

CREATION OF MONITORING POLYGON FOR CONTROL OF SEISMIC CHANGES ON LUSI TERRITORY

Igor KADURIN, Sergey KADURIN, Dimitry
SIOUBAROV

25-26 May 2011,
Surabaya

What we want to know?

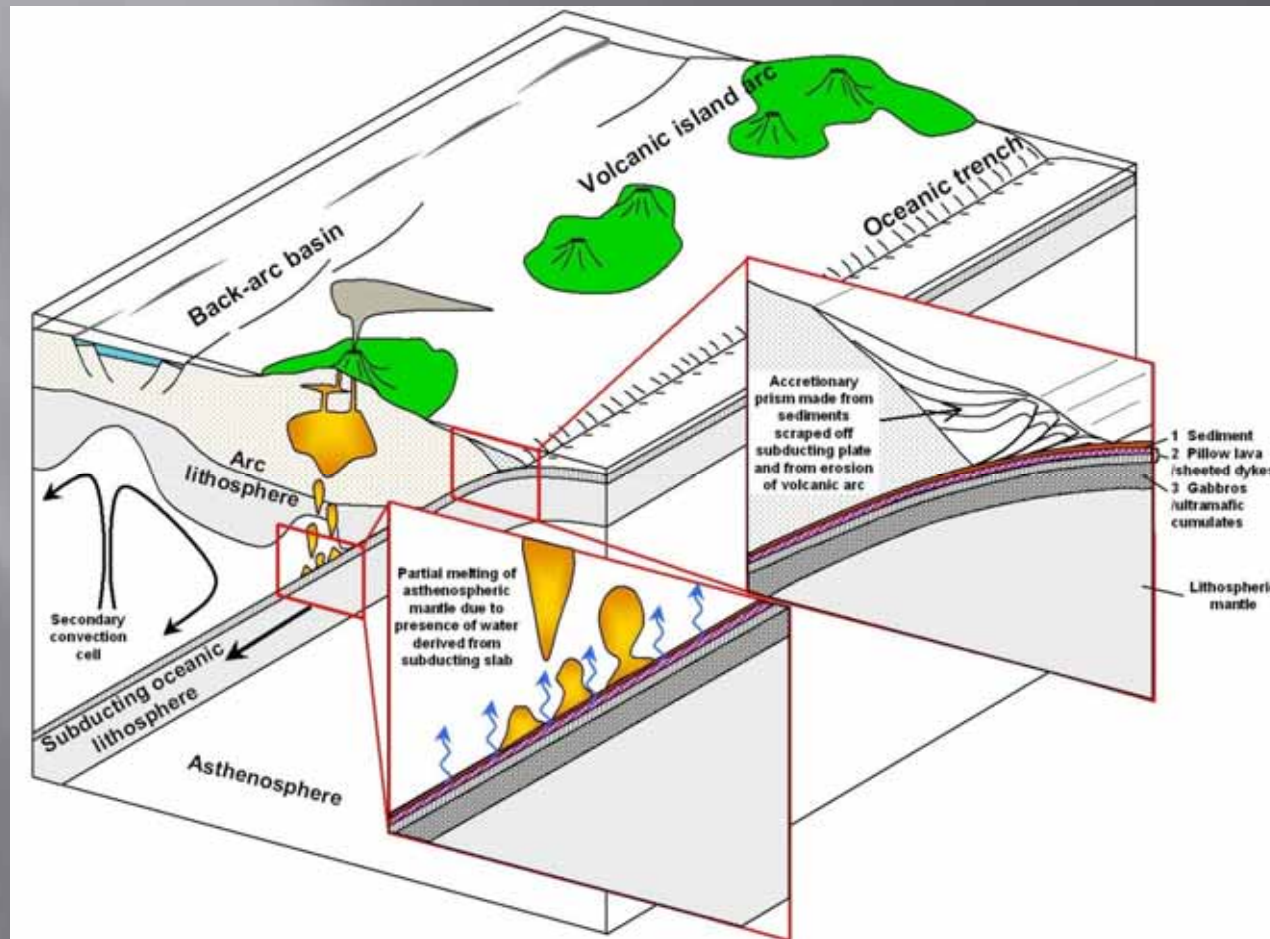
- ▣ How long eruption will proceed?
- ▣ What is the frequency of eruptions?
- ▣ How deep source of mud located?
- ▣ How that mud volcano works – what is the trigger, how long and what way mud goes up?

What we know now?

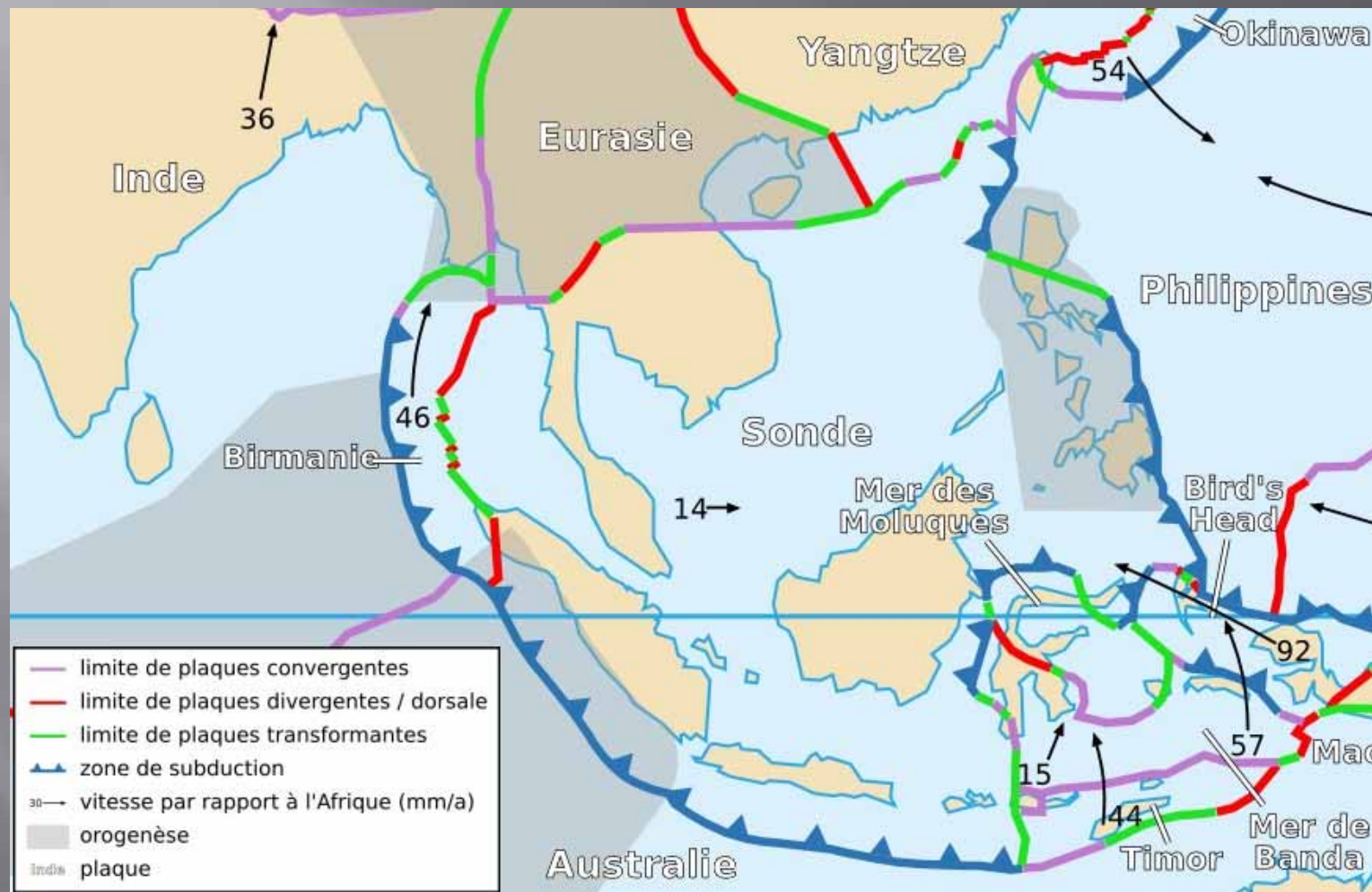
- ▣ Java island located in active tectonic zone;
- ▣ LUSI is a mud volcano;
- ▣ Material for eruption comes from the depth through the sediments and partly involve them

Background:

- ▣ Java Island is a part of Sunda subduction zone.

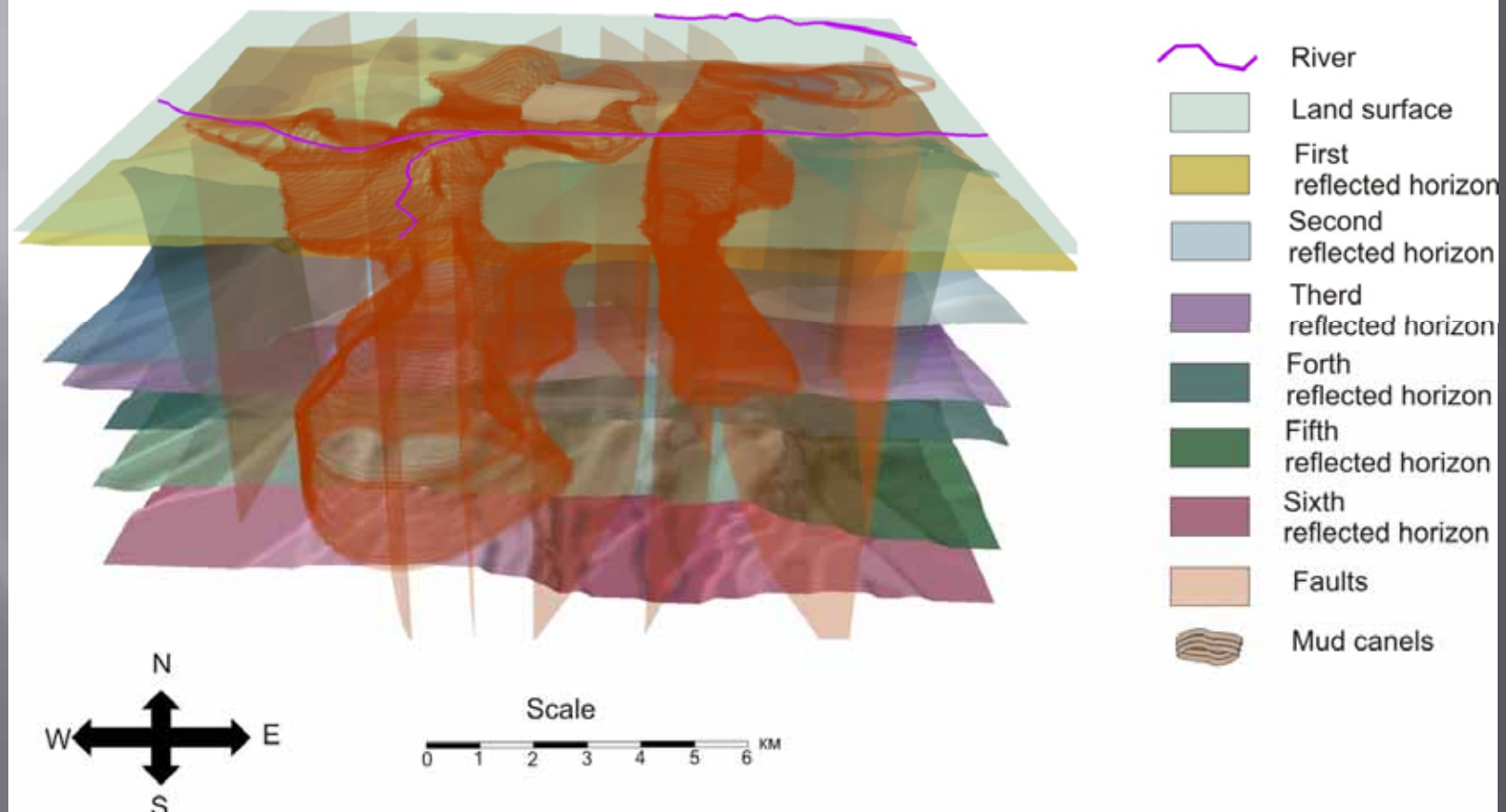


Sunda subduction zone

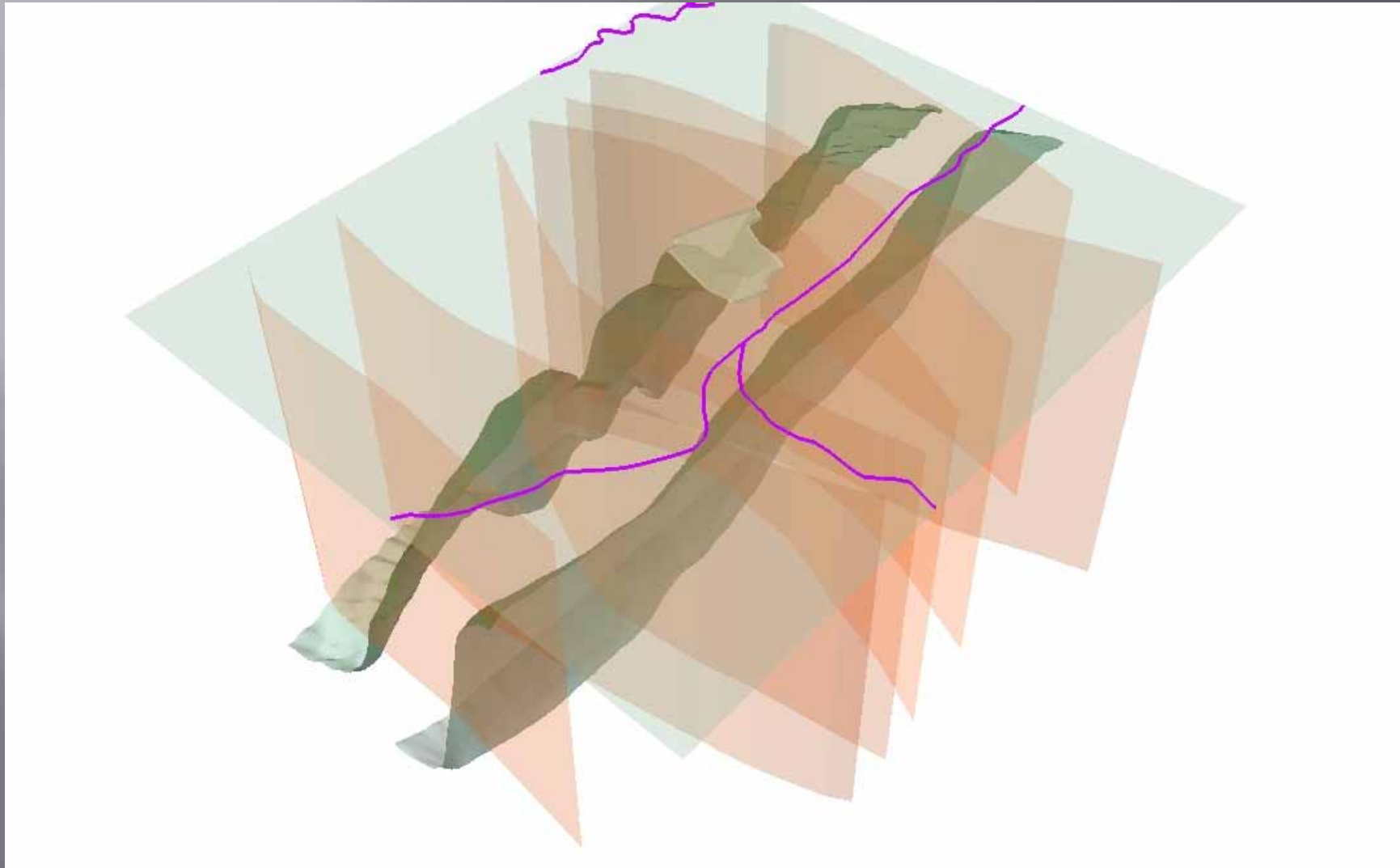


LUSI is a mud volcano which formed in back-arc basine

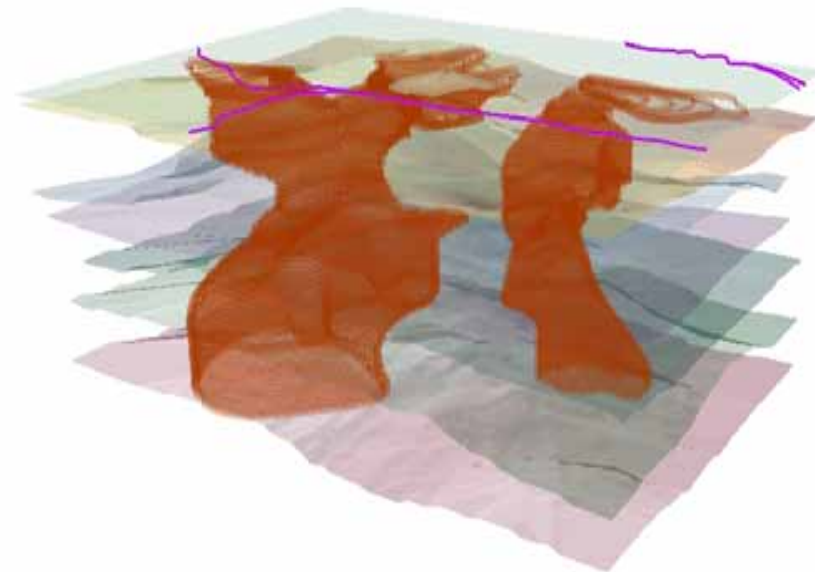
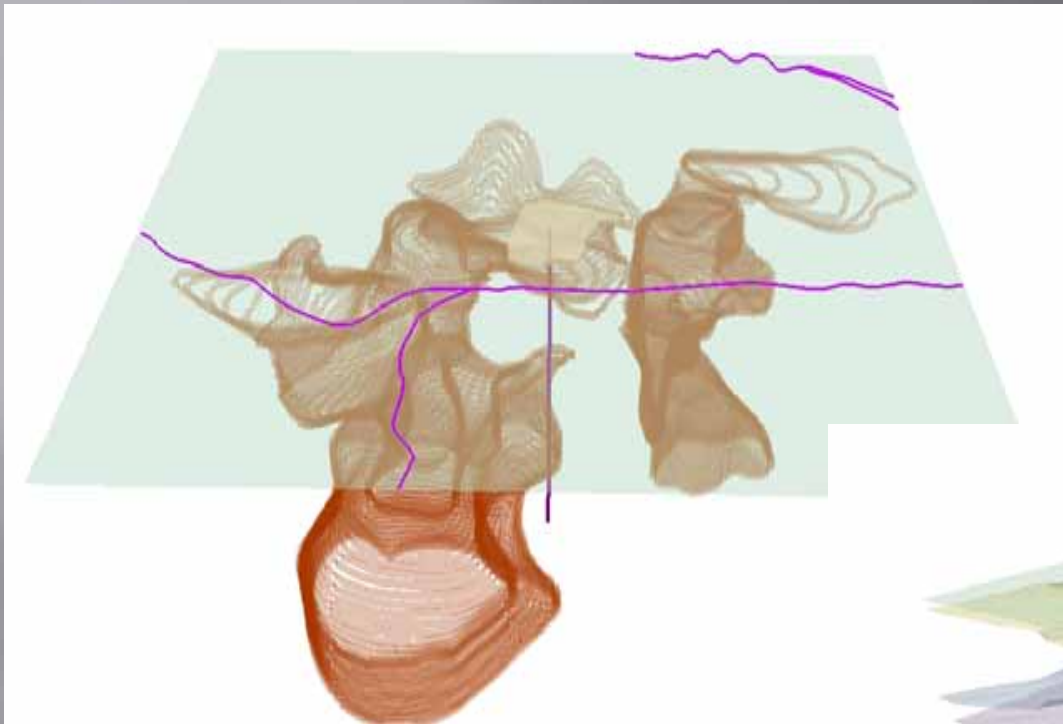
3-D model of mud volcano "LUSI"



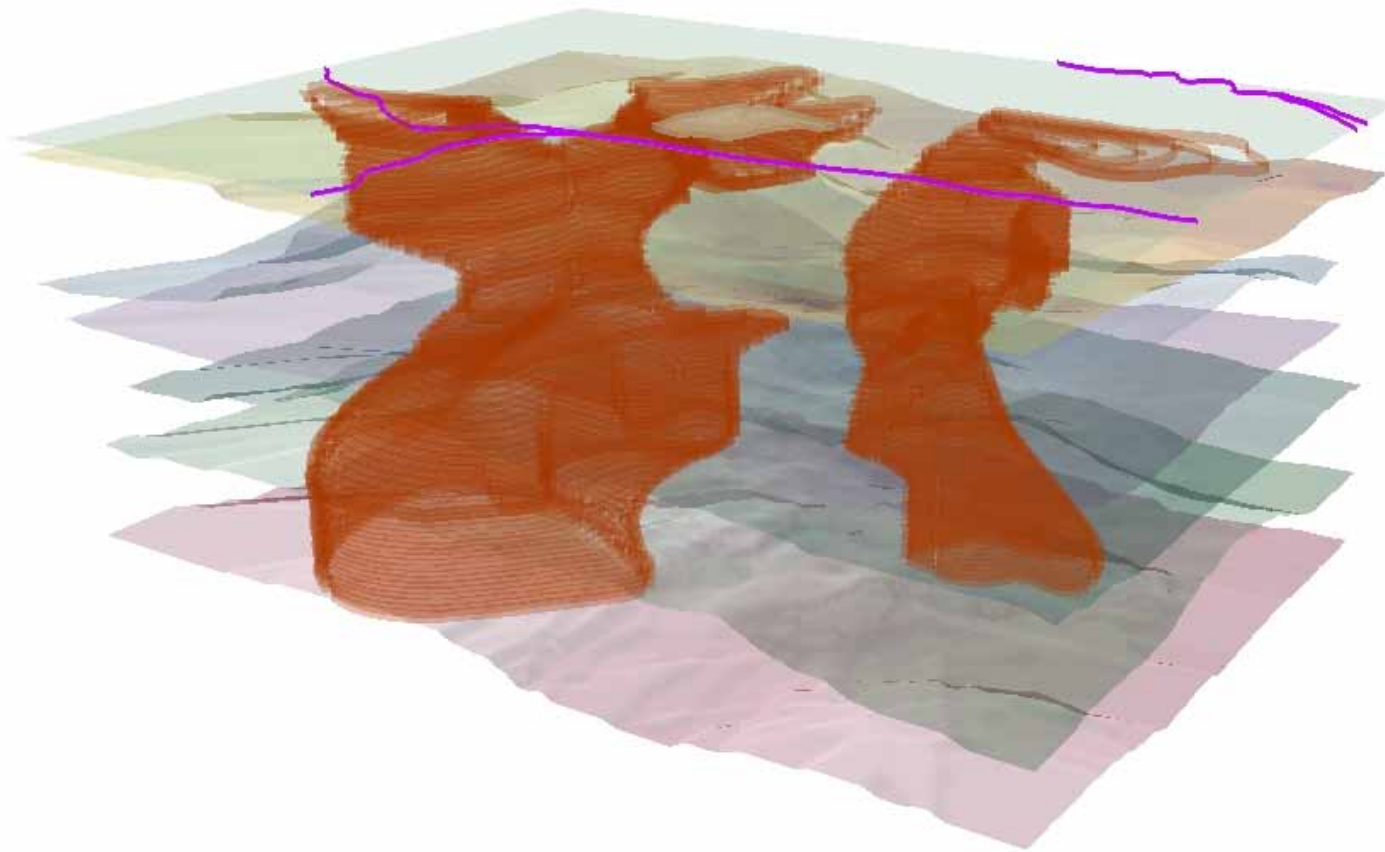
System of faults



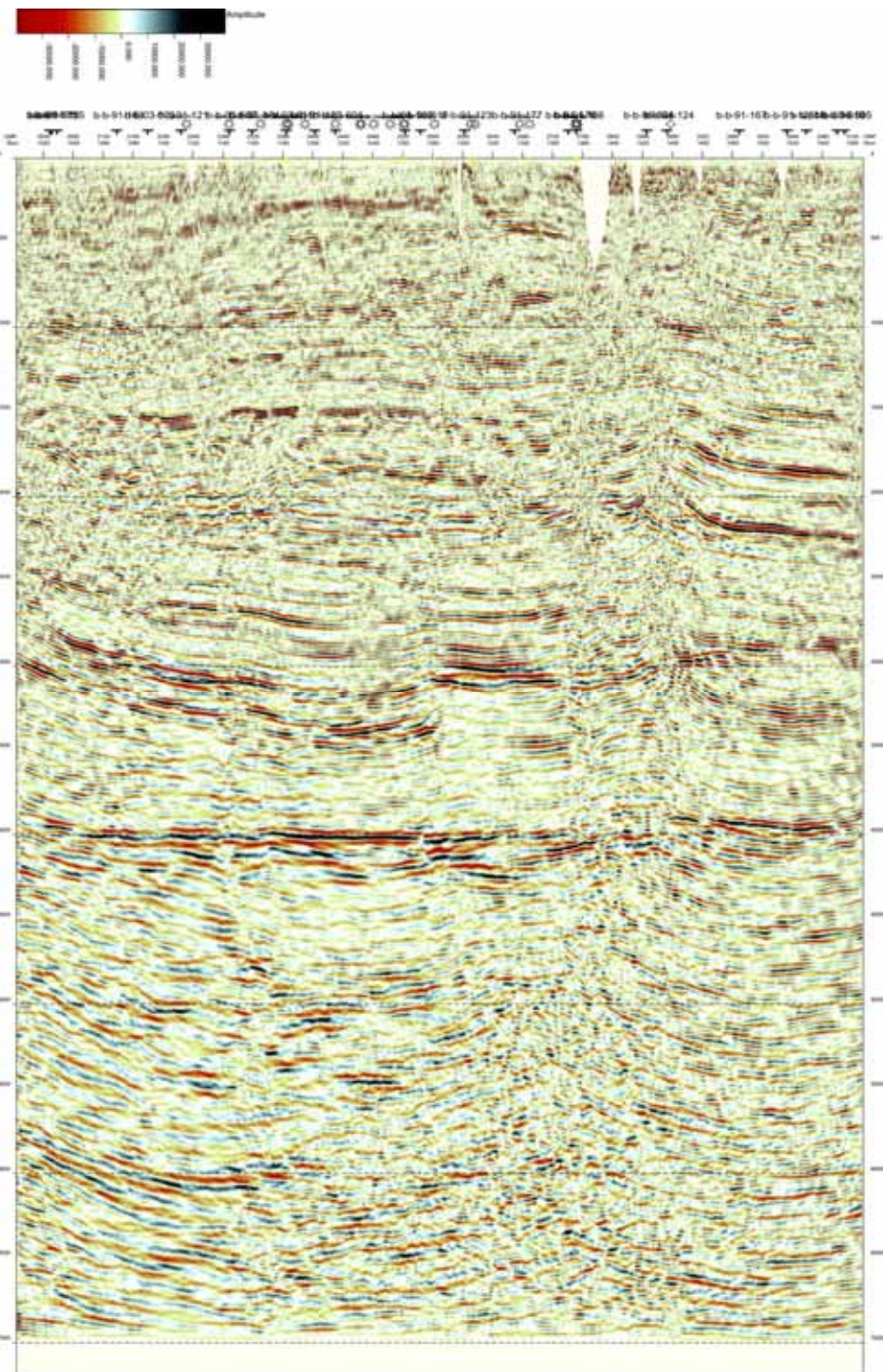
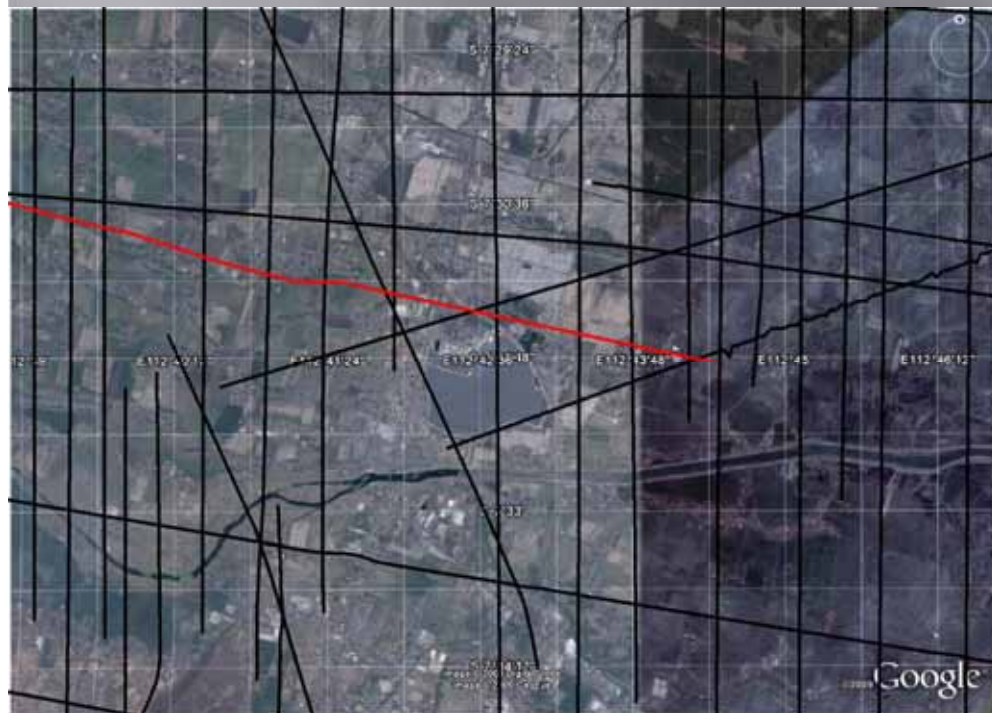
Mud structures



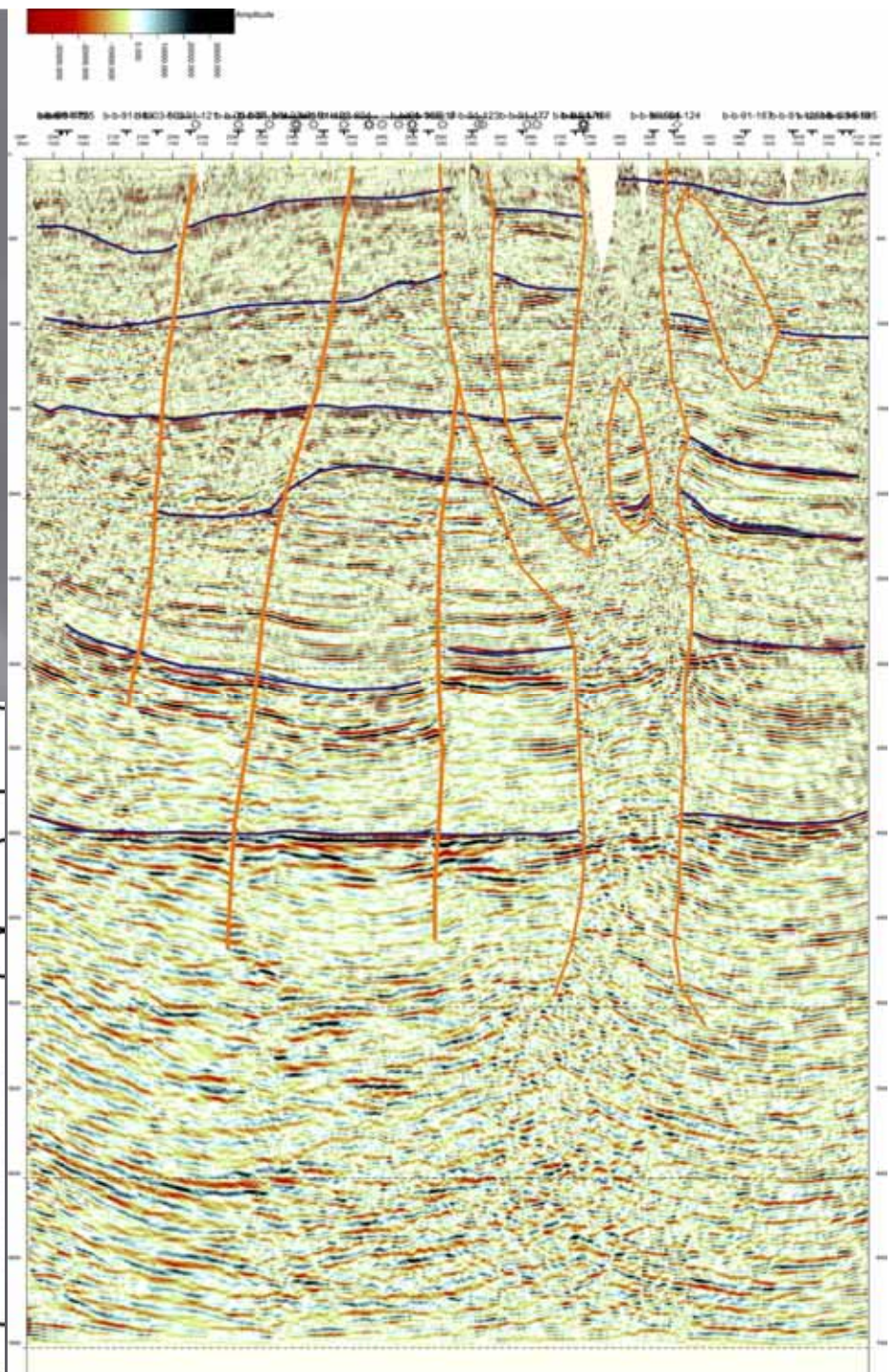
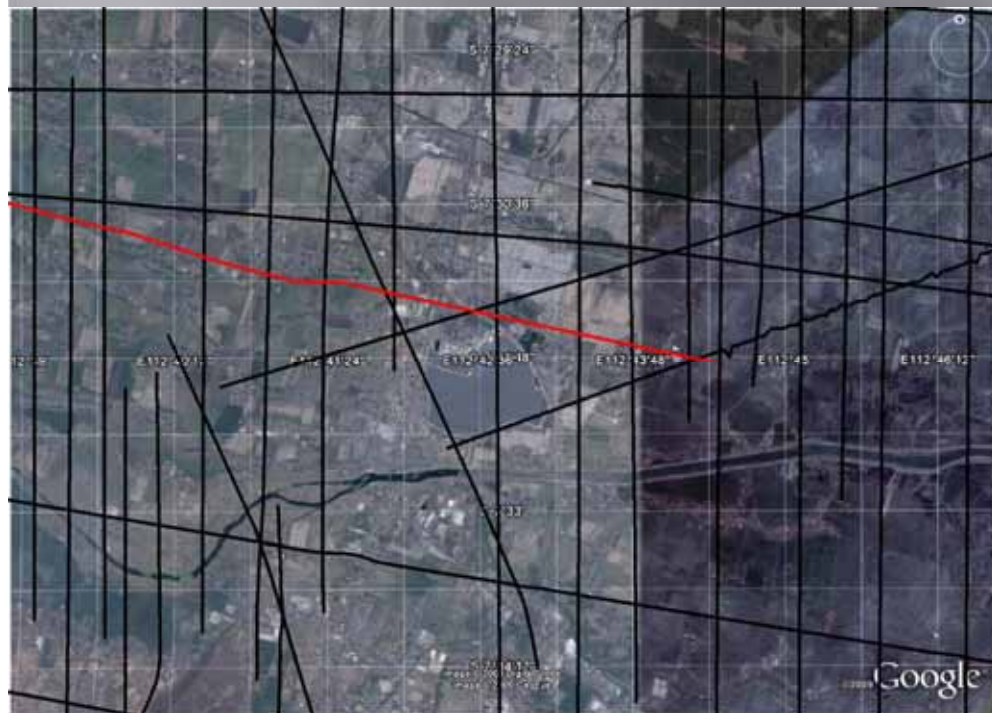
The mud goes up from the depth
throw the natural chanal.



B-03-602



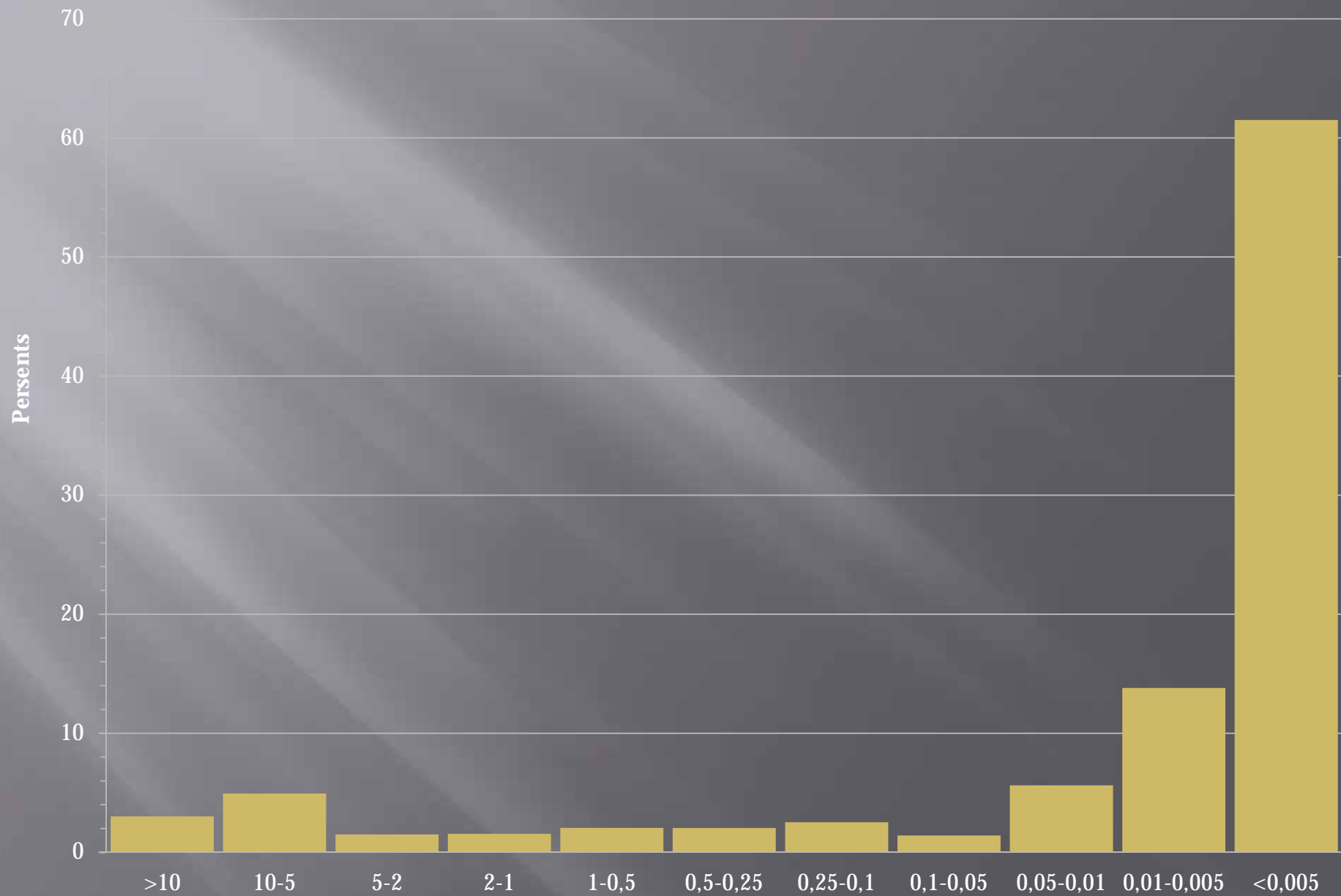
B-03-602



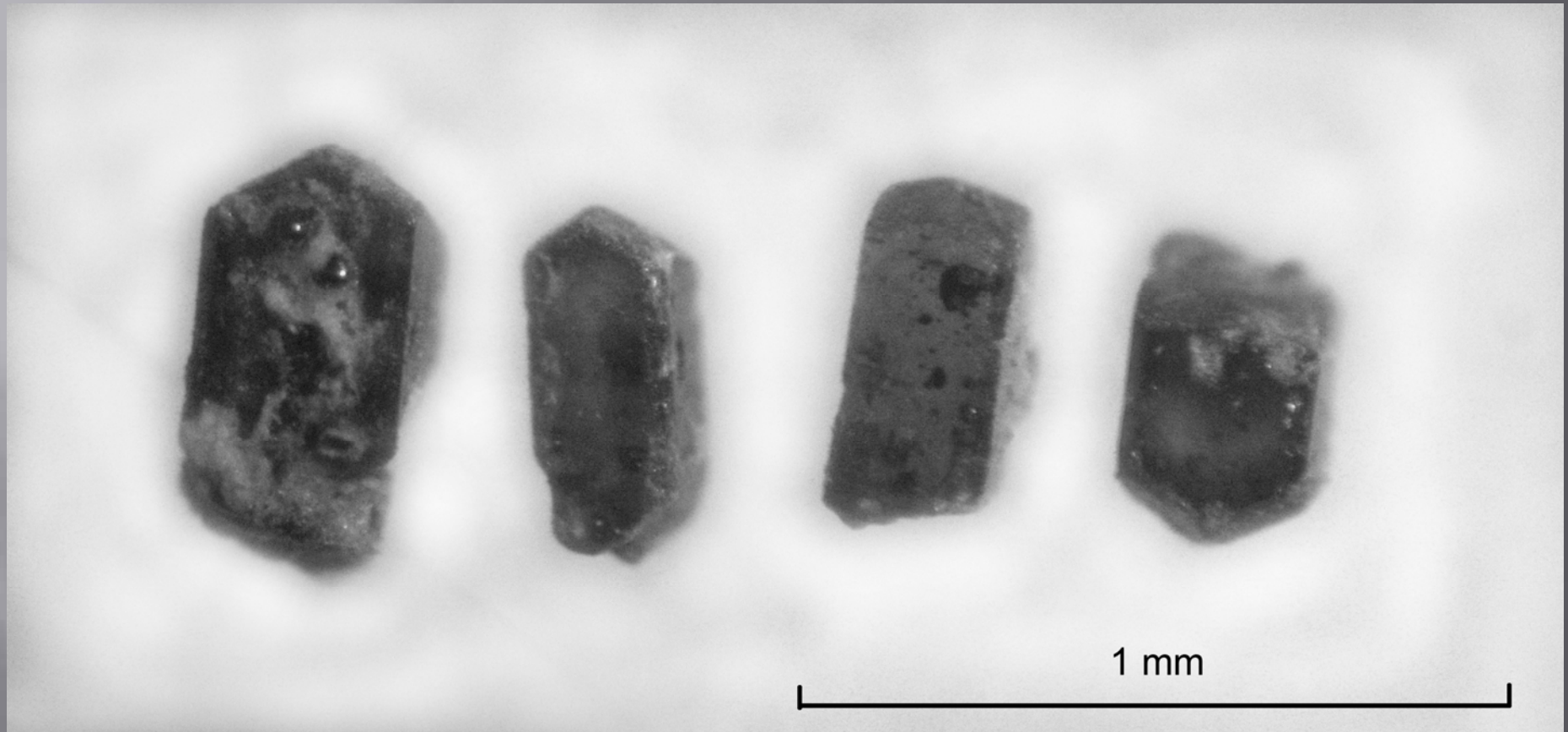
The mud is a combination of different components from different layers and depth.



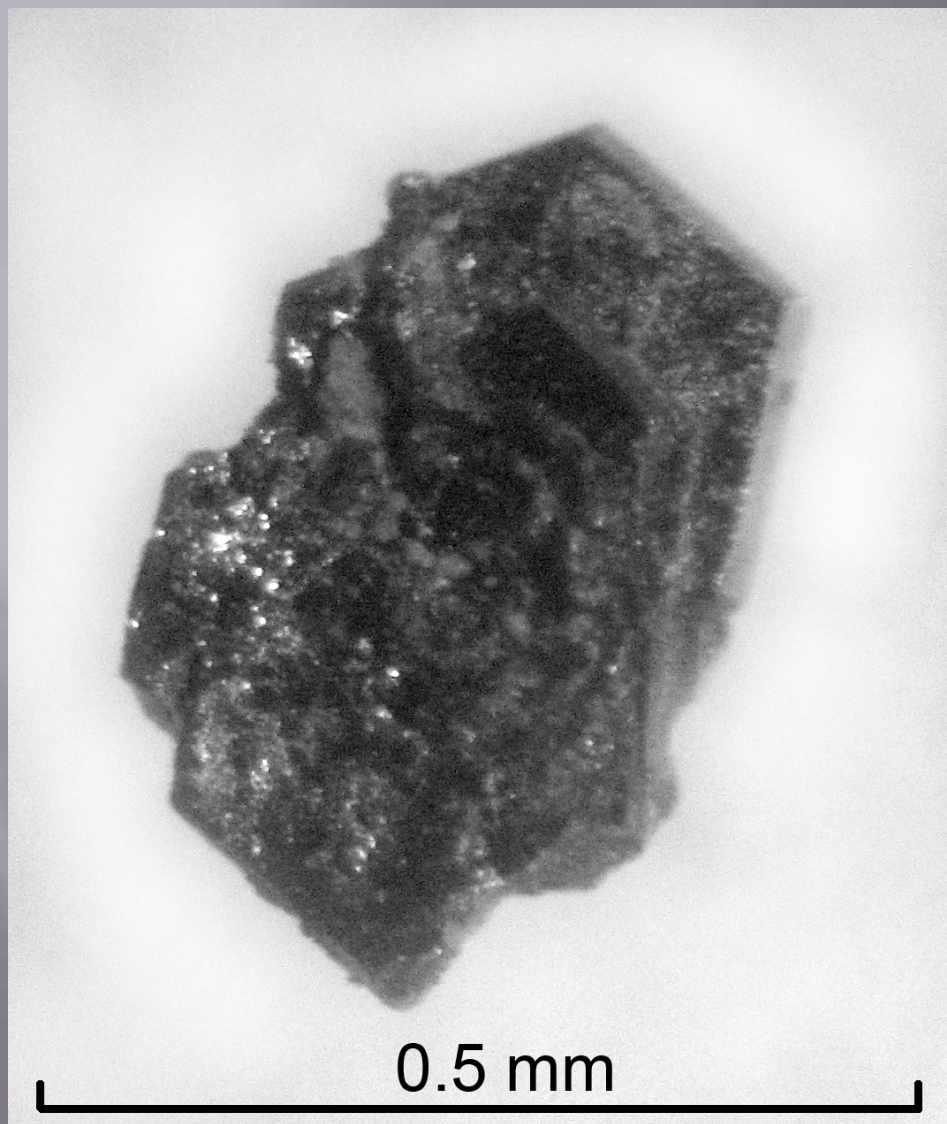
LUSI mud grain size



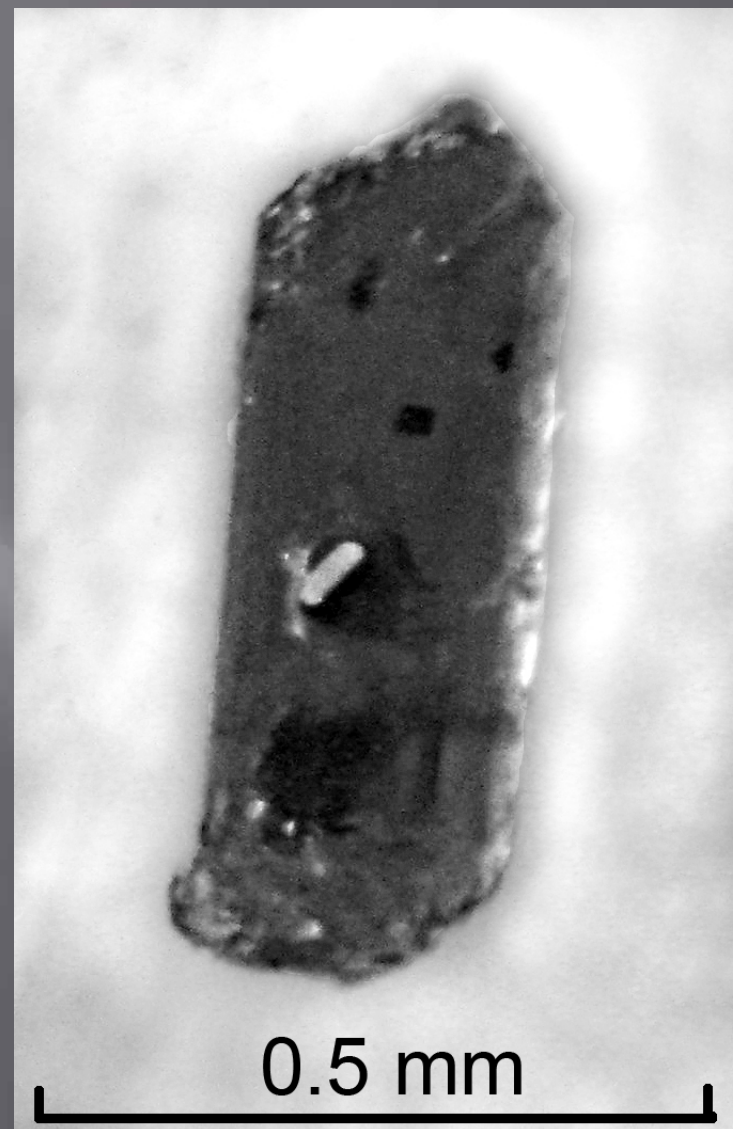
Minerals in mud



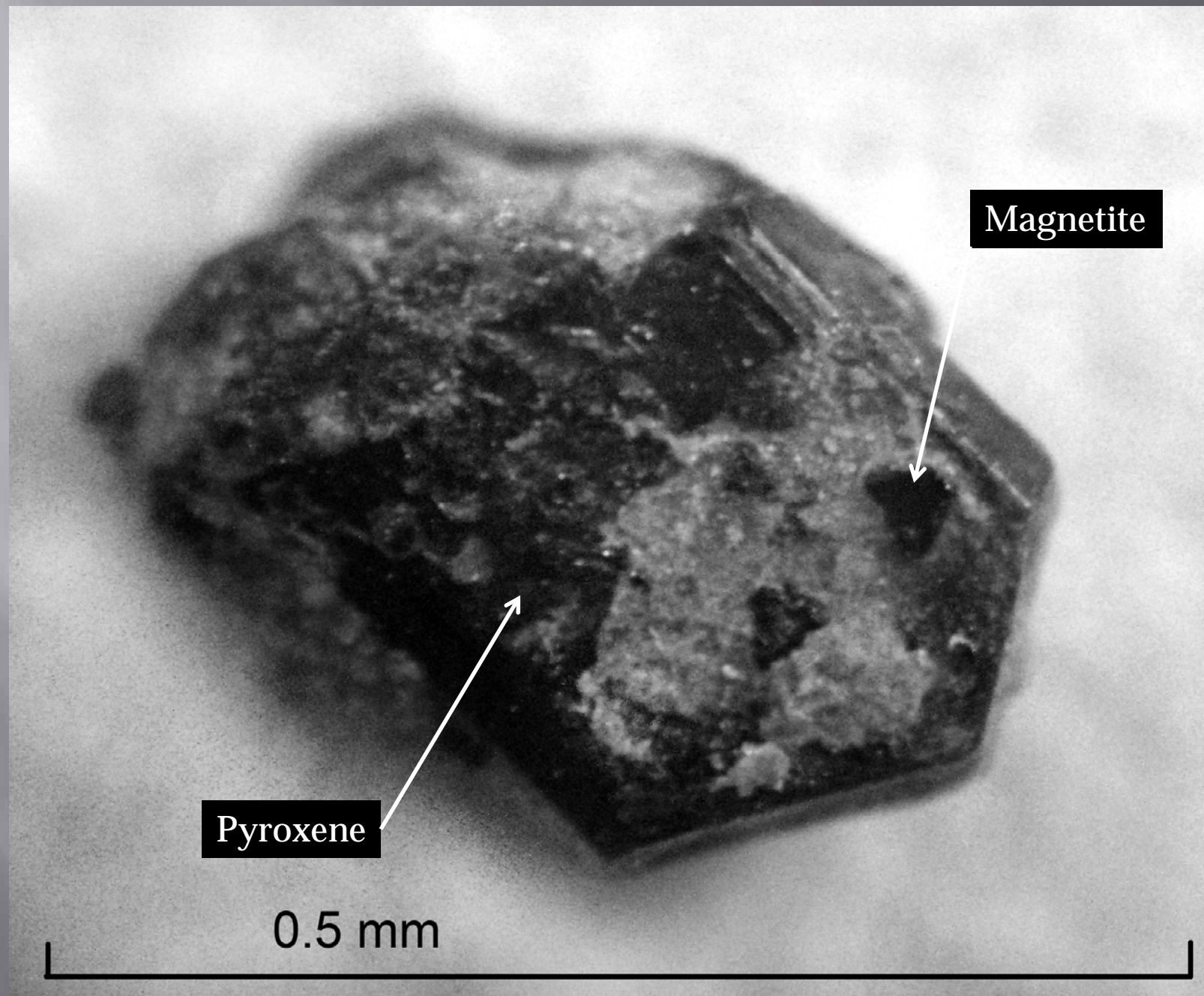
Pyroxenes



Magnetite



Pyroxene and magnetite



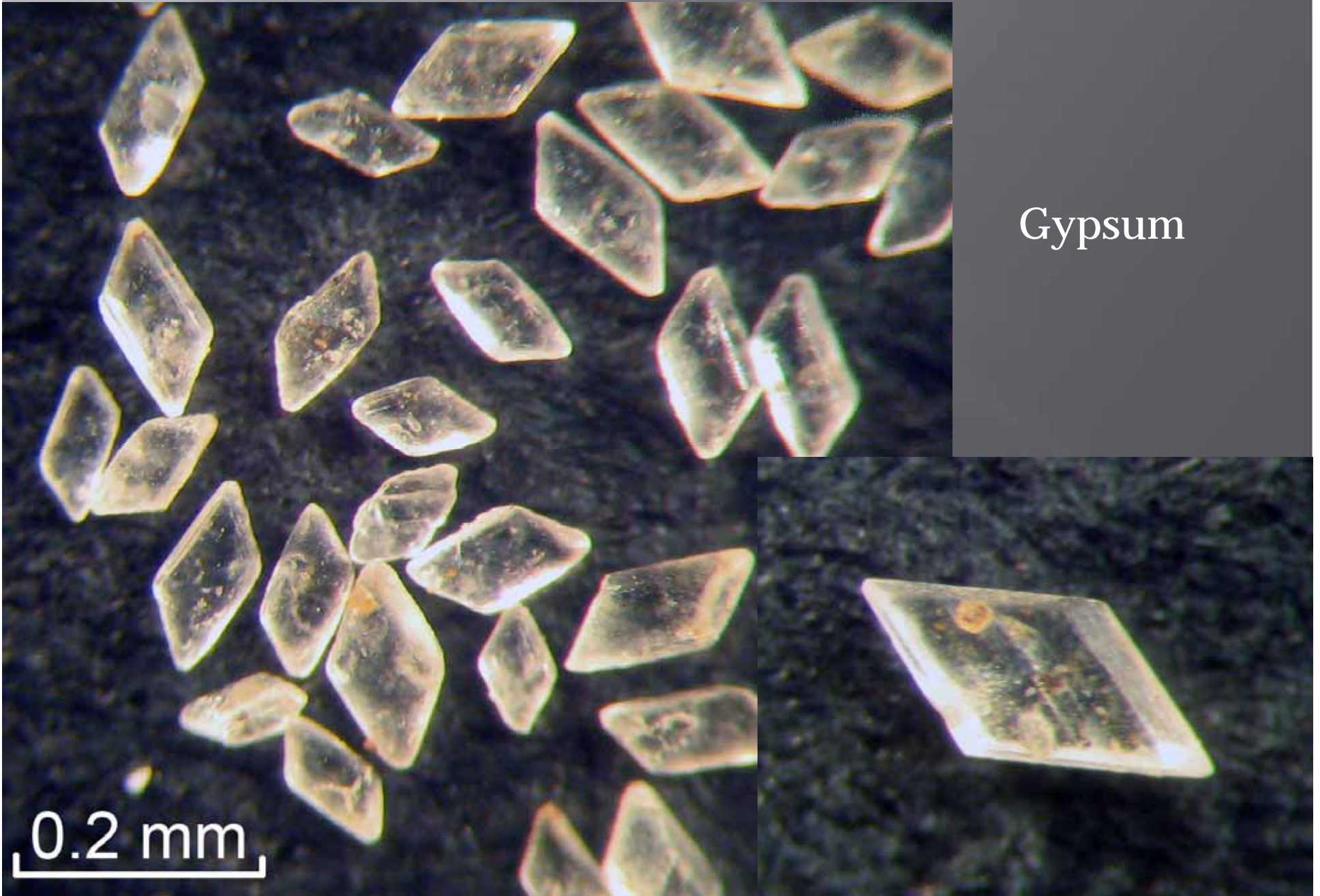
Pyroxene

Magnetite

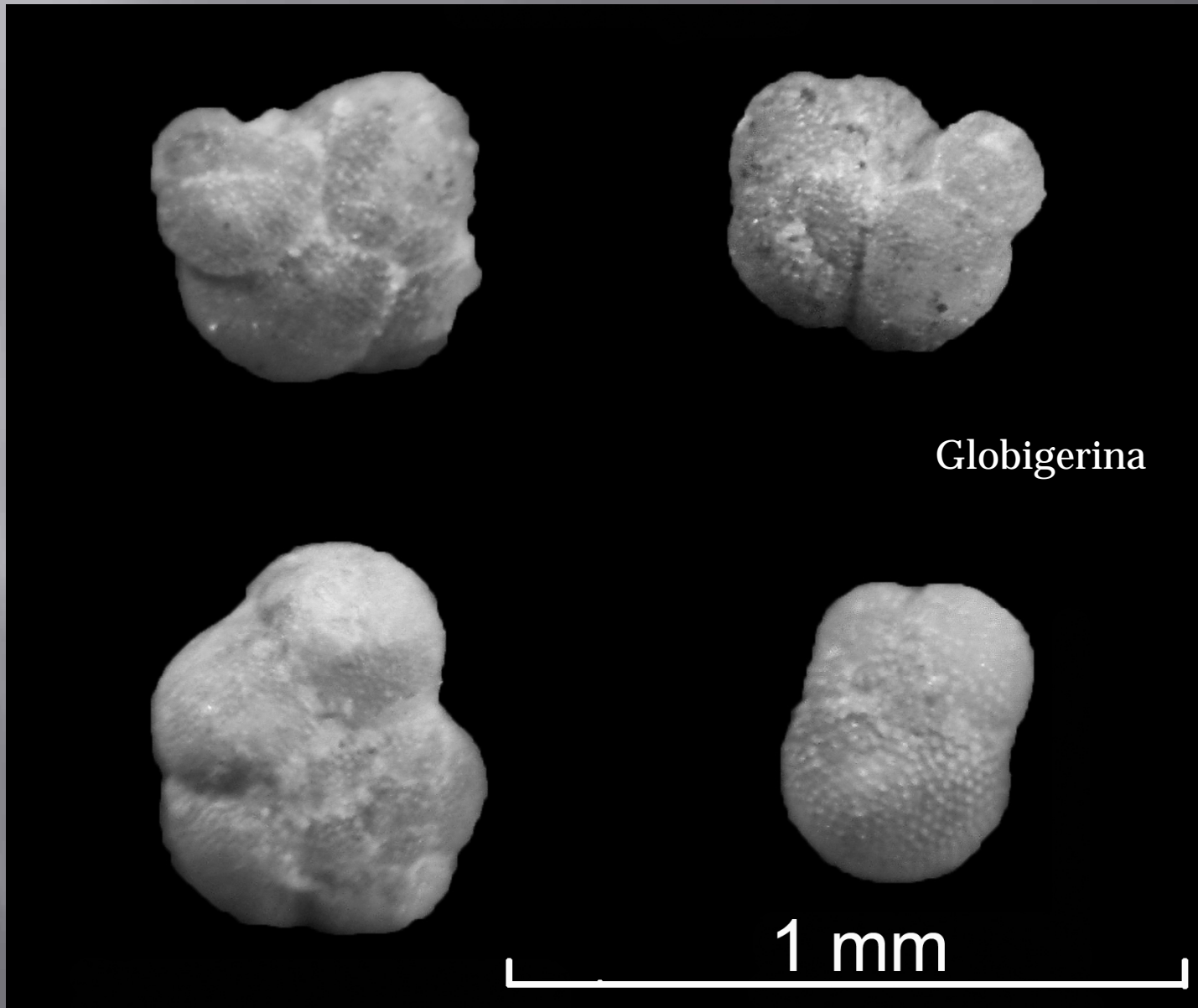
0.5 mm

Gypsum

0.2 mm



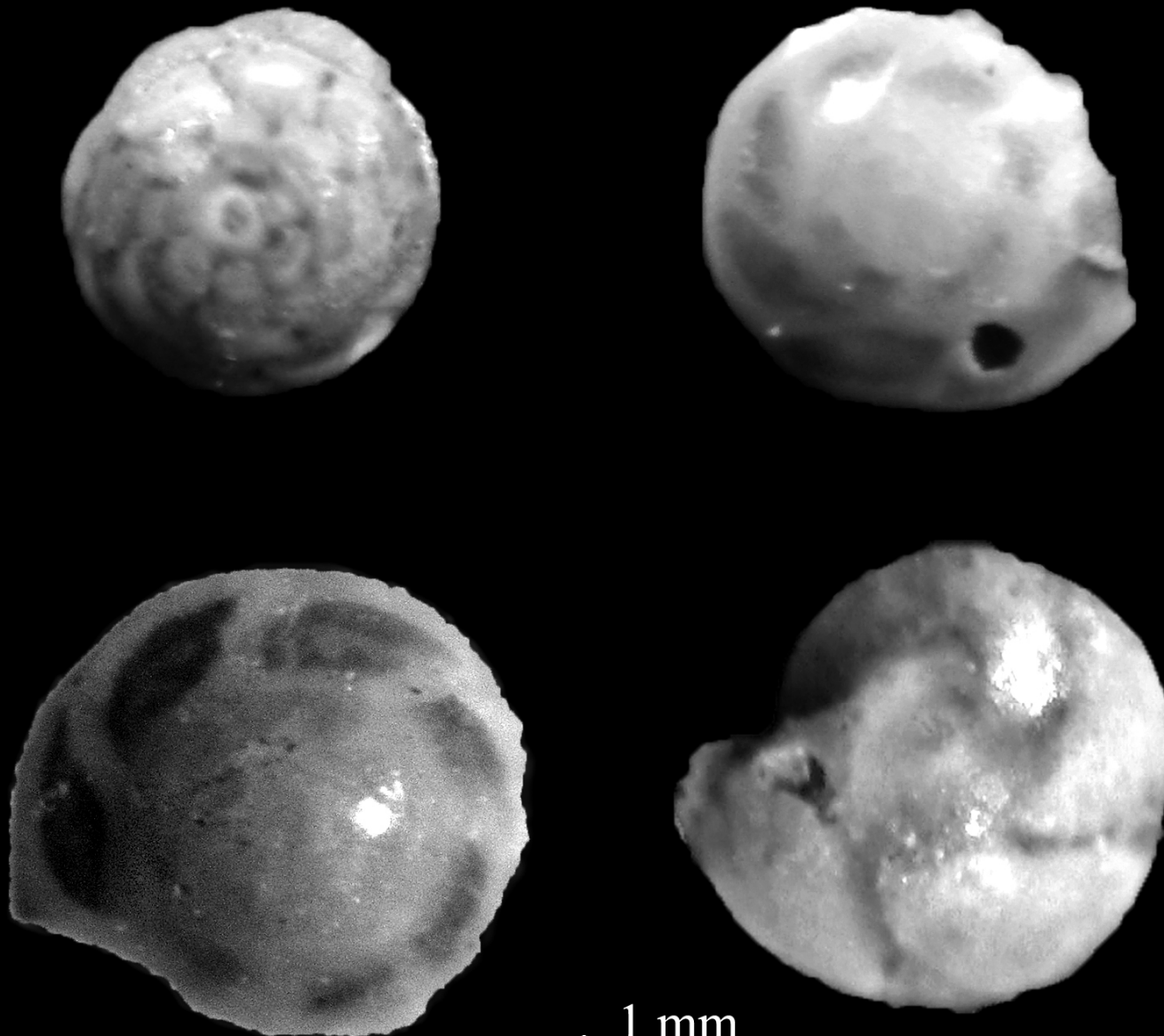
Foraminiferas in mud



Globigerina

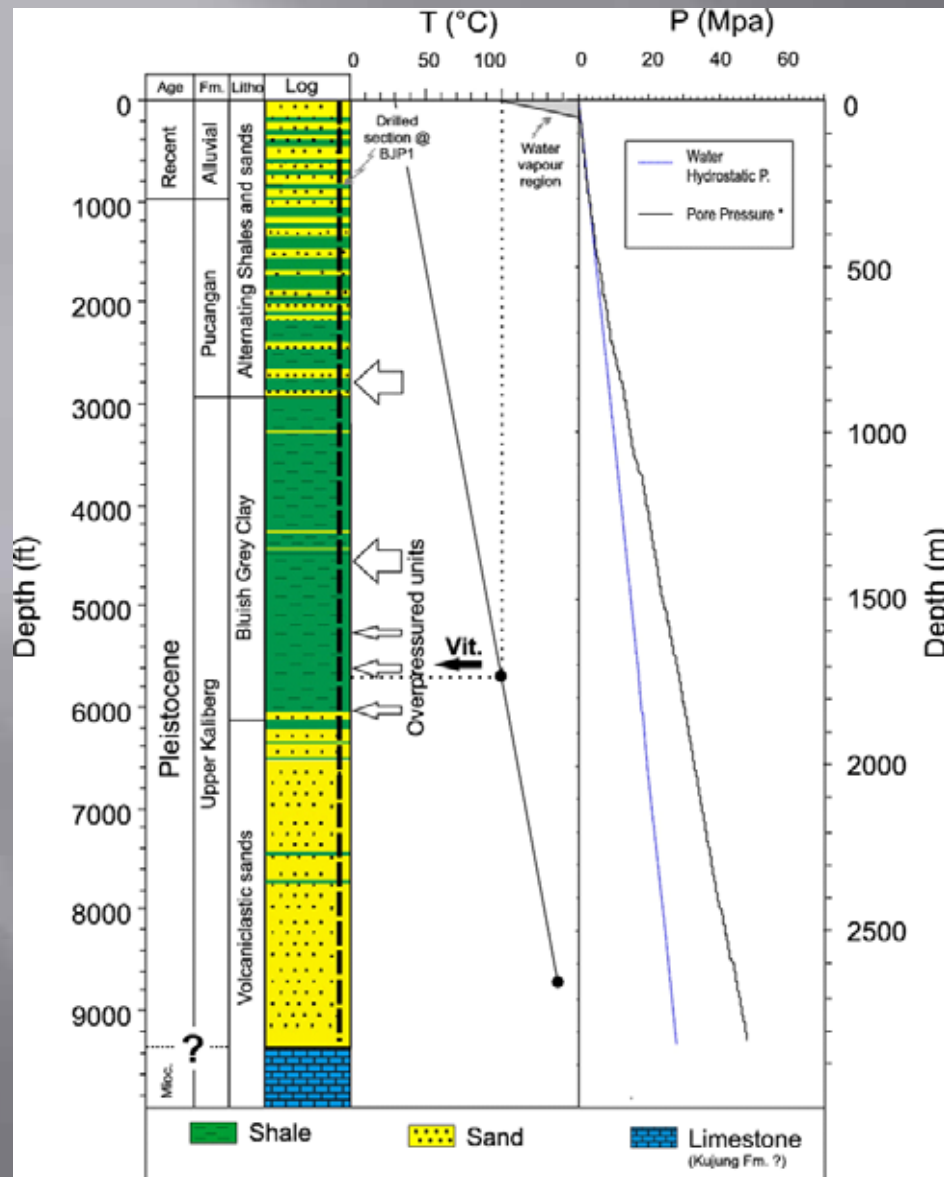
1 mm

Challengerella ?



How we can get answers for previous questions?

- ▣ We should understand present situation under the surface – location of mud canal and position of mud layer.
- ▣ We should understand mechanism of mud eruption – what is the trigger, what pressure level needs for eruption.
- ▣ We should find mud layers from previous eruptions for calculating its frequency.



BJP – 1 well

(after Mazzini, 2007)

Position of Sand and Shale in the top part of well can be interpreted as results of previous eruptions.

Monitoring polygon for control of seismic changes on LUSI territory

Equipment for geodynamic polygon

Seismic station:

- Seismic station Delta-GEON 02 M

Sensor:

- Geophone CK1-П

Registration equipment:

- MFP-01

Mobile modem:

- SIEMENS TC65 Terminal

Satellite modem:

- GSP-1620



The basic characteristics of digital seismic station Delta-GEON 002M

Capacity	22
Frequency diapason	0.1 - 240 Hz
Number of information canals	3 canals SP + 1 additional canal
Range of controlling on the channel strengthening	automaticly
Size of flash disk	512 Mb
Remote access to the data	Modem
Access possibility to the information	Software "RSS 232"
Type of data saving	continuous
Coordinate and time position	GPS
Calibration	Rectangular impulse
Quantization frequency of entrance signal	31.25, 62.5, 125, 250, 500, 1000 time/s
Range of detecting frequencies	0,1...7,5 Hz; 0,1...15 Hz; 0,1...30 Hz; 0,1...60 Hz; 0,1...120 Hz; 0,1...240 Hz;
Temperature range	- 30 / +50C
Power	Direct Current / 12V / 1.6 W (without sensor)



Multichannel geophysical registrar «МГР-01»



Basic characteristics:

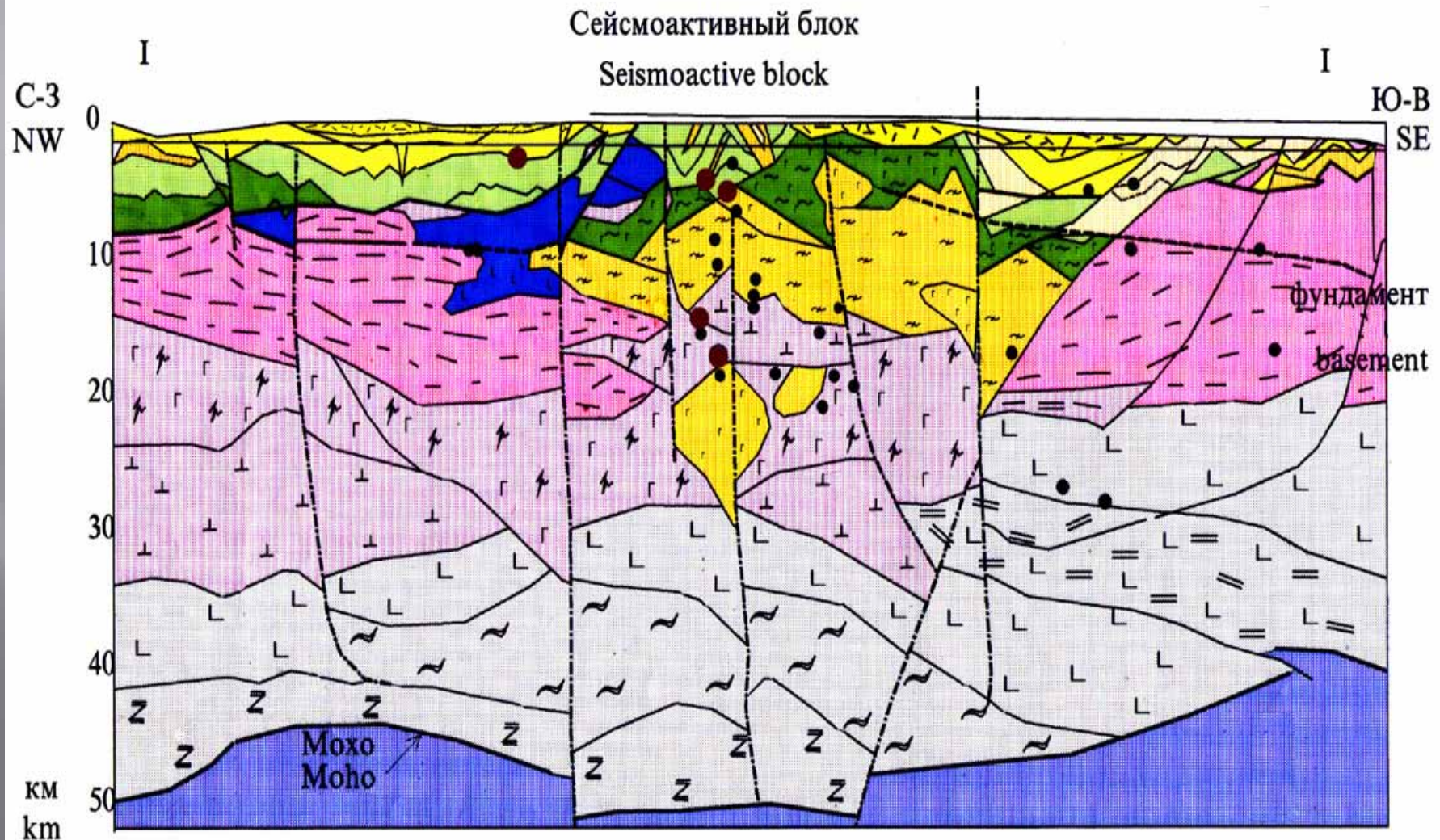
Frequency range of the electromagnetic emission channel – (1,3 - 500) kHz;

Frequency range of the signals accepted by the channel of acoustic emission - 500 Hz - 230 kHz;

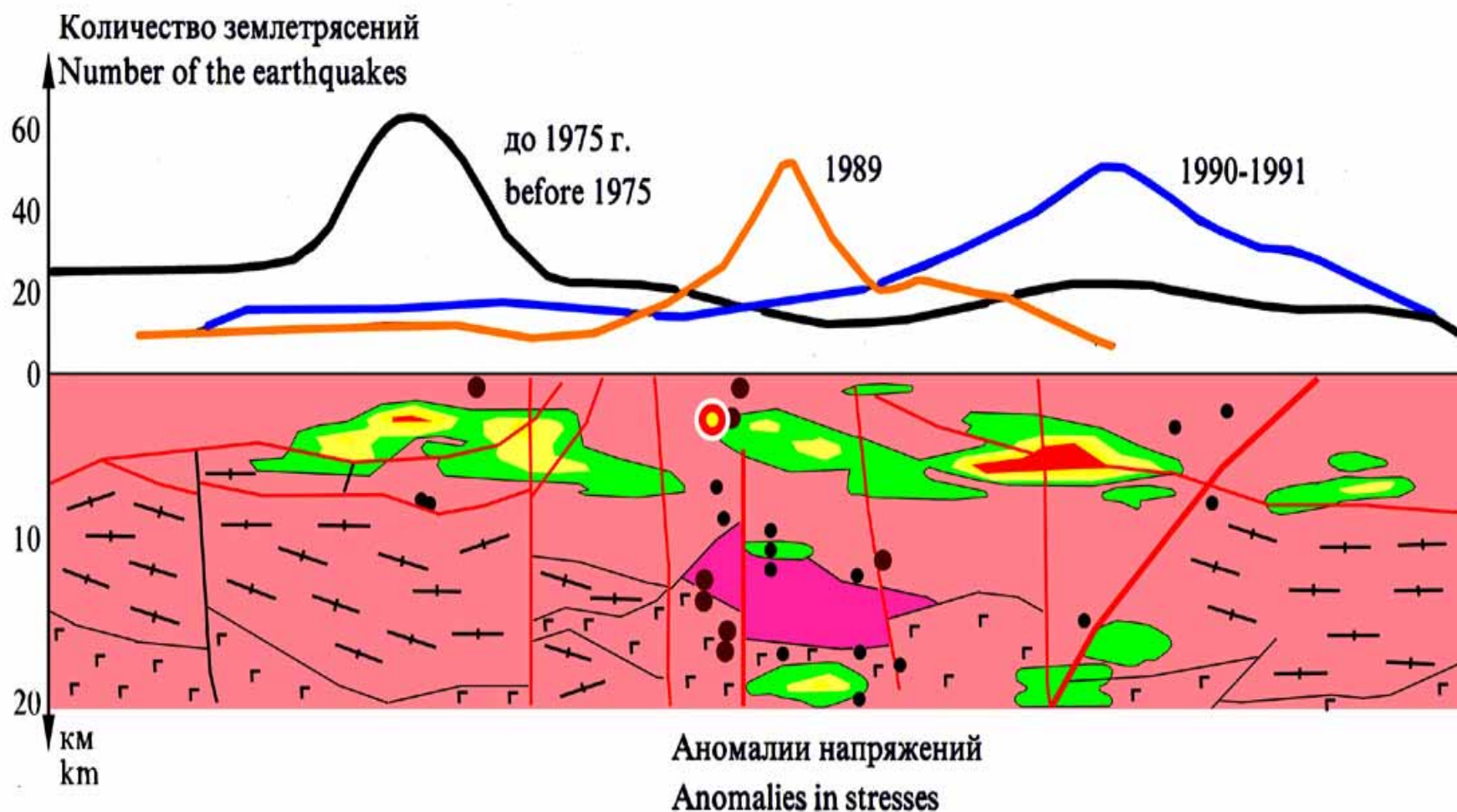
Digitizing frequency of electromagnetic and acoustic emission in accepted signals gets out in the program menu in limits (609, 557, 504, 419, 360, 331, 311, 238, и т.д. до 28) kHz;

Sensitivity of electromagnetic and acoustic emission channels is 60 microvolt.

Геолого-геофизическая модель Geologic and geophysical pattern



Поле тектонических напряжений Tectonic stresses field



Seismic division into districts. Seismic danger to a platform of the APS

СЕЙСМОТЕКТОНИЧЕСКОЕ РАЙОНИРОВАНИЕ С ЦЕЛЬЮ ОЦЕНКИ СЕЙСМИЧЕСКОЙ ОПАСНОСТИ ДЛЯ ПЛОЩАДКИ АЭС

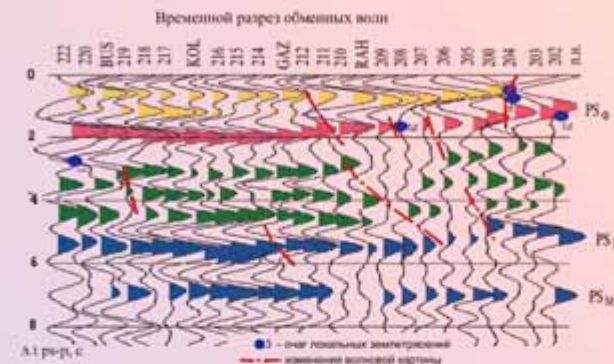


Схема эпицентров землетрясений



▲ - район работ (МОБЗ)

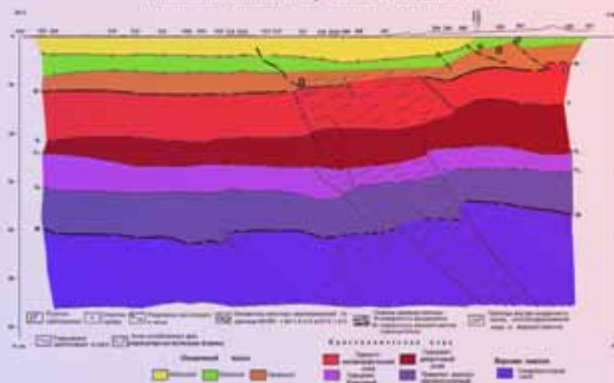
Карта региональных структурных элементов района АЭС
по данным глубинных сейсмических исследований



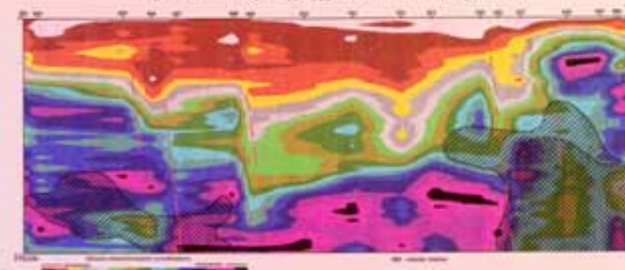
Ориентационно-структурный блок (Евразия) Декановский блок (Джиганский)
Сибирский, арктический блок Кавказ I Кавказ II

Пункты установки станций
● 10% - основной стая, 5 (100) - вспомогательные (1, 2, 3, 4)
■ - эпицентры локальных землетрясений

Глубинный разрез земной коры Внешнего Загроса
(Наблюдения выполнены с применением РСС Дельта-Гео)

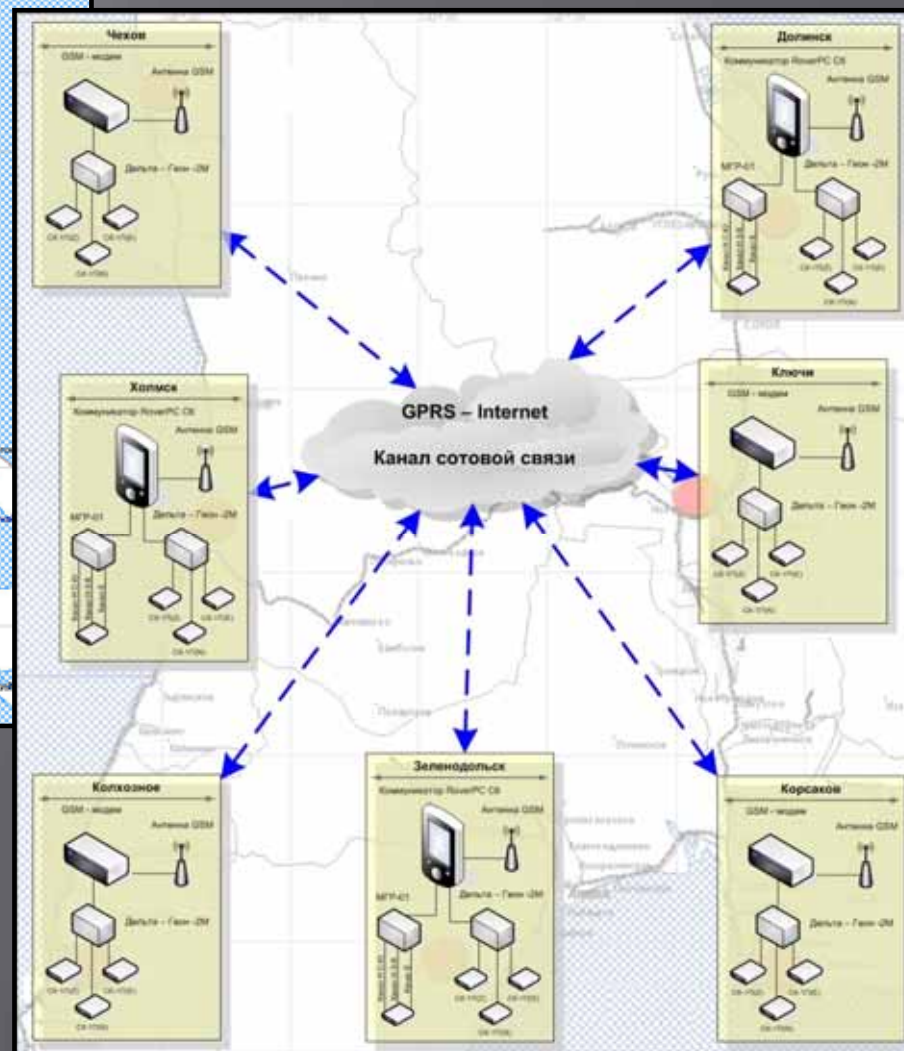
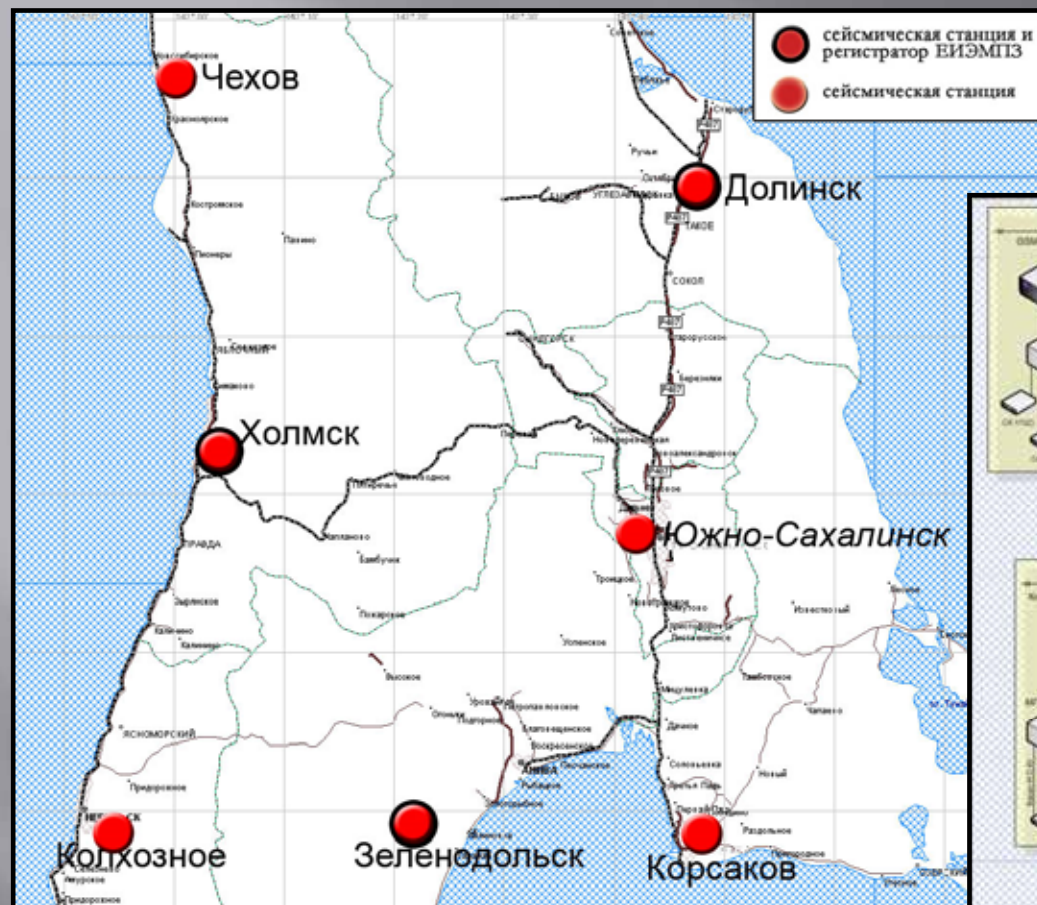


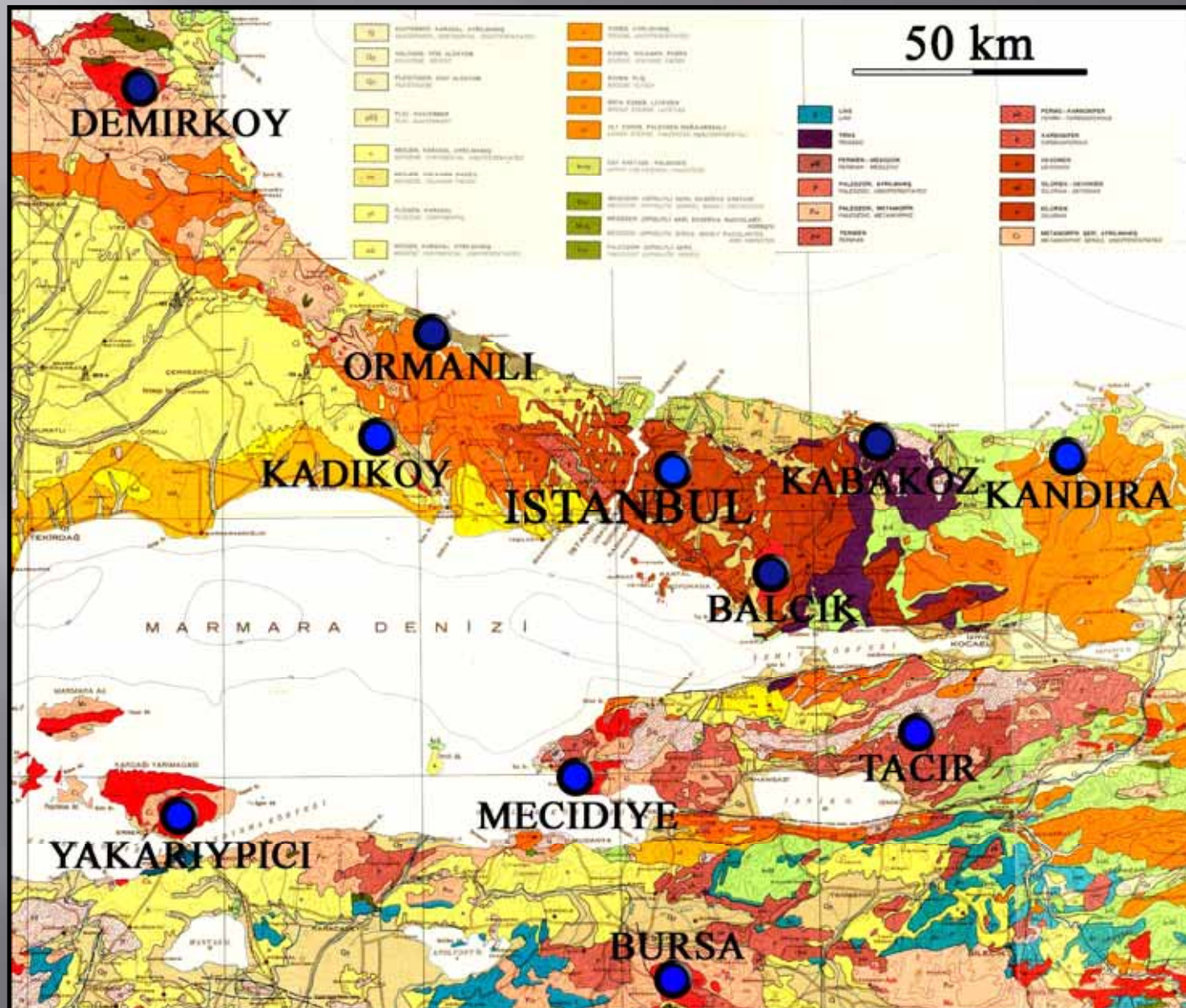
Структура распределения энергии обмена сейсмических волн далеких землетрясений
(отражает статическую структуру геологических неоднородностей)



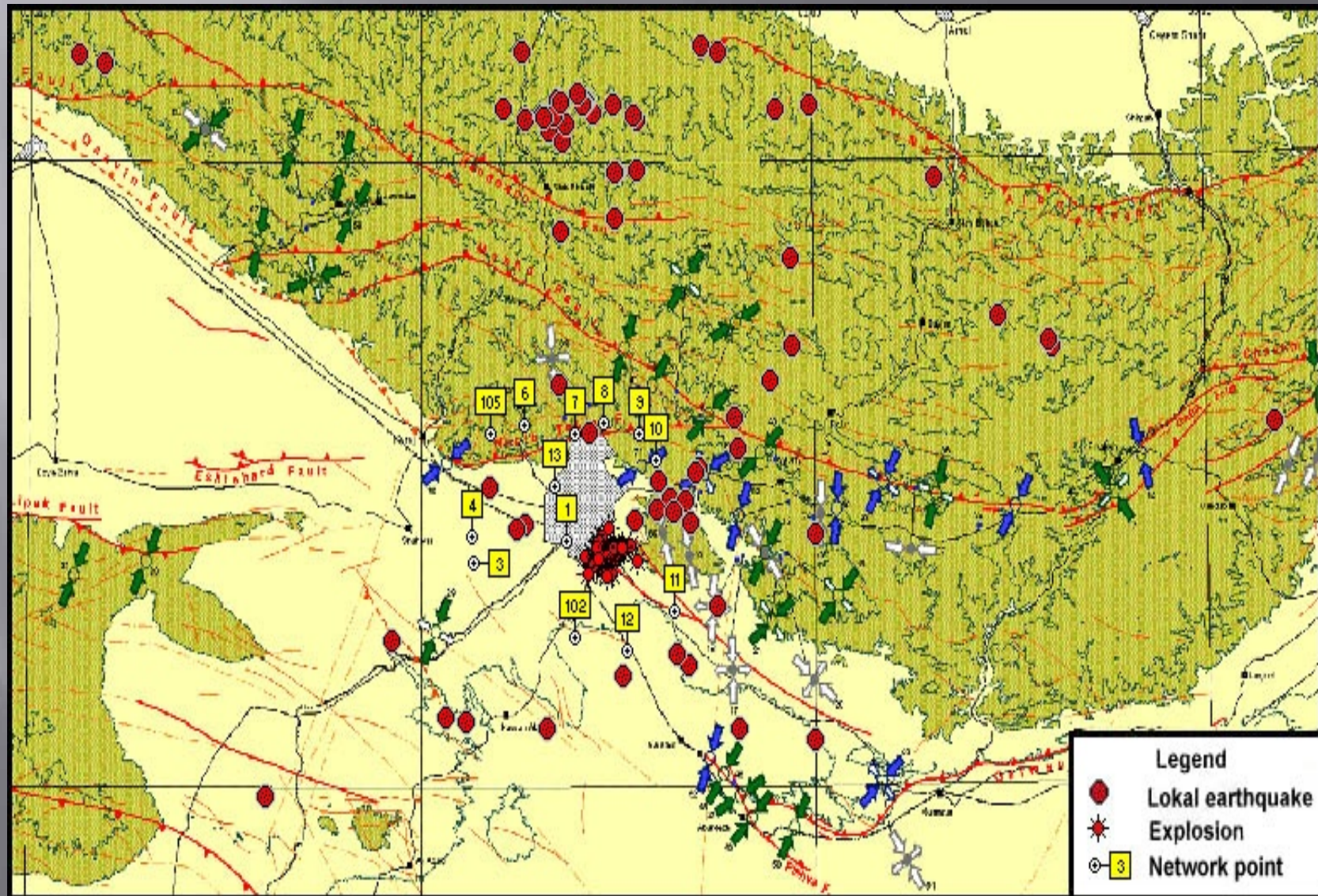
1 - зона структурных нарушений субформационного происхождения границ структуры сублитического слоя,
2 - статическая флюктуация разностей интенсивности на границах структурных неоднородностей, которая
имеет информацию о структуре земной коры (на данном этапе исследования)

Position of monitoring points in South Sakhalin polygon



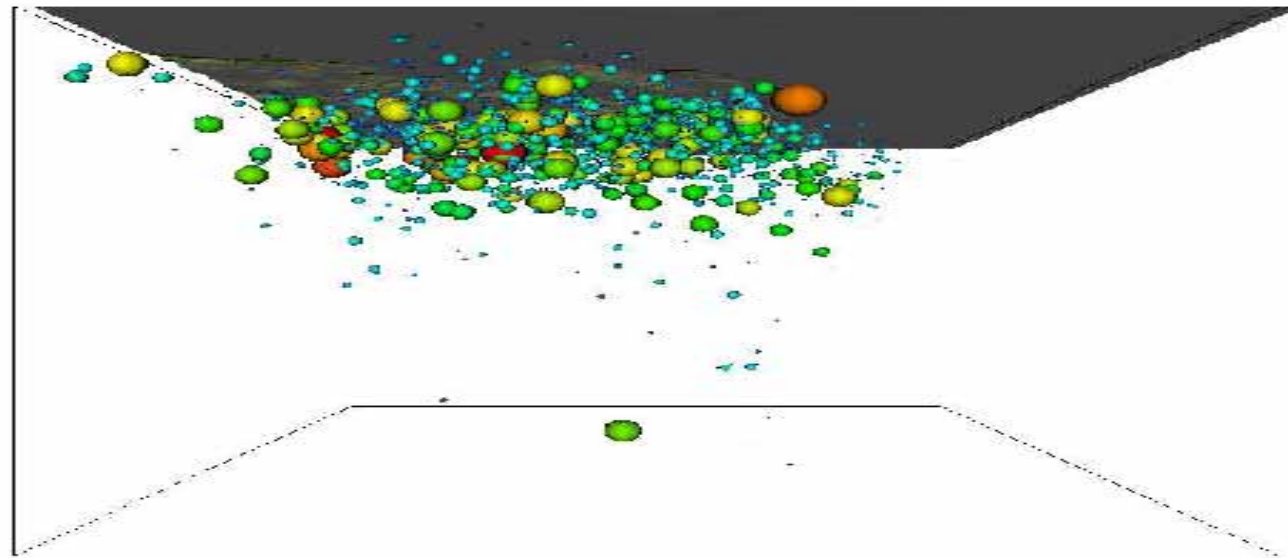


The valid seismic mode of urban agglomeration

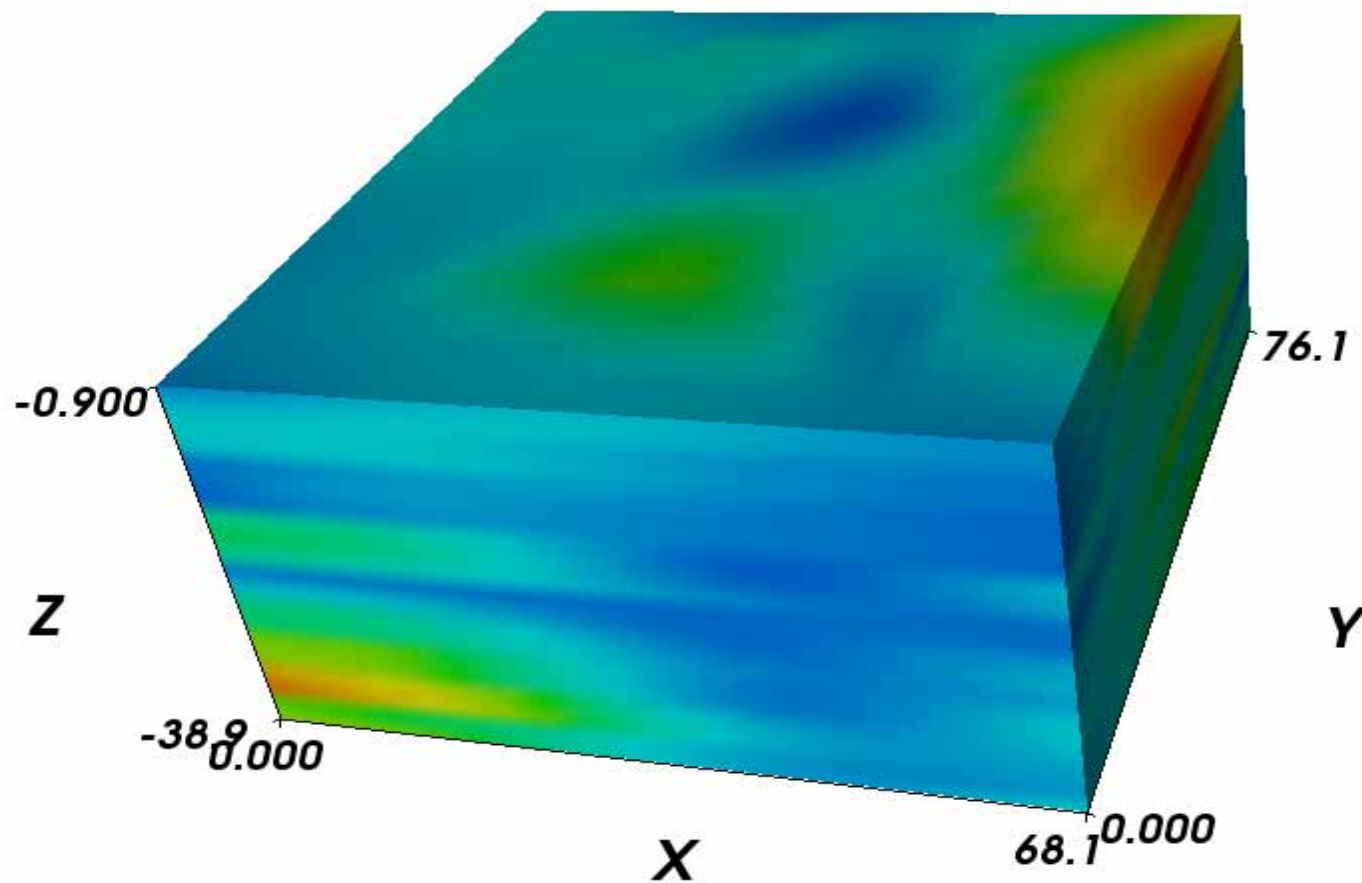


**Трехмерное представление землетрясений
Кавказского региона**

Caucasian earthquakes 3-D representation



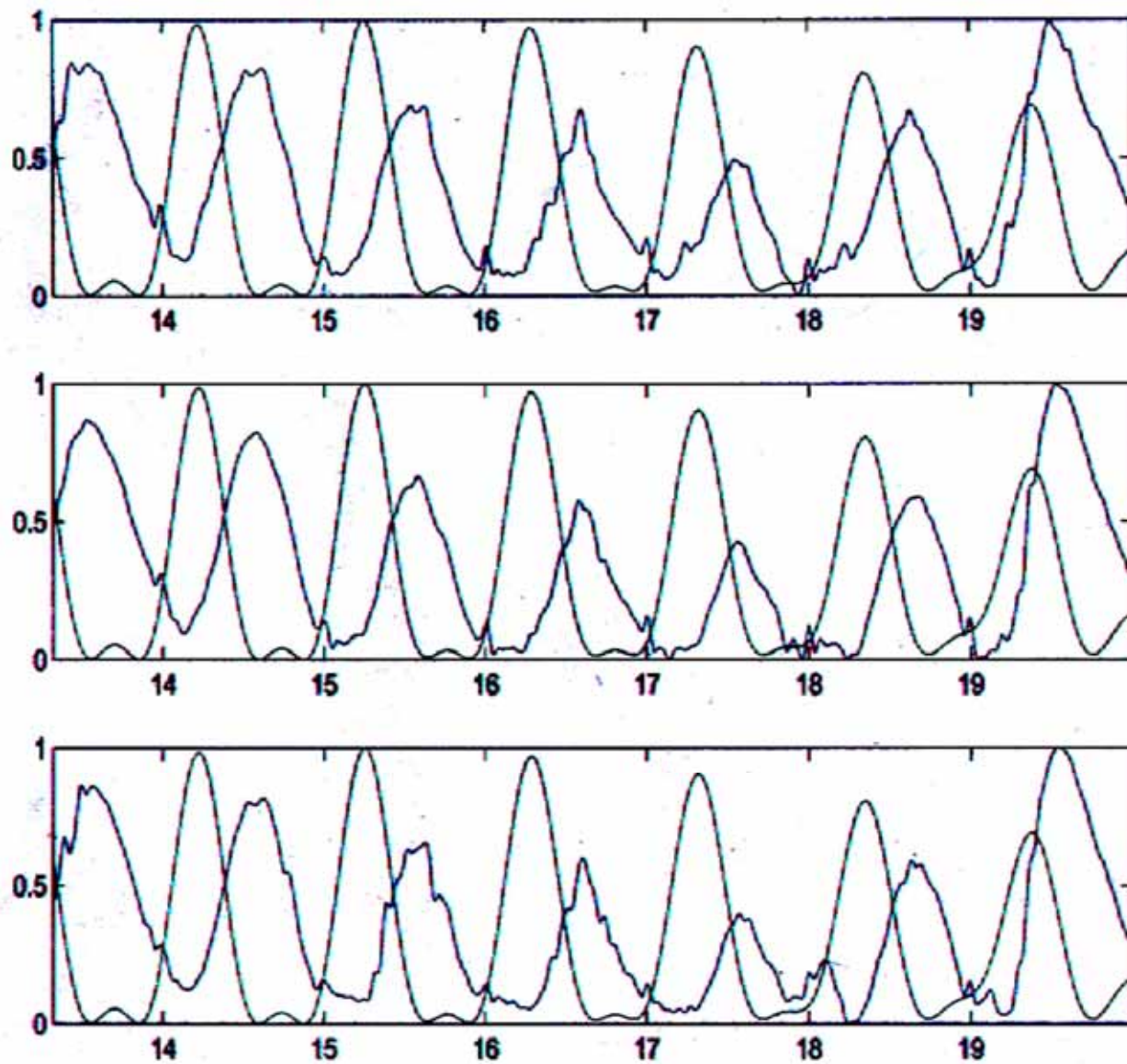
3D model shows the stress fields distribution in volume of geodynamic loop



Display of processes of the earthquake preparation in an electromagnetic field (Tyva Loop) (19.01.08 , M-5.0)



Wavelet approximation of seismic and tidal potential, June 2003



Вейвлет аппроксимация составляющих сейсмики
и приливной потенциал

Proposal for LUSI polygon



Thank you for your
attention!

