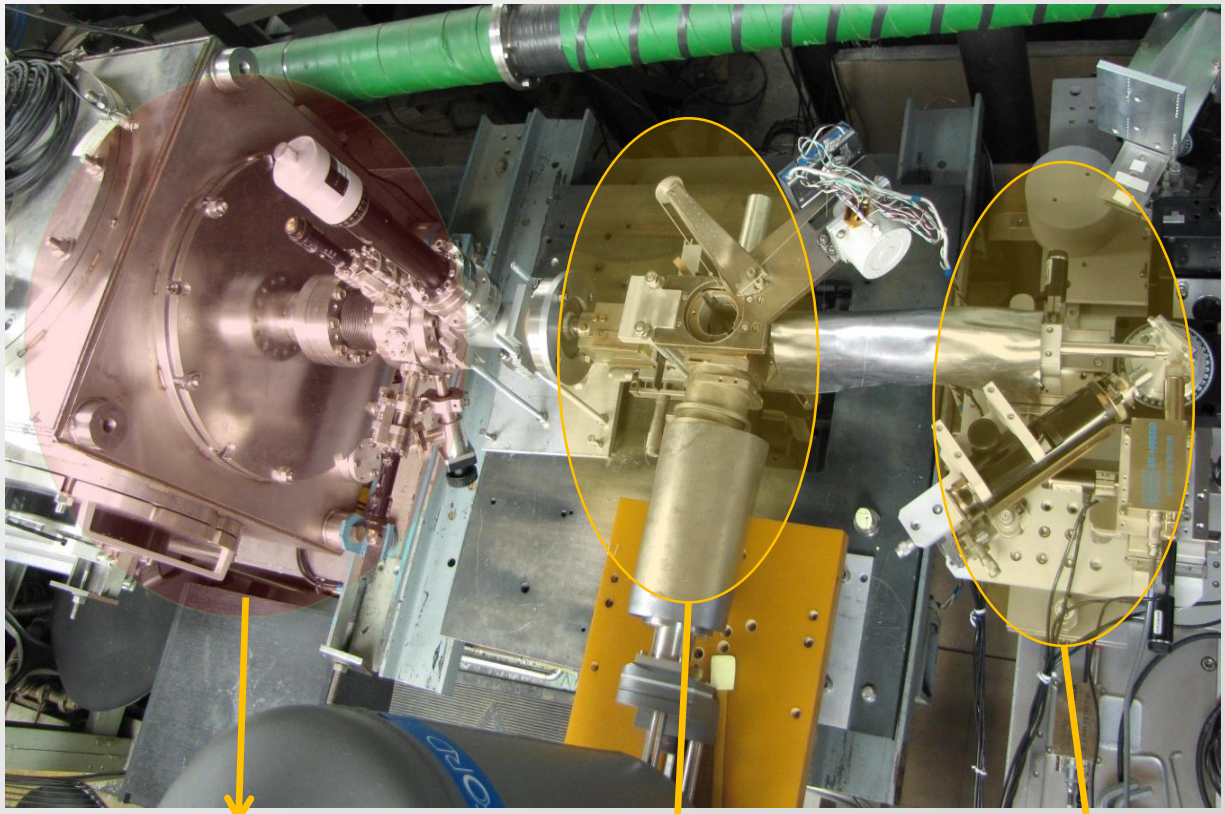
# Search for and analysis of composition and structure of submicron-size particles in geological samples

Speaker : Darin F.

F.A.Darin@inp.nsk.su

# XRF station in SSRC



Monochromator and slits for beam collimation

Two types of one-dimensional XRF scanners

Confocal X-ray microscope

Monochromator :

Channel-cut
Si (111)

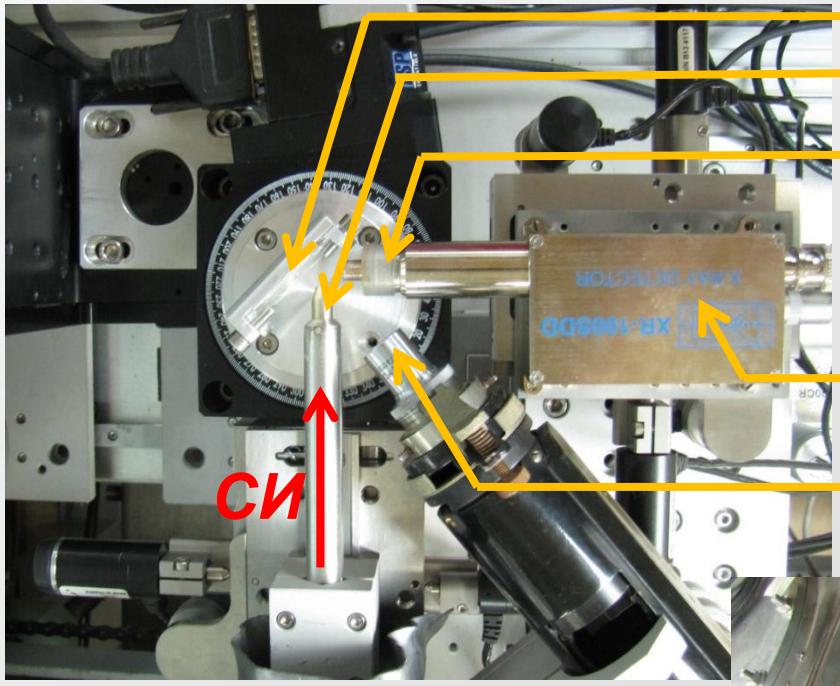
Energy resolution:

$\delta E/E = 2\text{-}3 \cdot 10^{-4}$

Working energy range :

$\Delta E = 5 – 40$ keV

# Confocal X-ray microscope



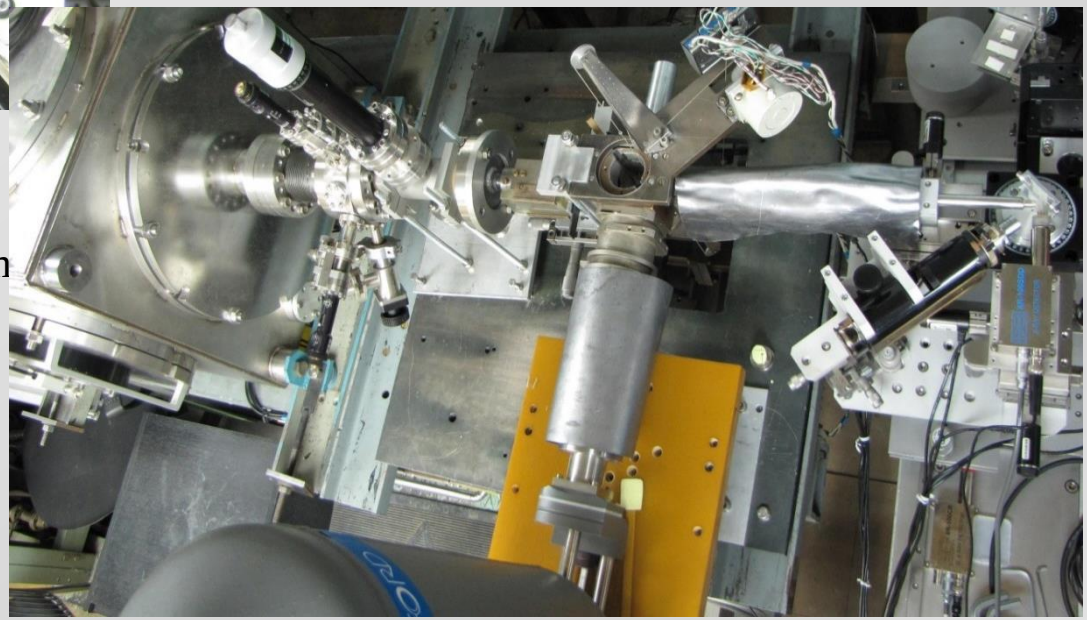

*Sample holder*

*First polycapillary lenses*

*Collimator/second polycapillary lenses*

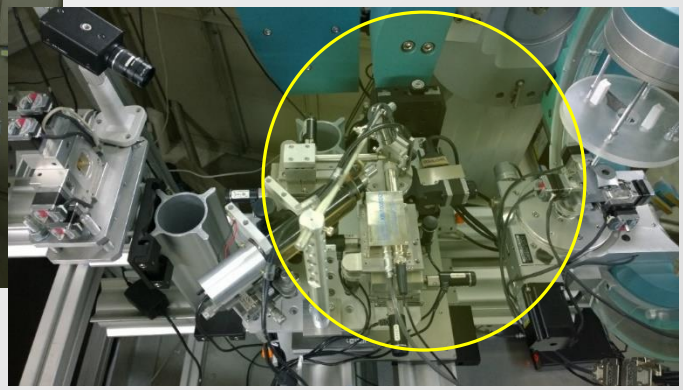
*X-ray detector XR-100 SDD*

*Microscope*

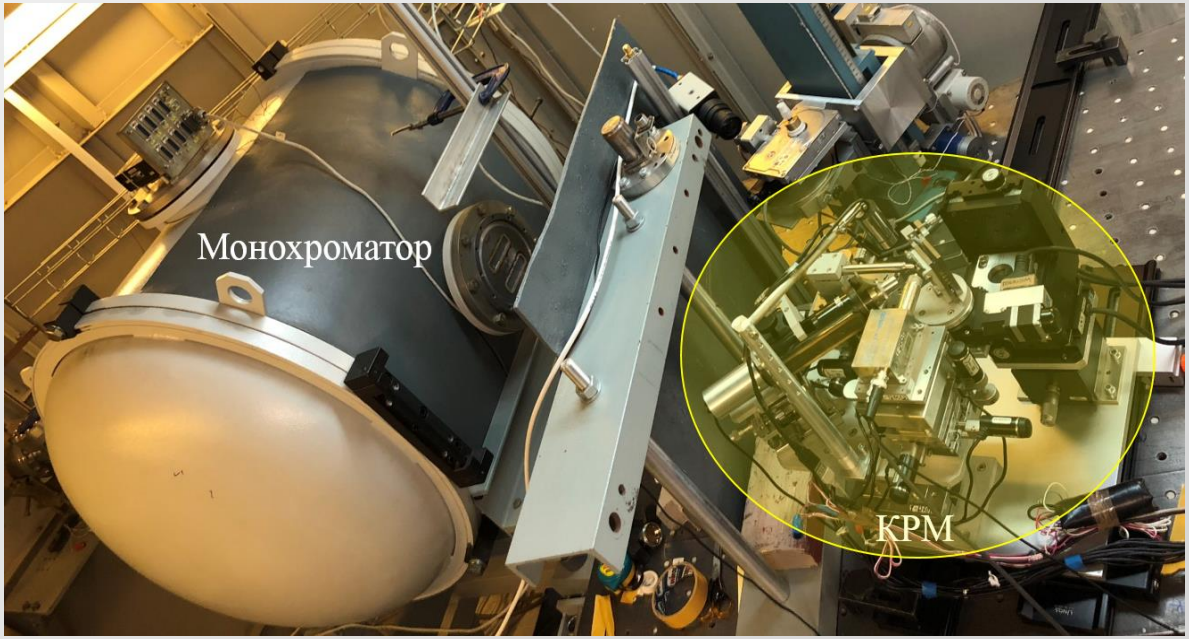


Sample movement : 25.4mm XYZ
Minimal step: 0.1mkm
Beam size: variable from 10mkm to 100mkm
Detector: Amptek XR 100 SDD
Monochromator: Channel-cut Si(111)
$\Delta E = 5 – 40$ keV
$\delta E/E = 2\text{-}3 \cdot 10^{-4}$

# CXM in NRCKI

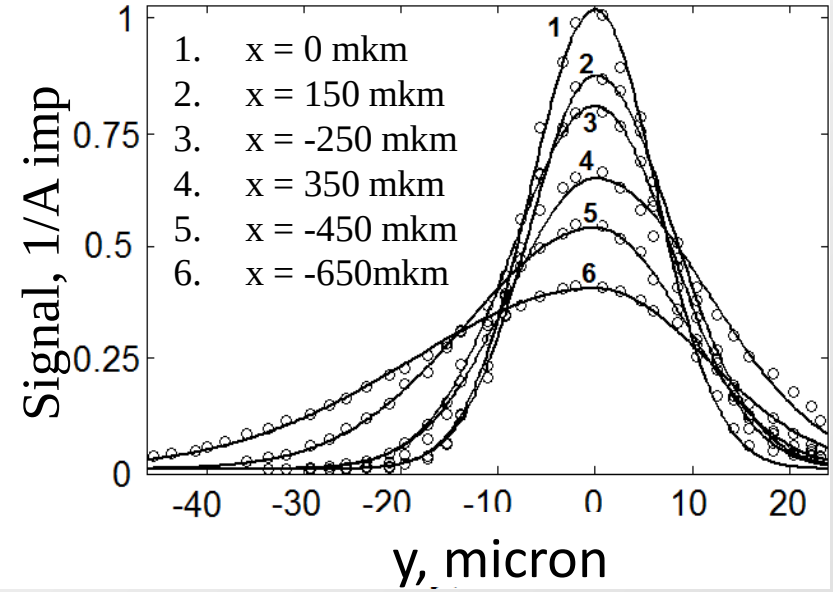


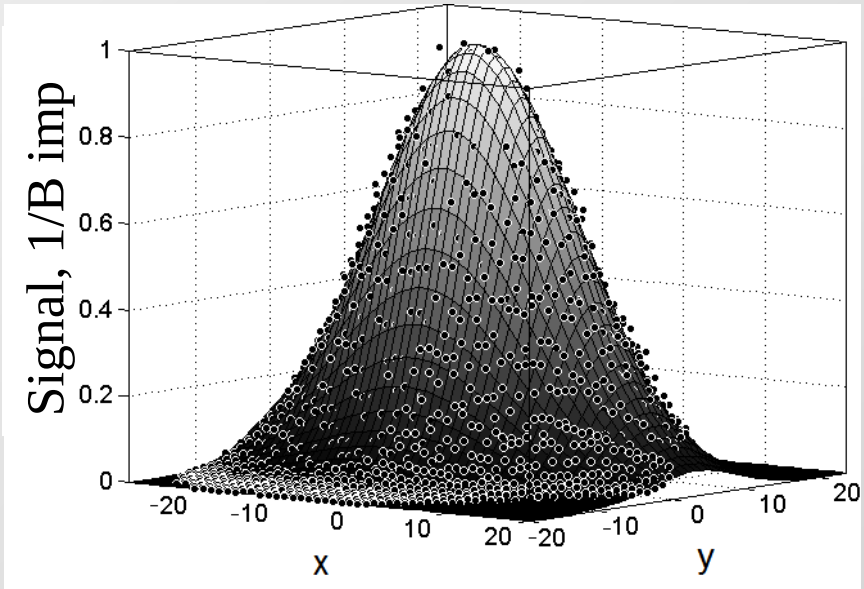
Double crystal monochromator
Si (111) : ΔE = 5 – 20 keV
$\delta E/E \sim 1 \cdot 10^{-3}$
Si(311) : ΔE = 20 – 40 keV
$\delta E/E \sim 5 \cdot 10^{-4}$




Single crystal monochromator
Si (111) : ΔE = 5 – 40 keV
$\delta E/E \sim 4 \cdot 10^{-4}$

# Instrumental function of pollycapillary lense



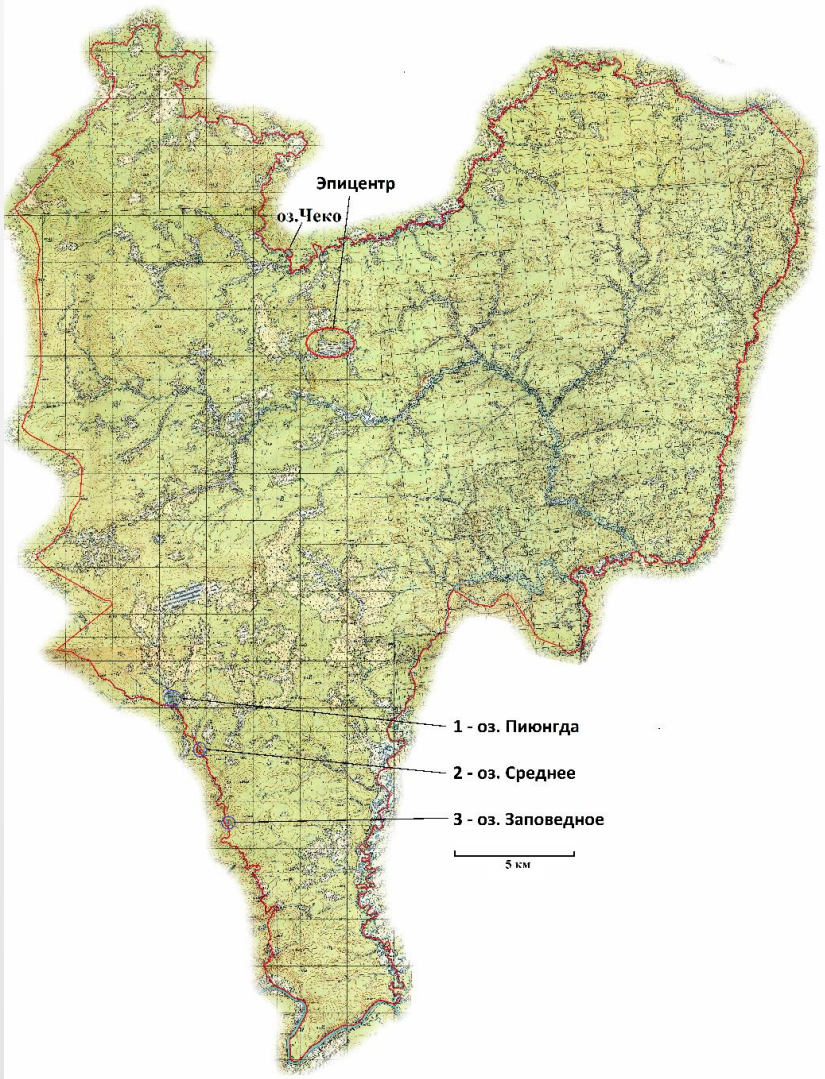

$$Sig(x,y,E) = \frac{A}{w\sqrt{2\pi}} e^{-\frac{y^2}{2w^2}}$$

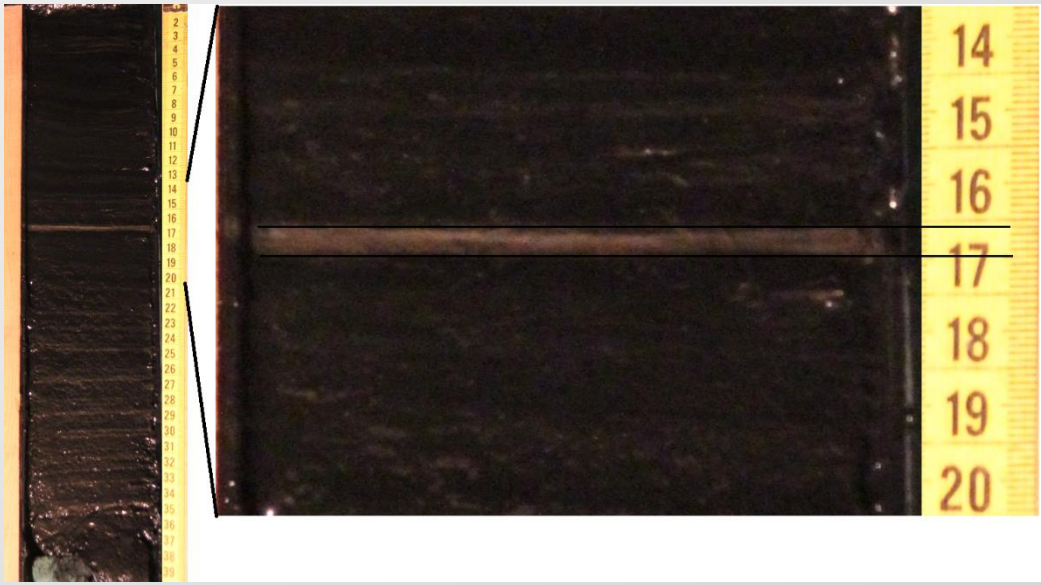
$$Sig(x,y,z,E,E_l) = Be^{-\left(\frac{x^2}{2v^2}+\frac{y^2}{2w(x=0,y)^2}\right)}$$

Where A=A(E) – maximum signal
w=w(x,y)≡{$w_1$(x): y<0; $w_2$(x): y≥0} – distribution width parameter, x- the coordinate of the wire along the incident beam relative to the focus of the lens, y - the transverse coordinate of the wire.

где B – normalization coefficient,
v=v($E_l$) – x distribution width parameter

# The study of the Tunguska event

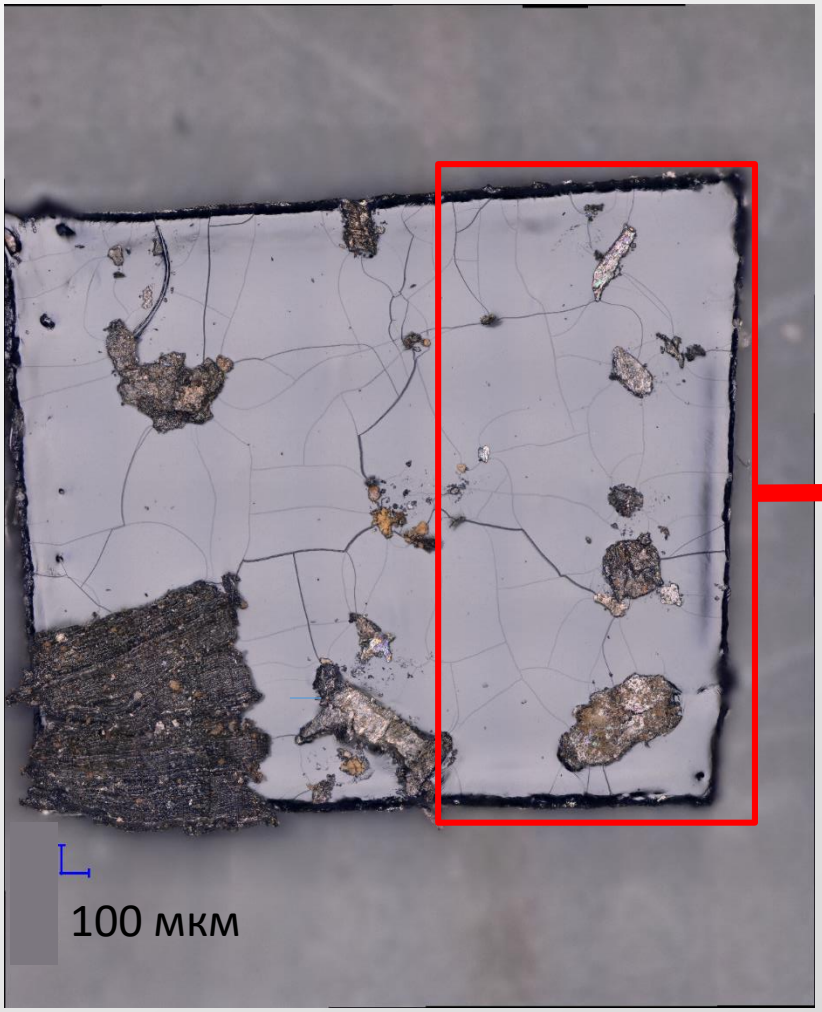


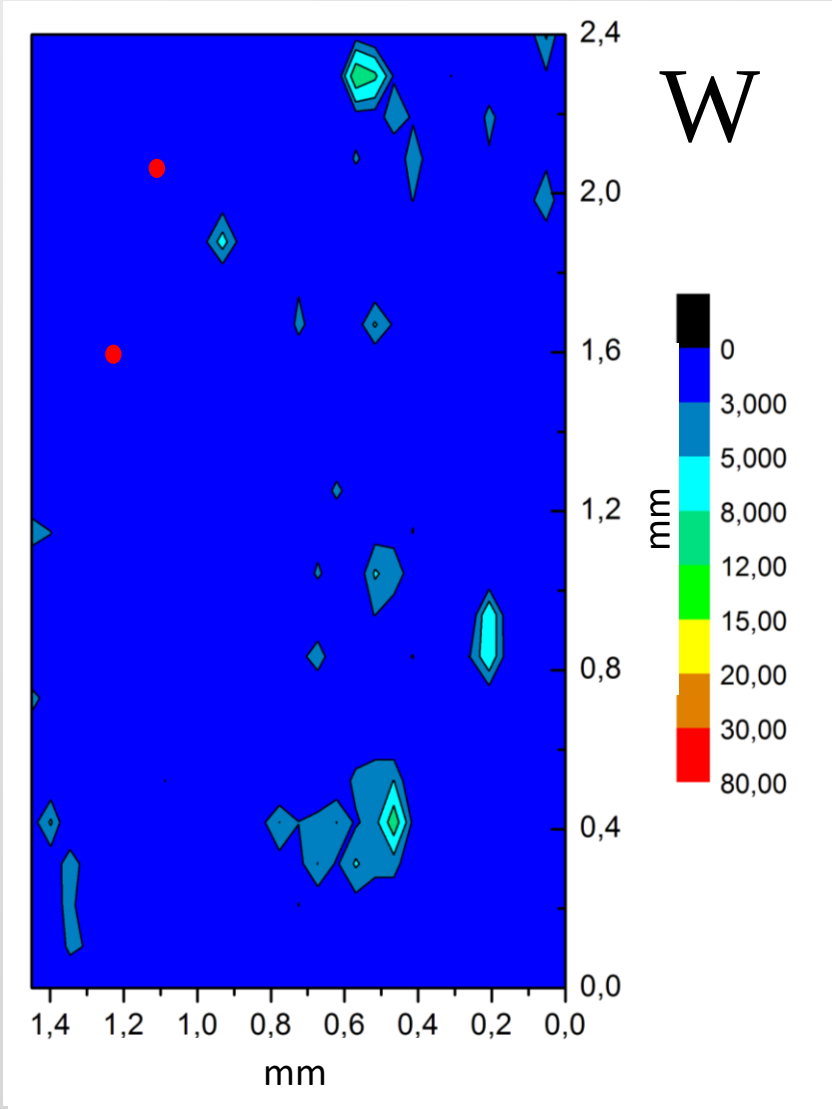




Dated layers (1908 g) of bottom sediments of lakes of the Tunguska were selected to searching traces of meteorite .

Particles of iron meteorites(Chelyabinsk meteorite) and iron-stone(Sikhote-Alin meteorite) were studied for identify characteristic features of the composition of meteorites

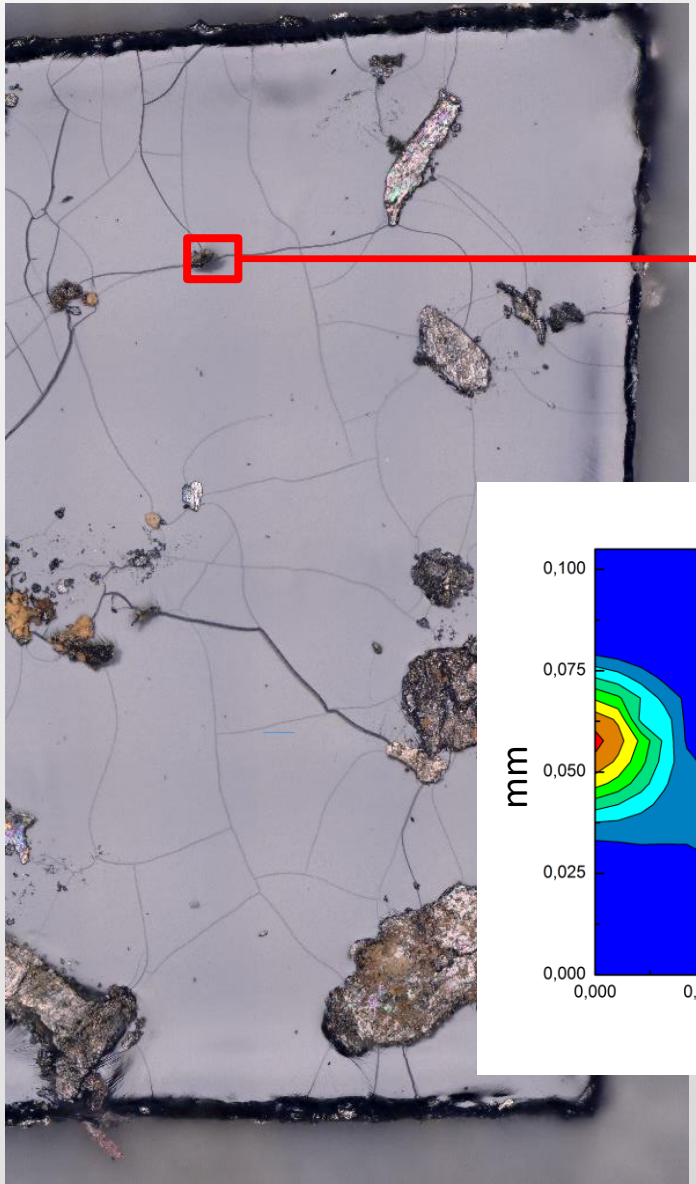
# Sikhote-Alin meteorite

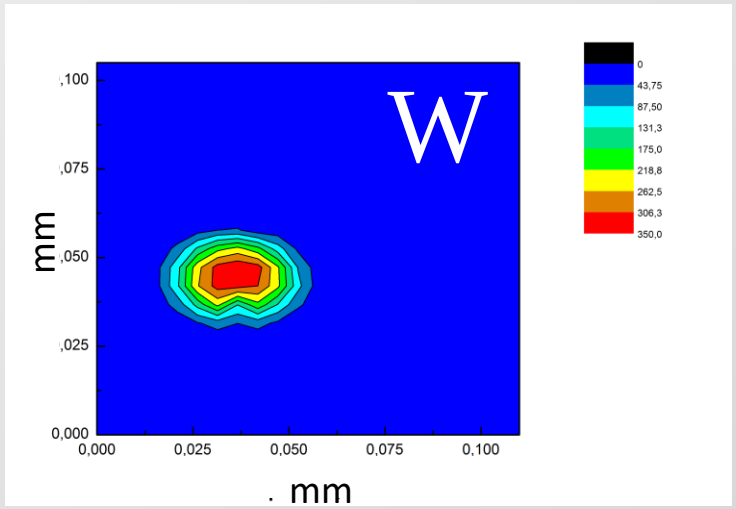


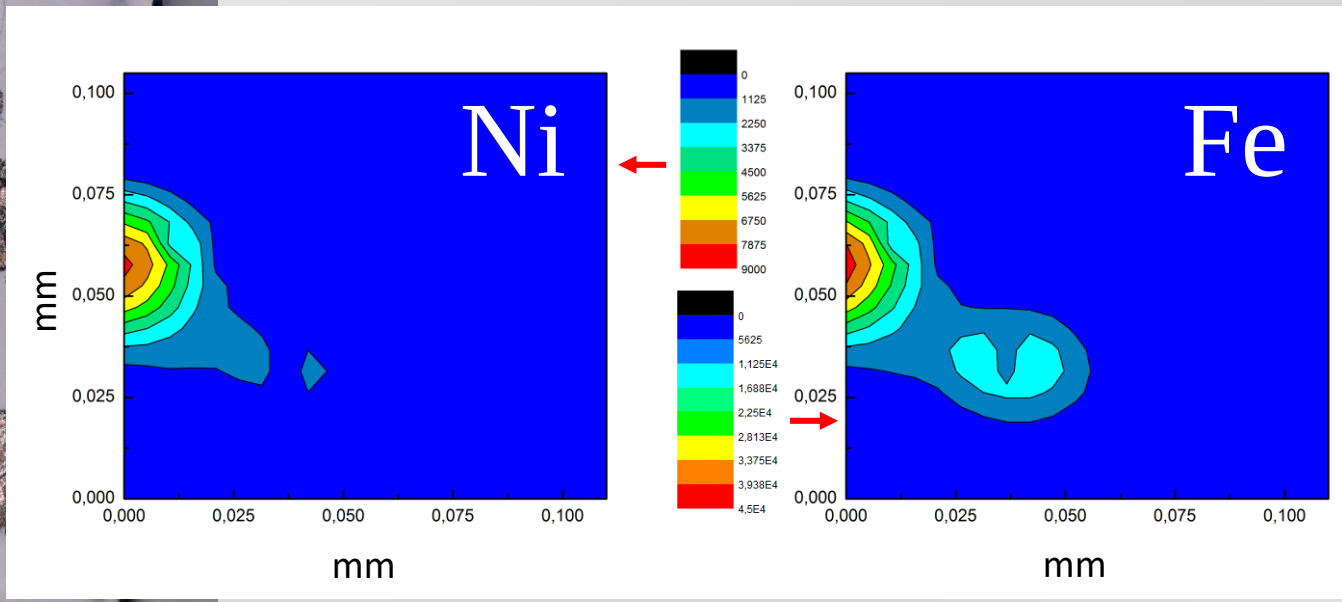




E=15keV, 24*48 pixels, step 50 mkm, t=30sec

# Sikhote-Alin meteorite

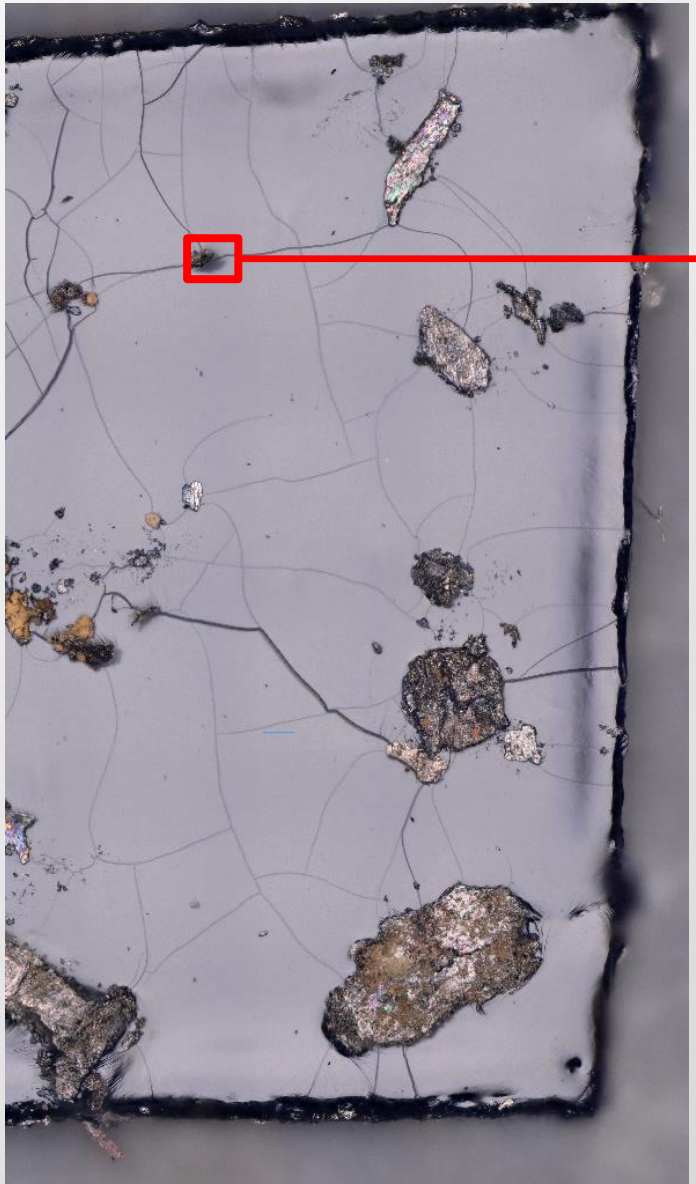


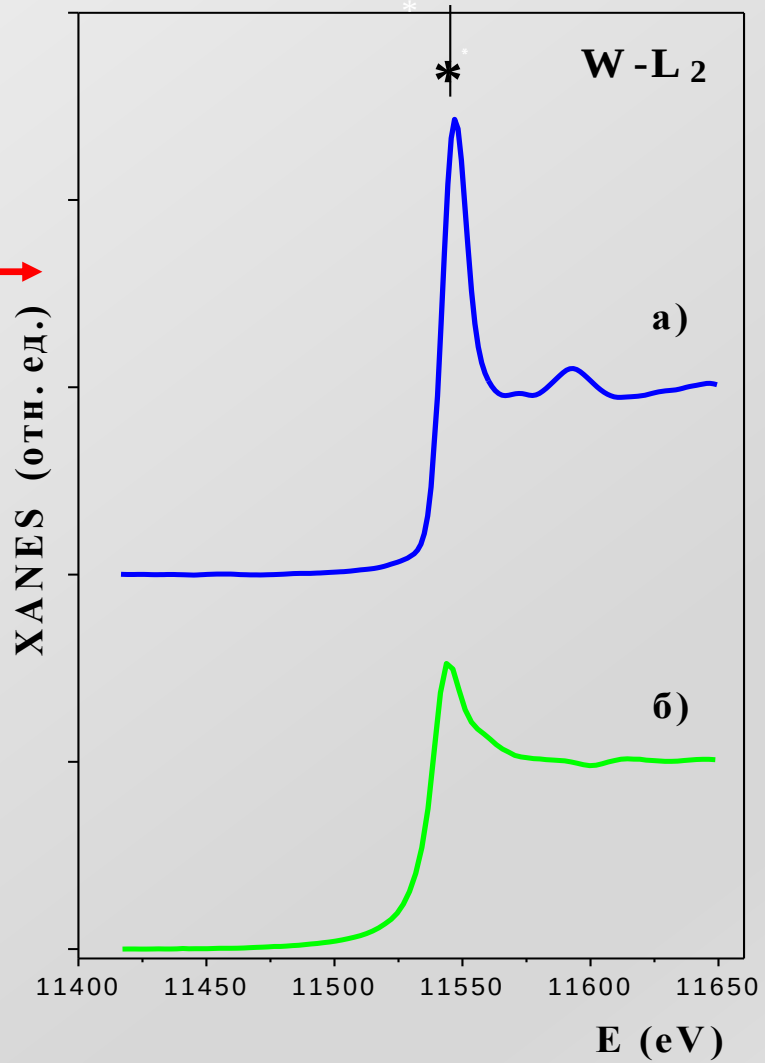



E=15keV, 21*22 pixels, step 5mkm, t=60sec

# Sikhote-Alin meteorite

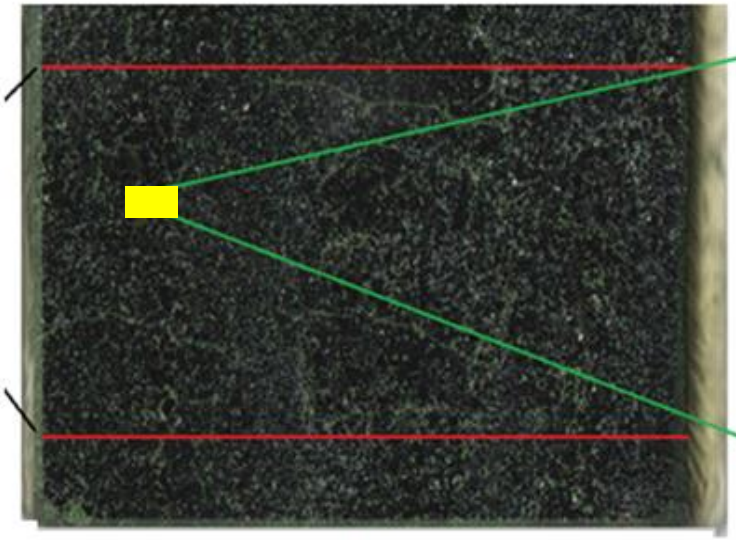


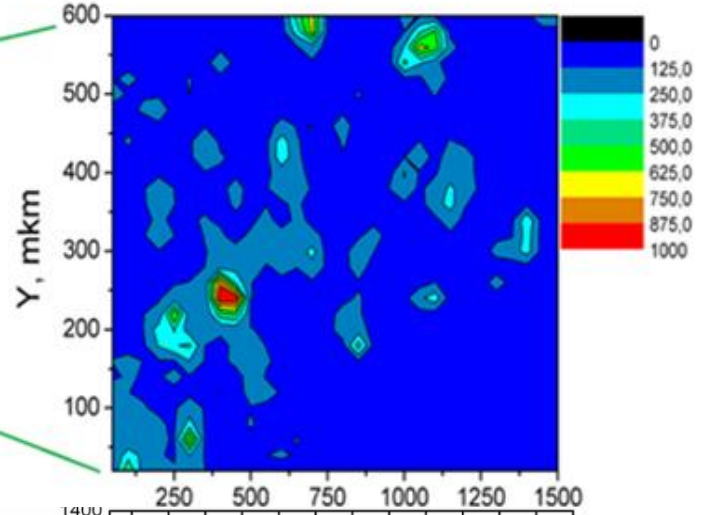



a) Sample, b) reference foil

# Pd investigation in Bushveld samples

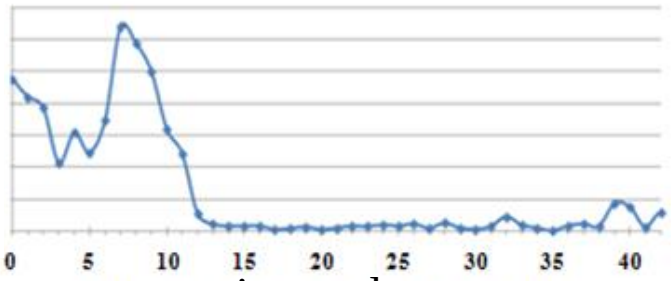
Scanning area



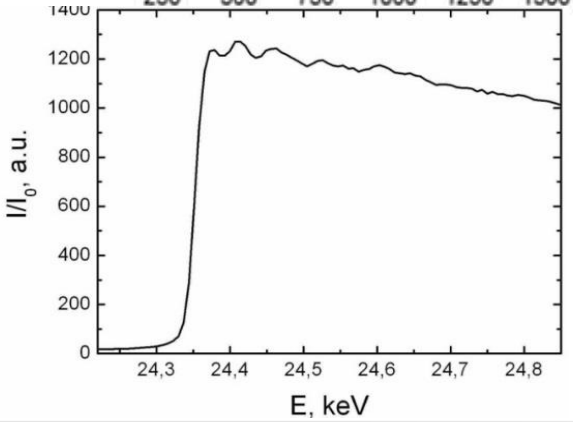



Pd_7(2)

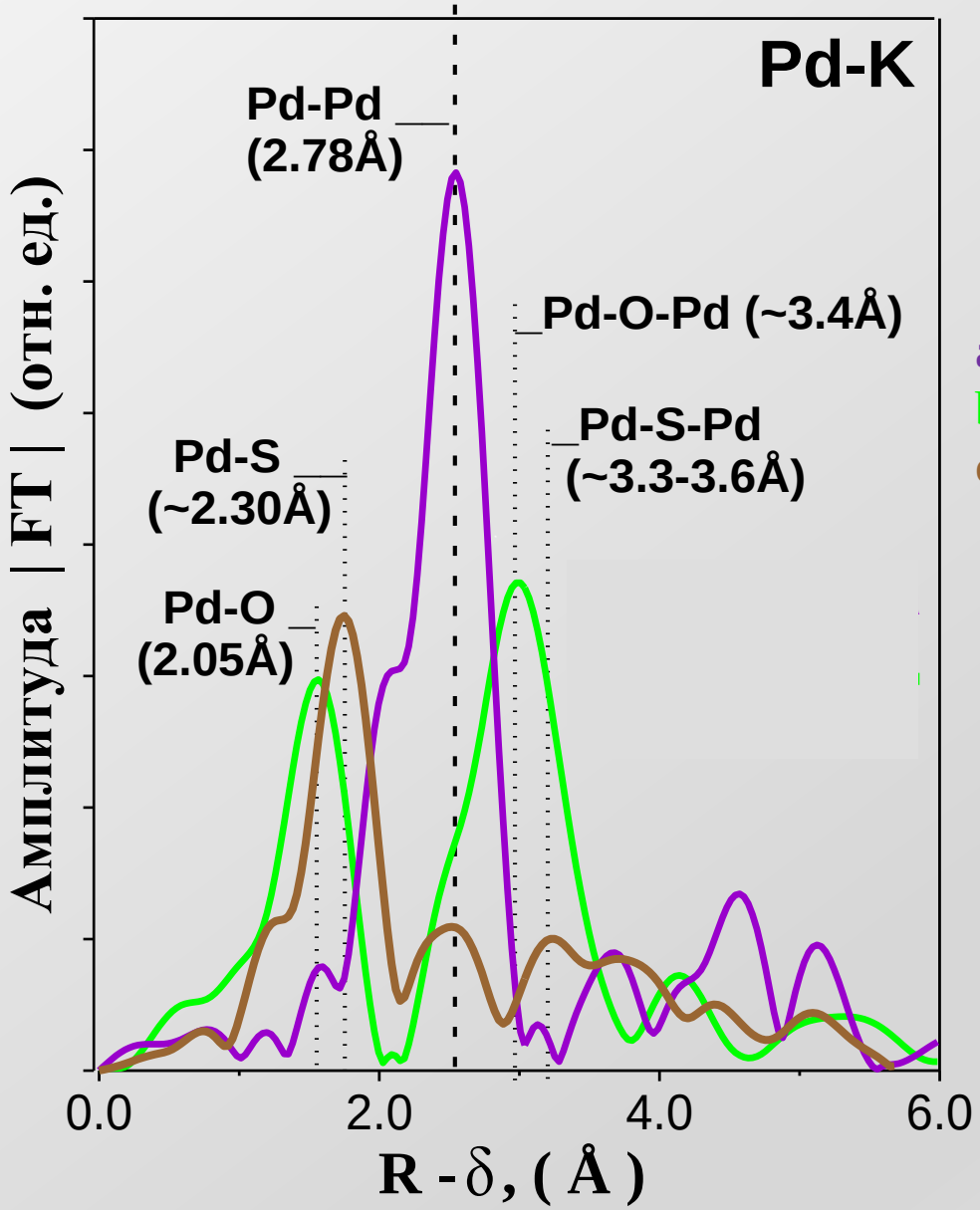
Concentration




scan interval, mm



# Pd-EXAFS




a) Pd – reference foil
b) PdO – reference
c) Sample

Thank you for your attention!