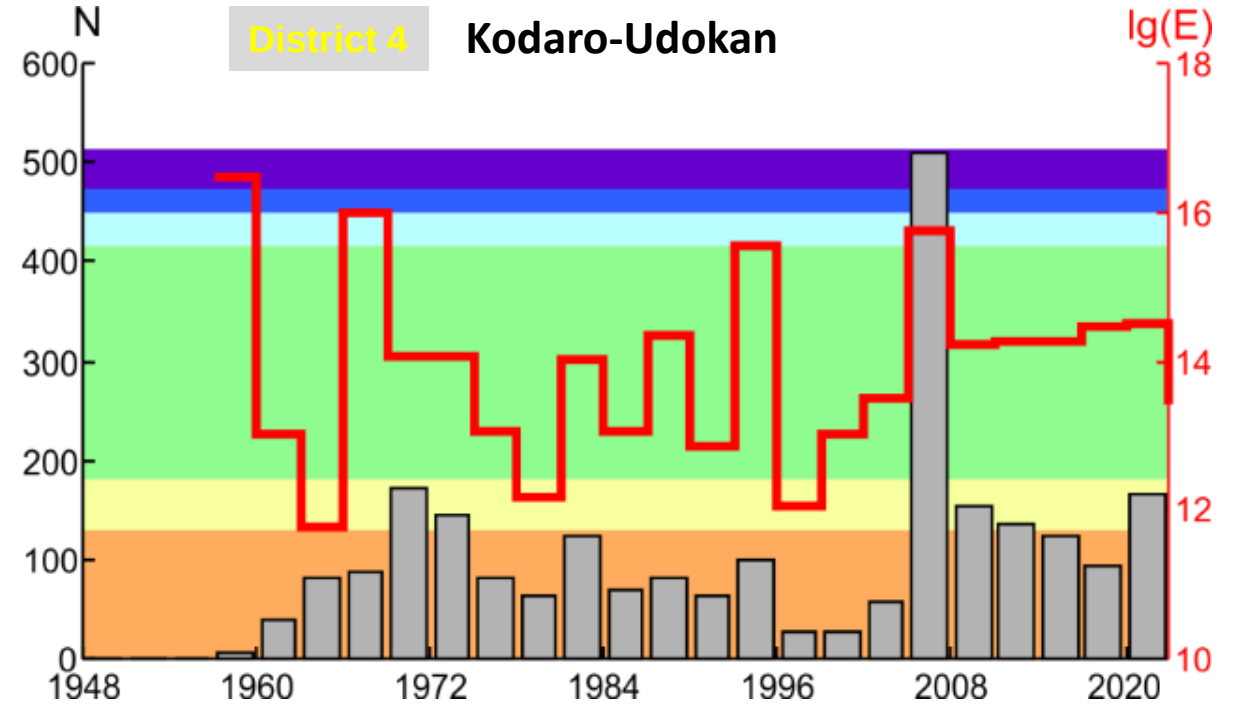
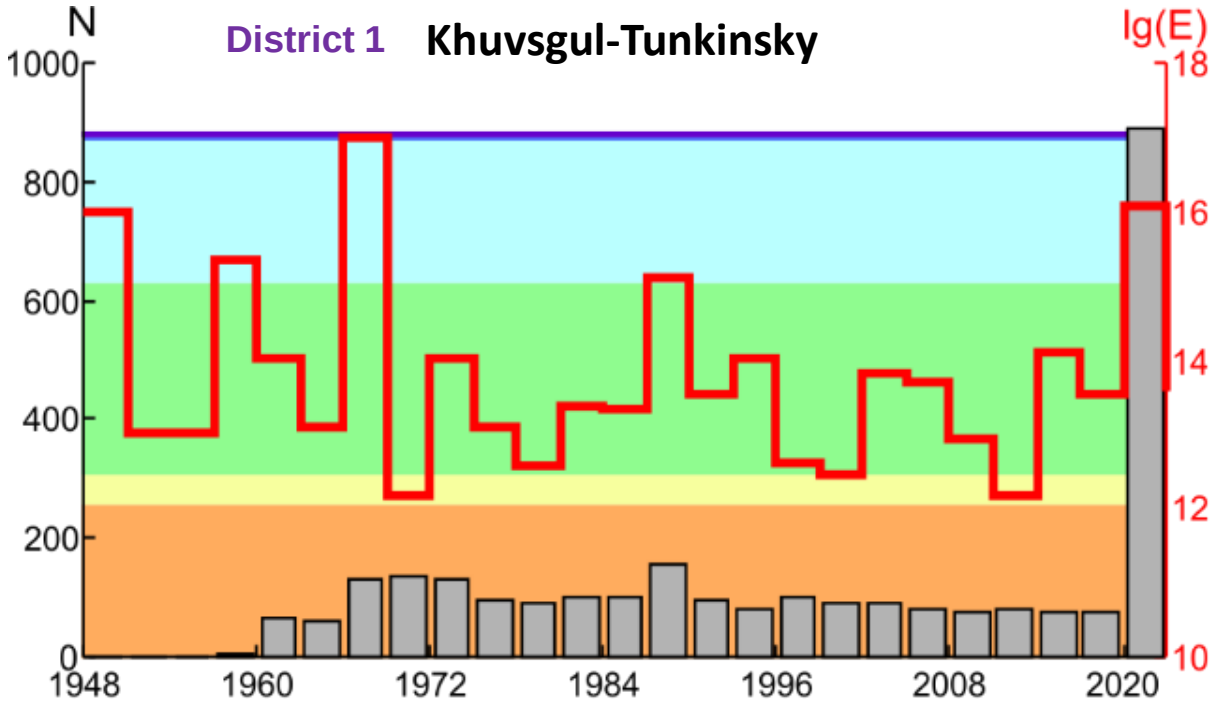
Statistical assessment of seismicity level «SOUS-09»

Empirical distribution functions of seismic energy
for 1950-2023. $\Delta T=3$ years

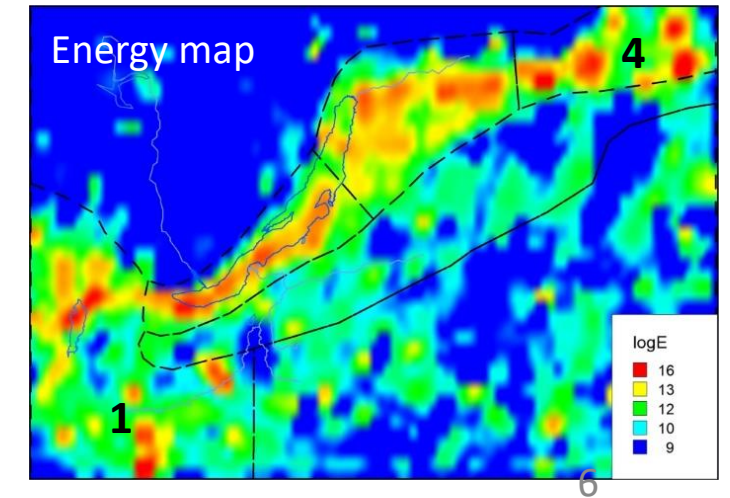


SOUS-09 scale

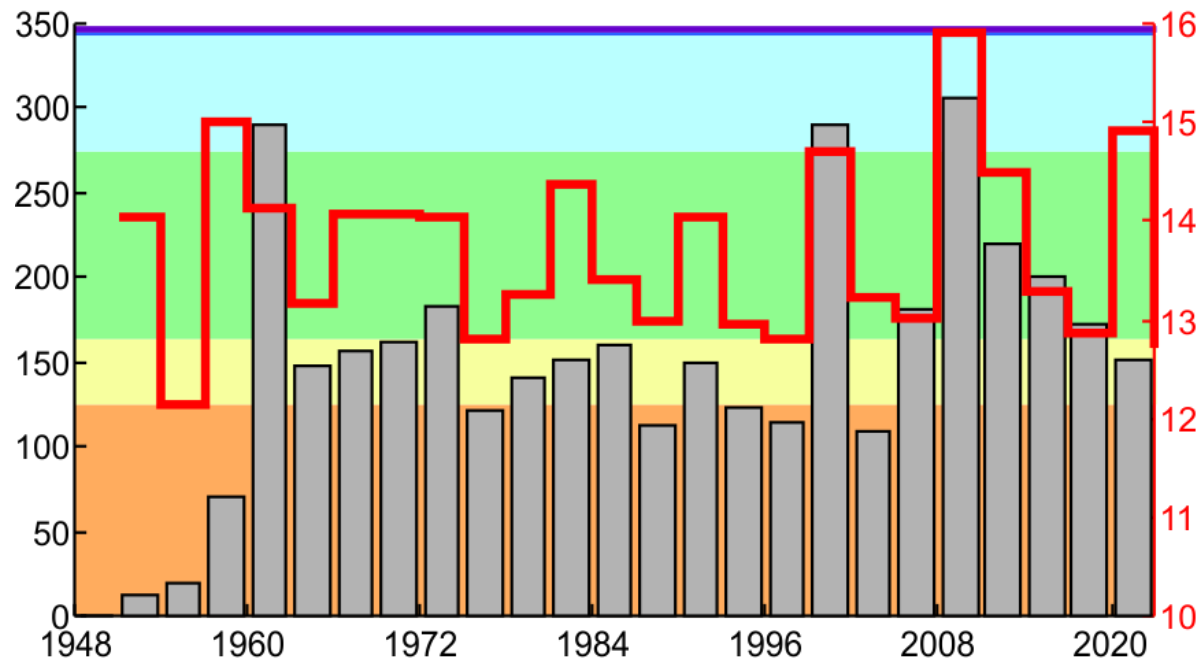
Saltykov [2009, 2011]		
Seismicity level		F
extremely high		$F \geq 0.995$
high		$0.975 \leq F < 0.995$
back-ground	elevated	$0.85 \leq F < 0.975$
	middle	$0.15 < F < 0.85$
	decreased	$0.025 < F \leq 0.15$
low		$0.005 < F \leq 0.025$
extremely low		$F \leq 0.005$



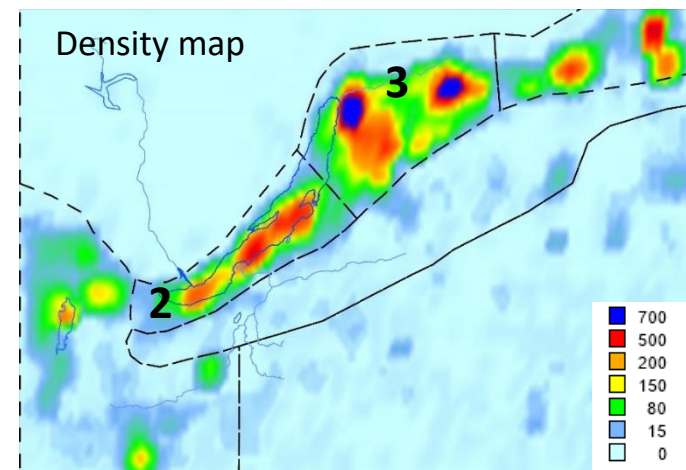
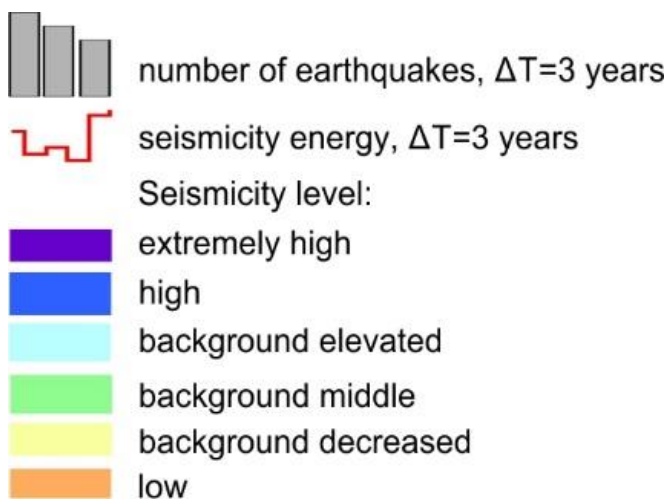
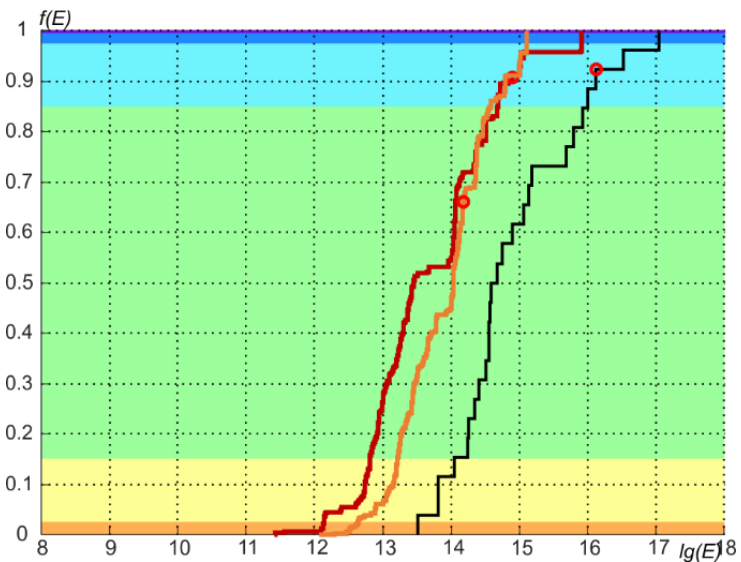
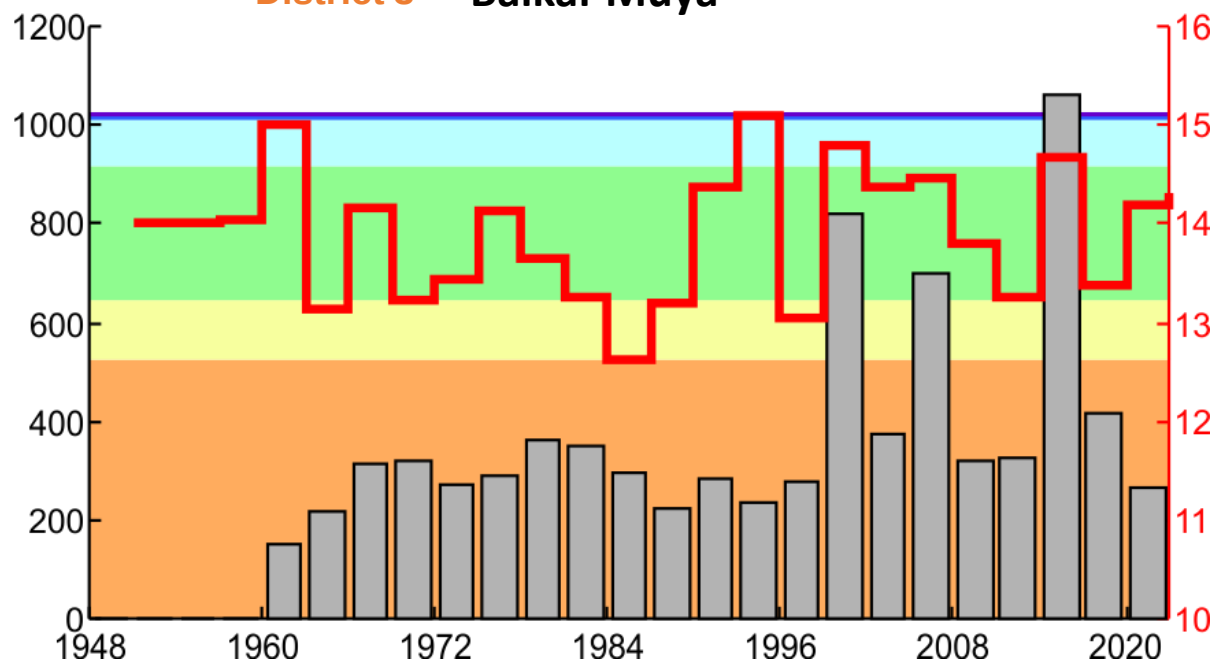
- number of earthquakes, $\Delta T=3$ years
- seismicity energy, $\Delta T=3$ years
- Seismicity level:
 - extremely high
 - high
 - background elevated
 - background middle
 - background decreased
 - low



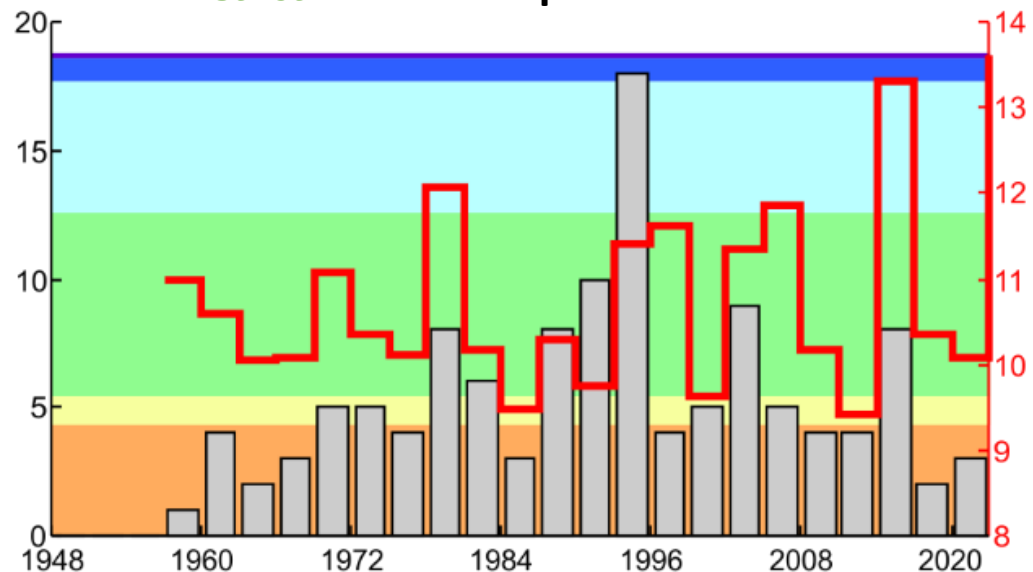
District 2 South Baikal



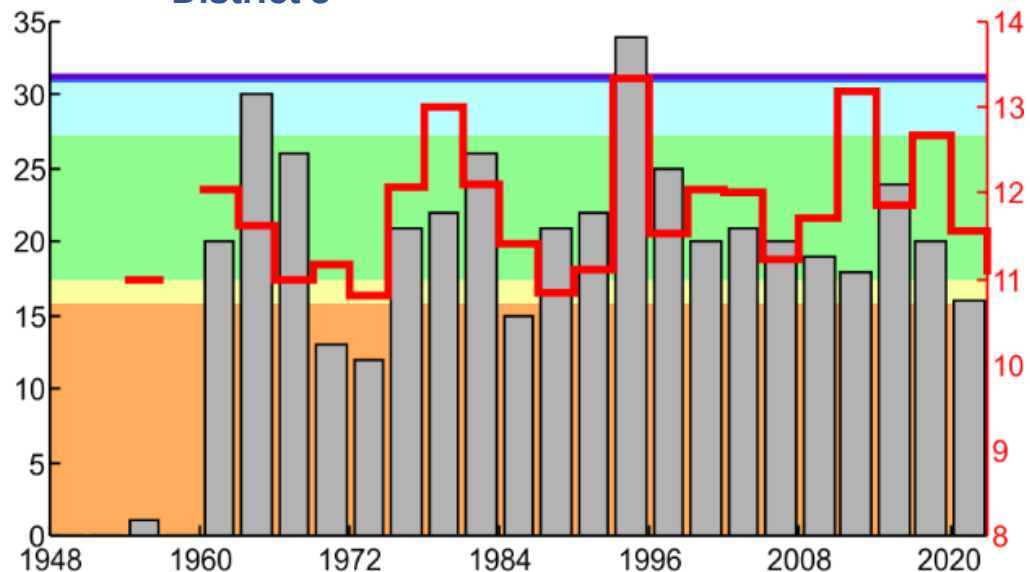
District 3 Baikal-Muya



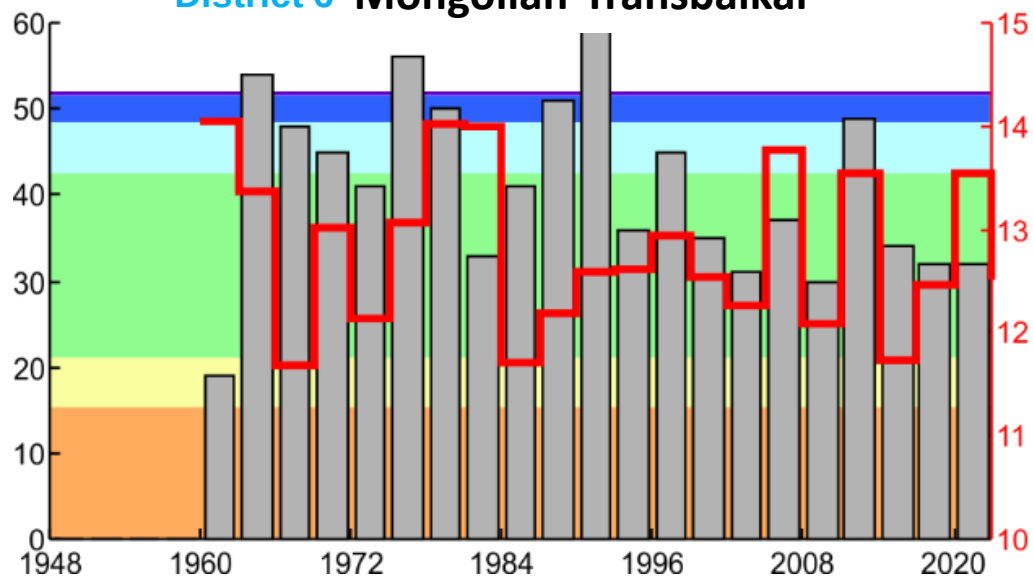
District 7 Siberian platform



District 5 Western Transbaikal



District 6 Mongolian-Transbaikal



number of earthquakes, $\Delta T=3$ years

seismicity energy, $\Delta T=3$ years

Seismicity level:

extremely high

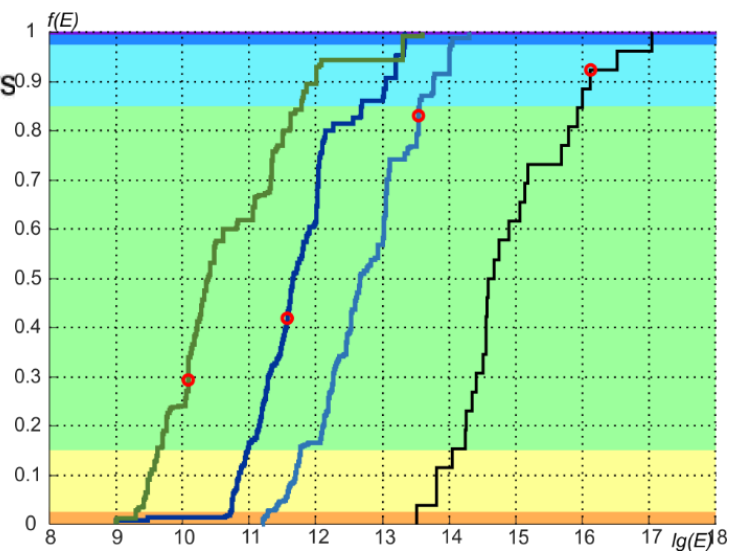
high

background elevated

background middle

background decreased

low



Seismicity parameters of the epicentral districts of Pribaikalye and Transbaikalia for 1950-2023

№	district	N^*	$K_{\max}$	$S, \bullet 1000 \text{ km}^2$	$\rho, N / 1000 \text{ km}^2$	Range E_{ext}, J	Range $E_{\text{bgm.}}, J$	Values for 2020-2022		
								E, J	F	Seismic level
1	Khuvsgul-Tunkinsky	2861	17	232.6	12	$10^{11.74} - 10^{17.00}$	$10^{12.44} - 10^{15.04}$	$10^{16.08}$	0.936	background elevated
2	South Baikal	3775	15.9	78.8	48	$10^{11.42} - 10^{15.92}$	$10^{12.82} - 10^{14.69}$	$10^{14.9}$	0.907	background elevated
3	Baikal-Muya	7919	15.1	116.4	68	$10^{12.06} - 10^{15.10}$	$10^{13.22} - 10^{14.58}$	$10^{14.19}$	0.660	background middle
4	Kodaro-Udokan	2418	16	88.6	27	$10^{11.59} - 10^{16.48}$	$10^{12.42} - 10^{15.54}$	$10^{14.5}$	0.801	background middle
5	Western Transbaikal	447	13.3	210.2	2	$10^{9.00} - 10^{13.33}$	$10^{10.97} - 10^{12.69}$	$10^{11.57}$	0.419	background middle
6	Mongolian-Transbaikal	861	14	595.3	1	$10^{11.19} - 10^{14.31}$	$10^{11.77} - 10^{13.56}$	$10^{13.55}$	0.831	background middle
7	Siberian platform	122	13.6	742.4	<1	$10^{9.0} - 10^{13.60}$	$10^{9.62} - 10^{11.78}$	$10^{10.08}$	0.294	background middle
	BRZ	18403	17	2064.3	9	$10^{13.51} - 10^{17.04}$	$10^{14.05} - 10^{16.00}$	$10^{16.12}$	0.923	background elevated

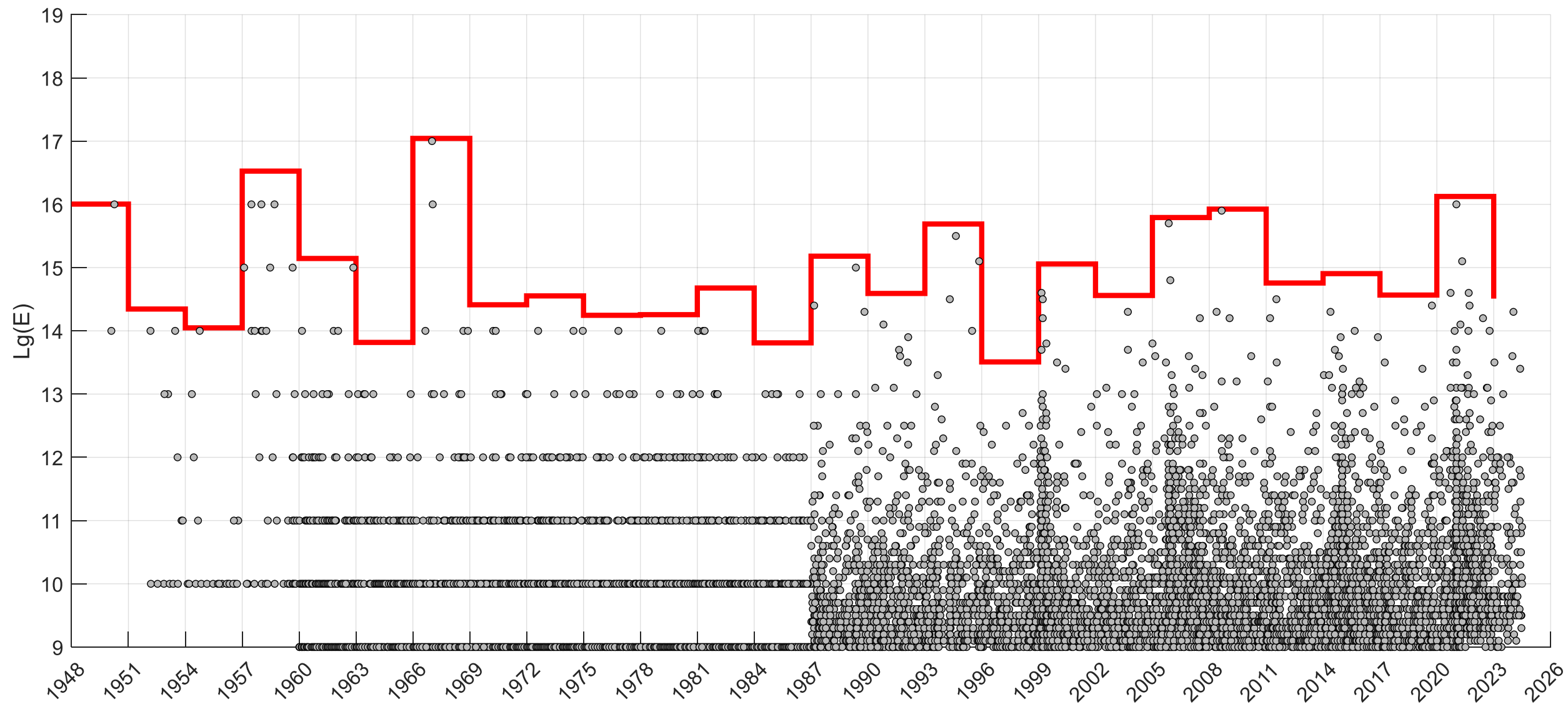
Thank you for your attention

Darima Sanzhieva
e-mail: gindarima@mail.ru

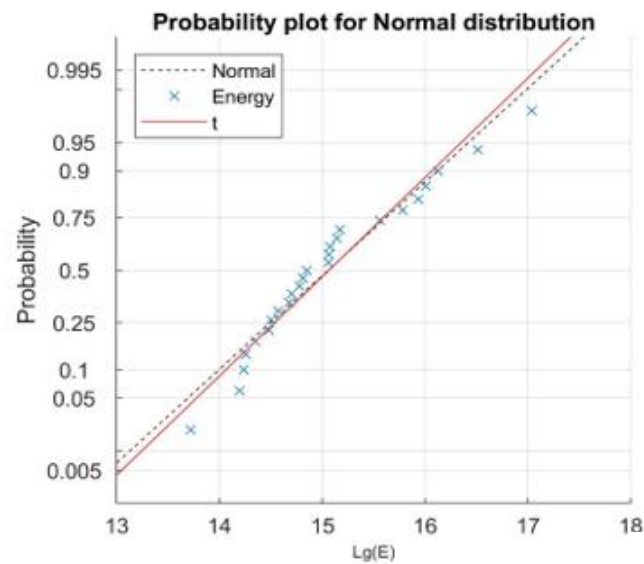
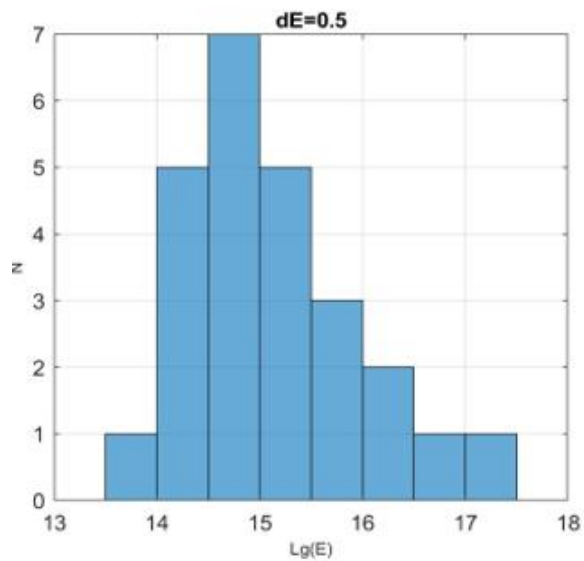
The work was carried out within the framework of state assignments
№ 075-01271-24 и № AAAA-A21-121011890033-1



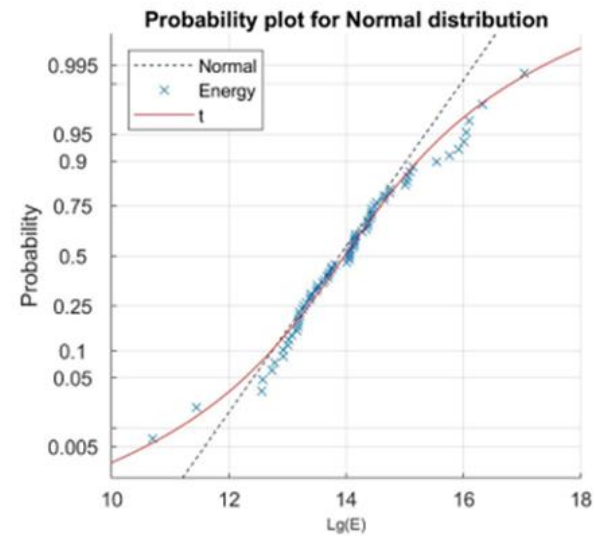
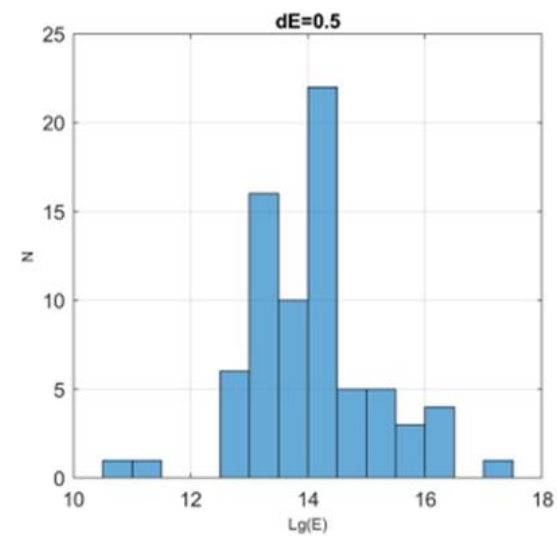
Seismic energy for 1950-2023. $\Delta T=3$ years



1950-2023 гг. $\Delta T=3$ года

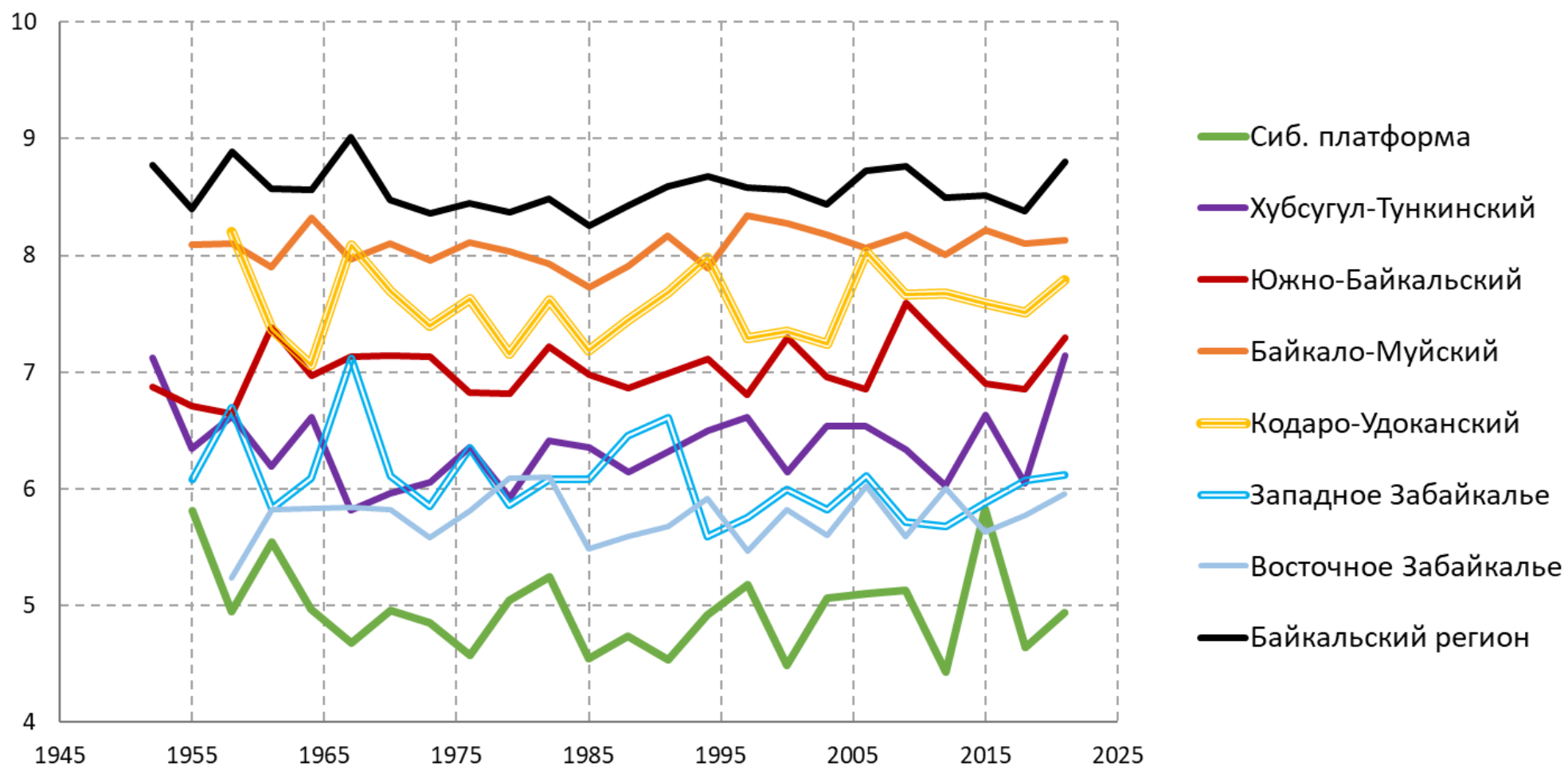


1950-2023 гг. $\Delta T=1$ год



Стандартное отклонение выделившейся энергии

ΔT	период			
	1950-2023	1957-2023	1960-2023	1987-2023
3 года	0.800	0.800	0.800	
1 год	1.937	0.957	0.894	
6 мес.	2.205	1.028	0.945	
3 мес.	2.269	1.085	1.003	1.010
1 мес.	3.344	2.030	1.230	1.375
7 дн.	3.864	2.836	2.162	2.106



Энергия землетрясения включает

изменение энергии деформации – W ,

энергию для создания трещин – E_C ,

потерю тепла при разломообразовании – H ,

потенциальную энергию деформации – E_p ,

энергию, излучаемую в сейсмической волне – E_s

[Determination of earthquake energy release and ML using TERRAscope //

H. Kanamori, J. Mori, E. Hauksson, T.H. Heaton, L.K. Hutton, L. Jones

J. Geophys. Res., 83 (1993), pp. 330-346]

Актуальность, новизна, обзор....

Параметрическая оценка сейсмичности:

– **оценка выделившейся сейсмической энергии;**

– расчет вариаций наклона графика повторяемости;

– расчет сейсмической активности A_{10} ;

– мониторинг параметра RTL;

– выявление сейсмических затиший по методике «Z-функция»;

– мониторинг вариаций площади сейсмогенных разрывов;

– выявление групп землетрясений

Сейсмическая энергия – что это
Параметры сейсмичности
Для чего (прогноз, физика очага)

Параметрическое представление динамики сейсмичности Камчатки //

В. А. Салтыков, Ю. А. Кугаенко, Н. М. Кравченко, А. А. Коновалова.

Вулканология и Сейсмология, 2013 № 1. с.65-84