

Nonstandard radiation units

Banana equivalent dose

(US EPA Radiation Protection Webpage)

New York to San Francisco flight

(Health Physics Society)

1 μm ^{239}Pu fuel flea

(Physicians for Social Responsibility)

Natural or anthropogenic?

Banana equivalent dose

^{40}K , U , & Th ; natural primordial nuclides

New York to San Francisco flight

Natural cosmic rays

1 μm ^{239}Pu fuel flea

Definitively anthropogenic

$$1 \text{ Sievert (Sv)} = 1 \text{ Q J kg}^{-1}$$

Banana equivalent dose

$$\ll 0.078 \text{ } \mu\text{Sv}$$

New York to San Francisco flight

$$0.03 \text{ mSv or } 0.00003 \text{ Sv}$$

1 μm ^{239}Pu fuel flea

$$0.045 \text{ Sv}$$

1 M³ @ 1 MT

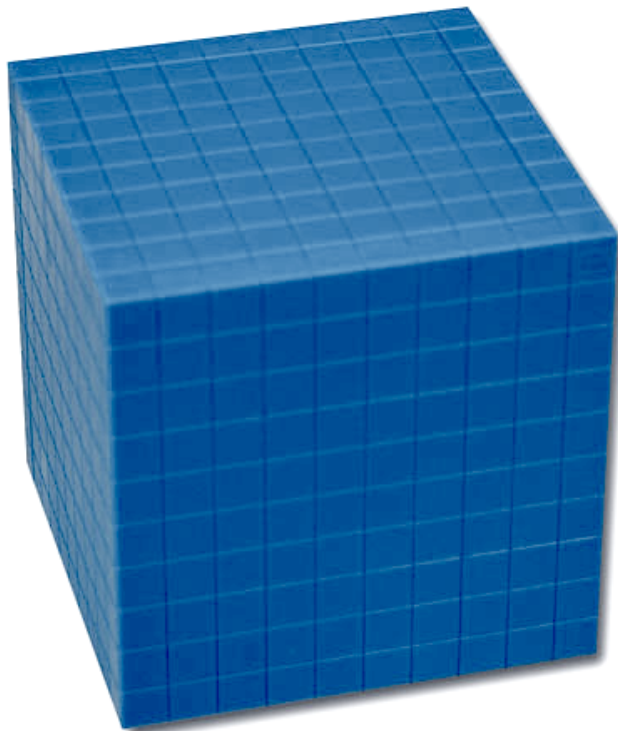
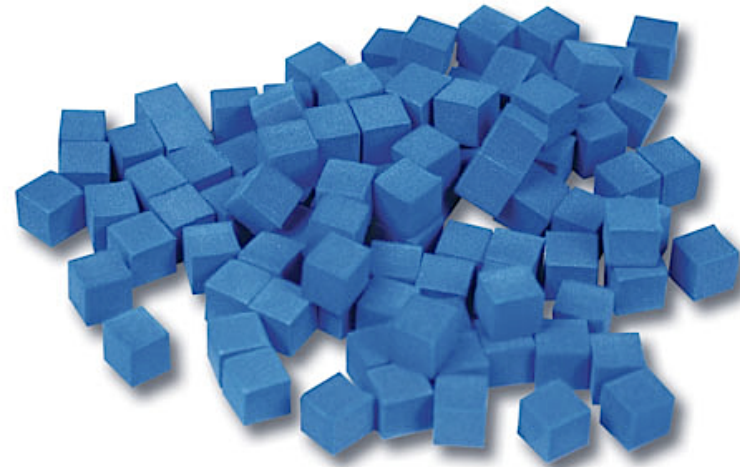
How many M²?



1 M³ @ 1 MT but in 1 L pieces

How many M²?

How many pieces?



What about 1 cc pieces?

How many M²?

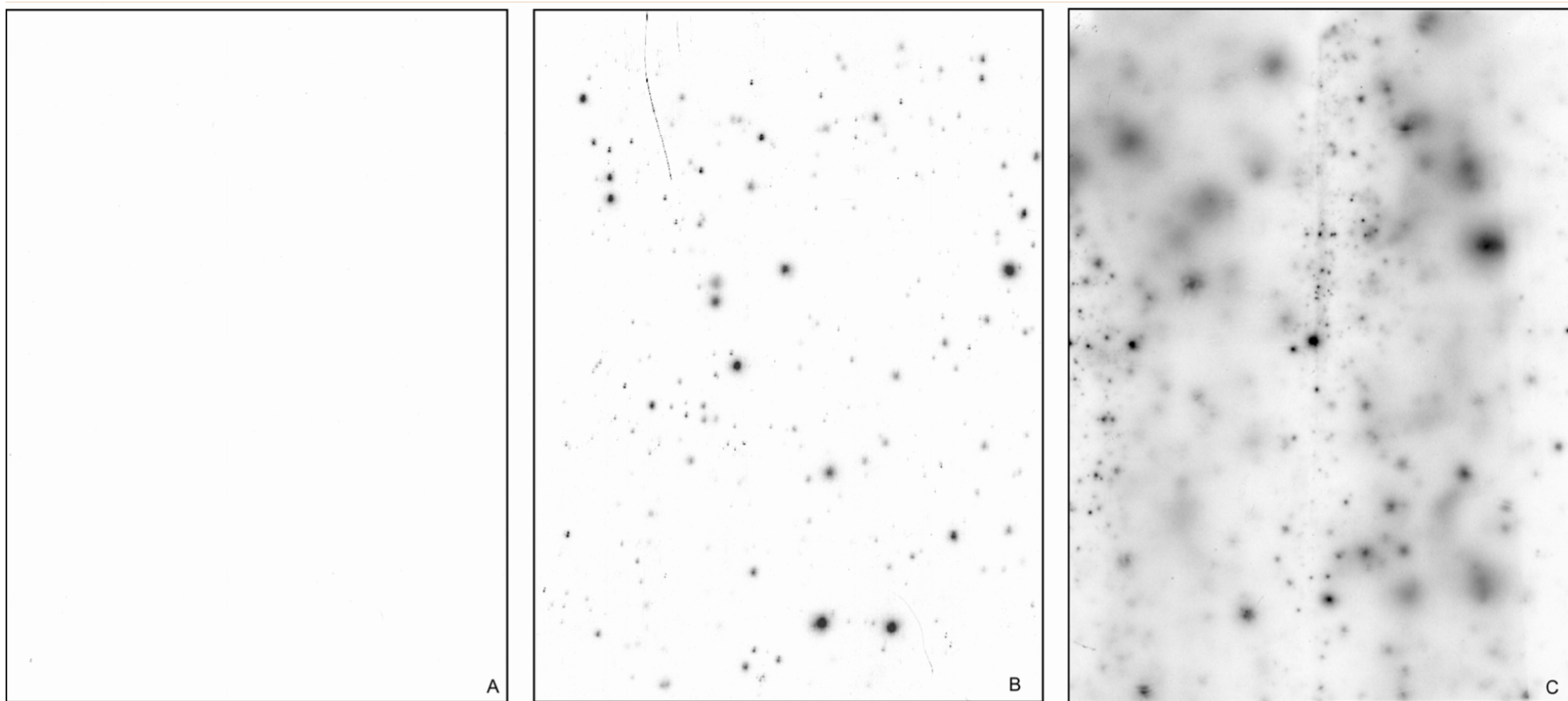
How many pieces?

What about 10 um pieces?

$A = 600,000 \text{ M}^2$, $n = 10^{15}$, $m = 1 \text{ MT}$

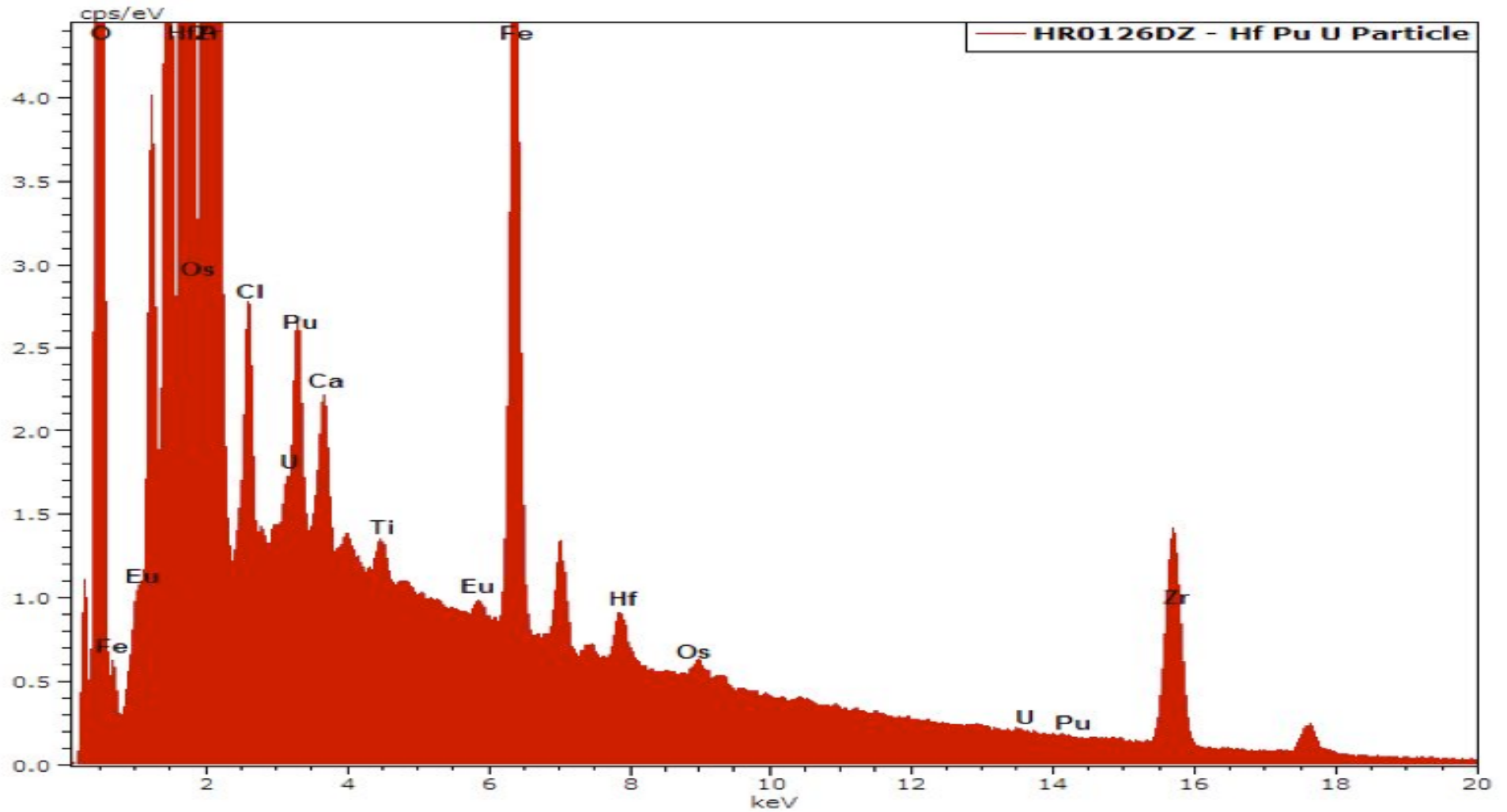
$m_i = 1/10^9 \text{ g (1 ng)}$

Why is this important? Post-Fukushima dust autoradiographs

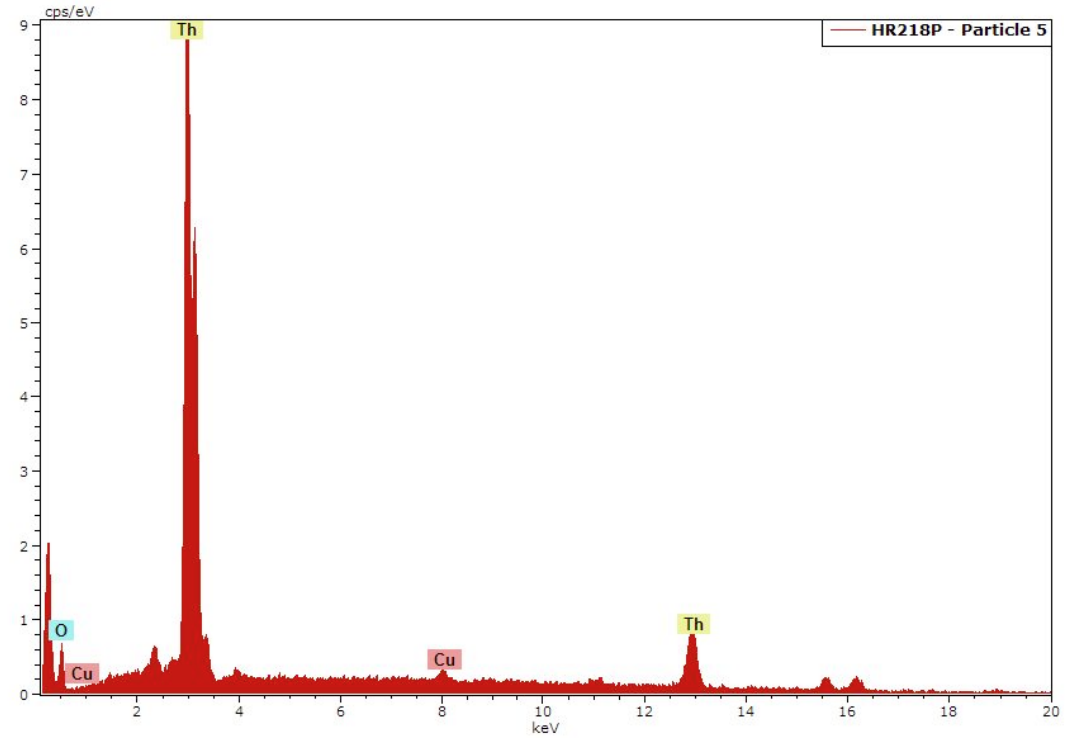


Natural or anthropogenic?

Hanford Nuclear Reservation dust sample testing as “nondetect” for Pu.



Natural or anthropogenic?



Natural or anthropogenic?

Gross (0.01 Bq g^{-1}) vs. Microanalytical ($> 0.5 \text{ wgt. \%}$)

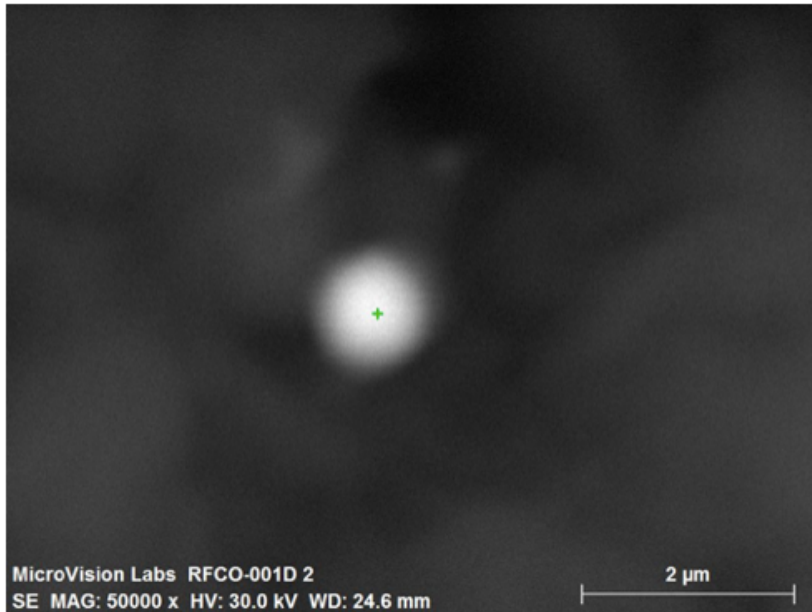
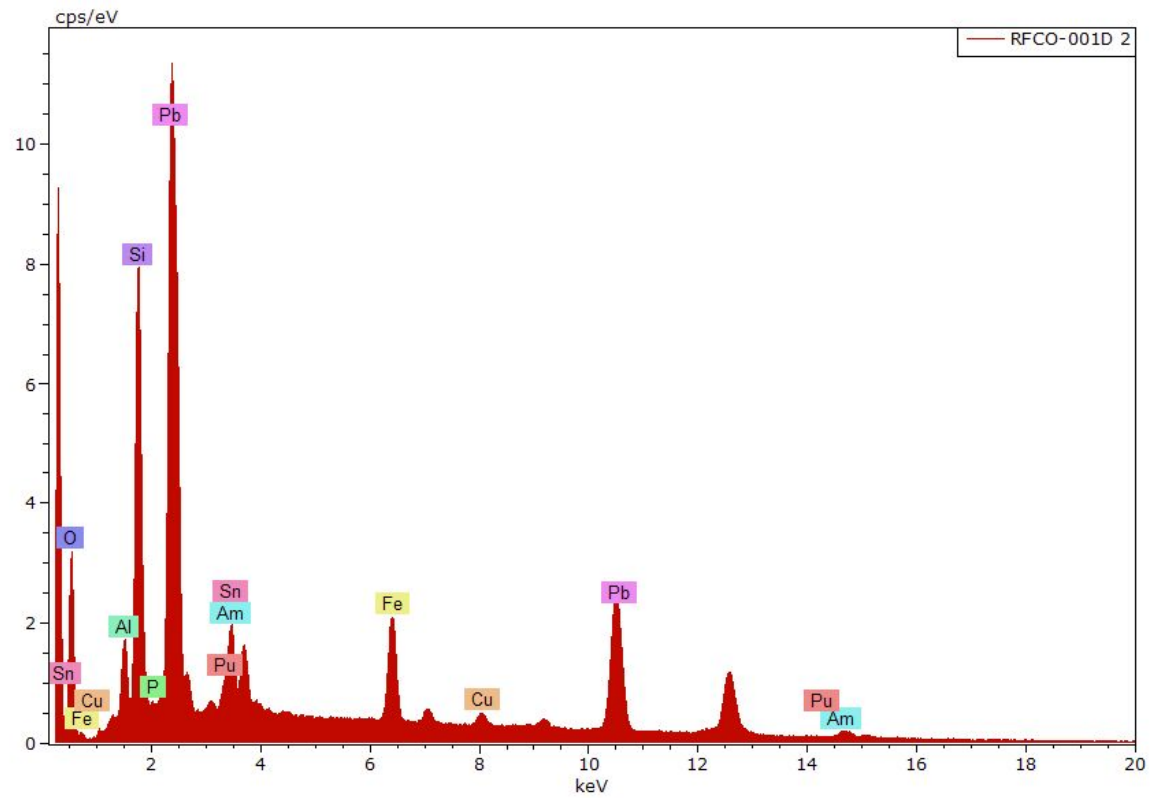


Fig. 1.5 Above, SEM photomicrograph of Rocky Flats dust particle



Natural or anthropogenic?

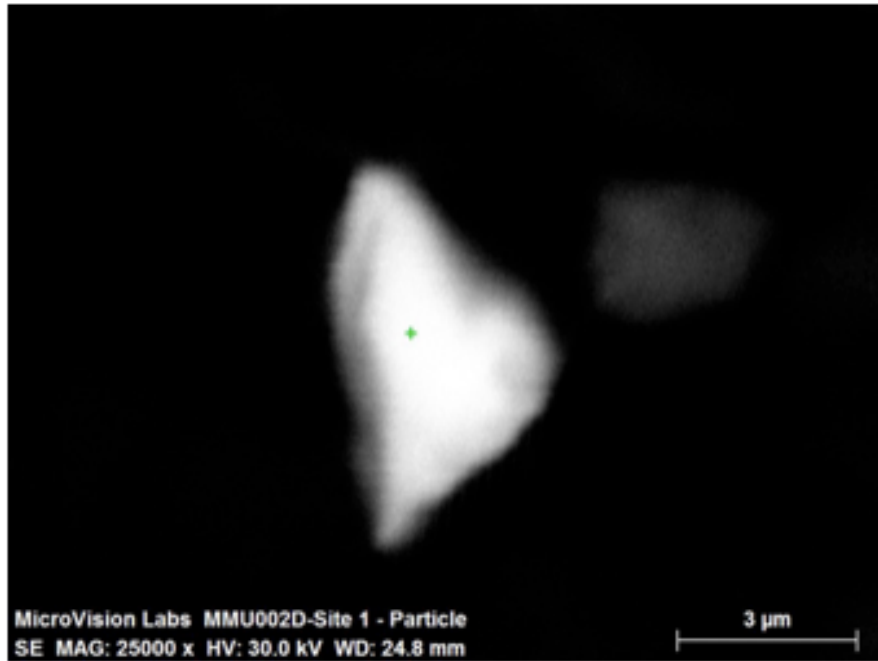
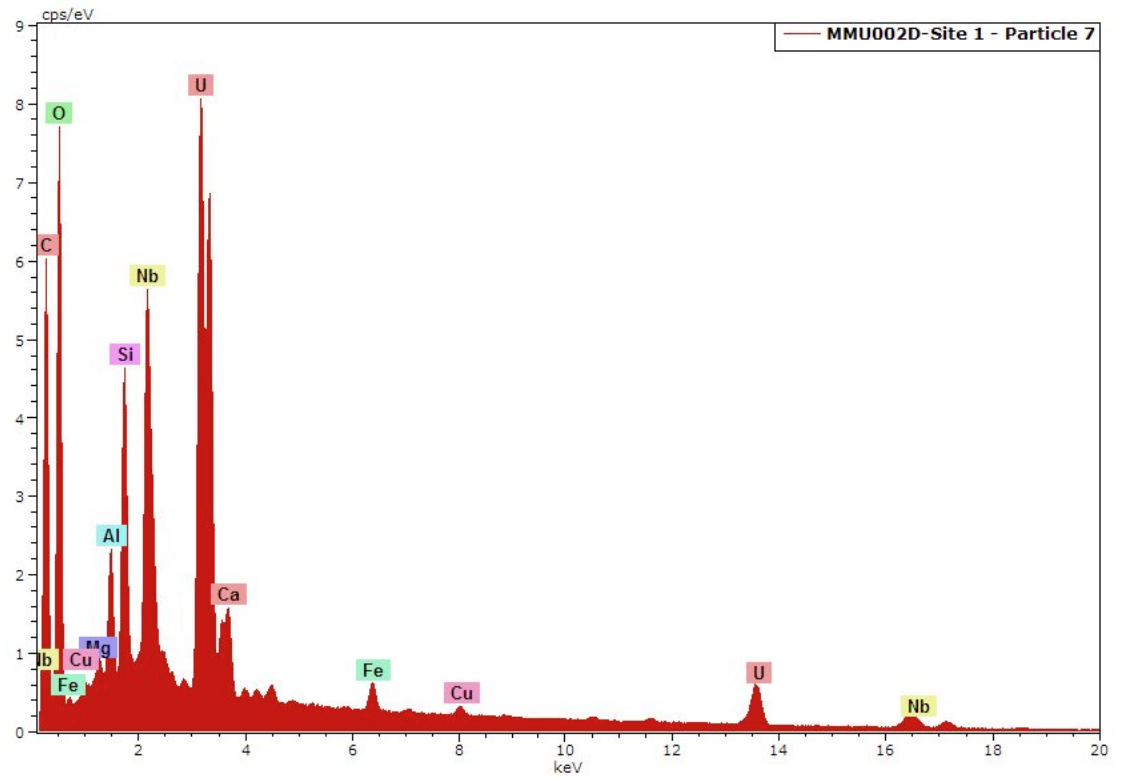


Fig. 1.11 Above, photomicrograph of uranium mine dust particle



Natural or anthropogenic?

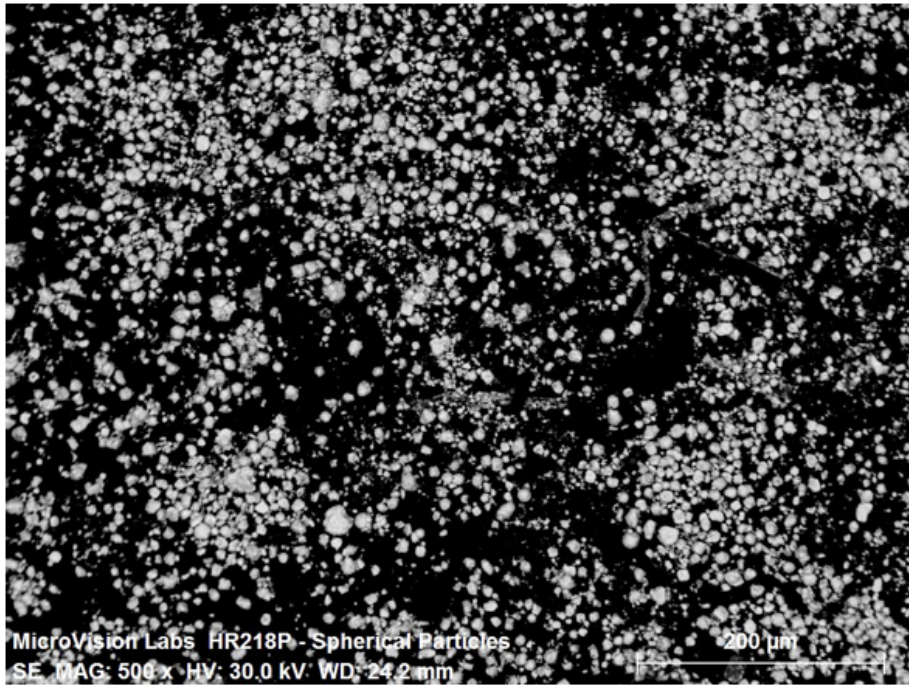
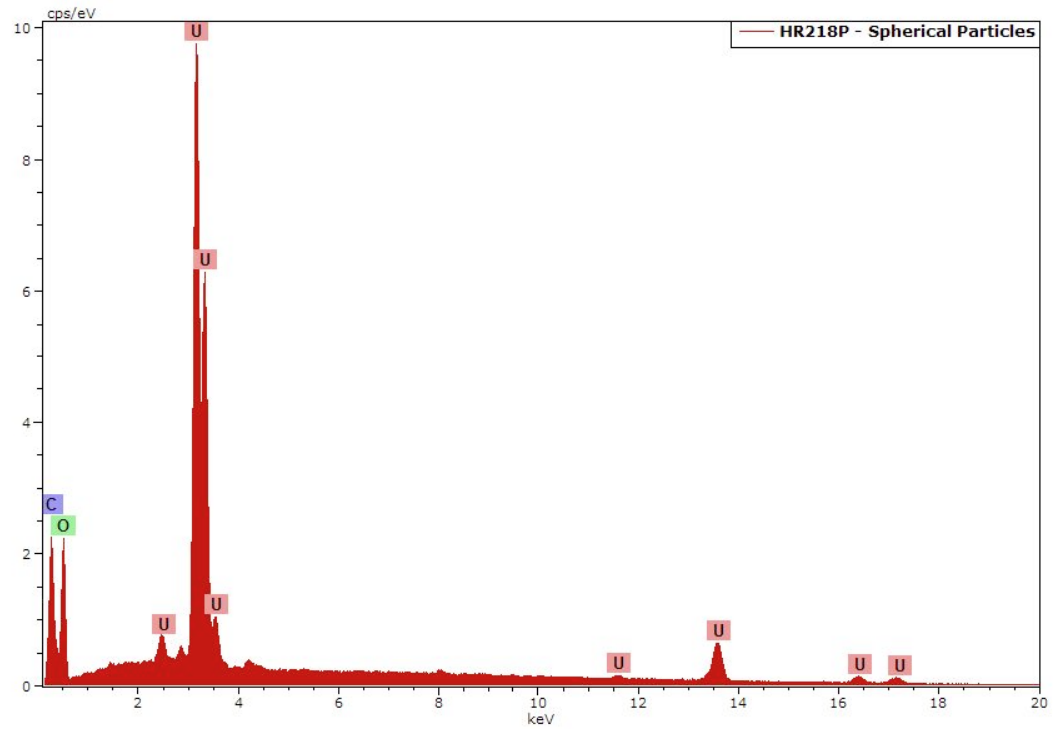
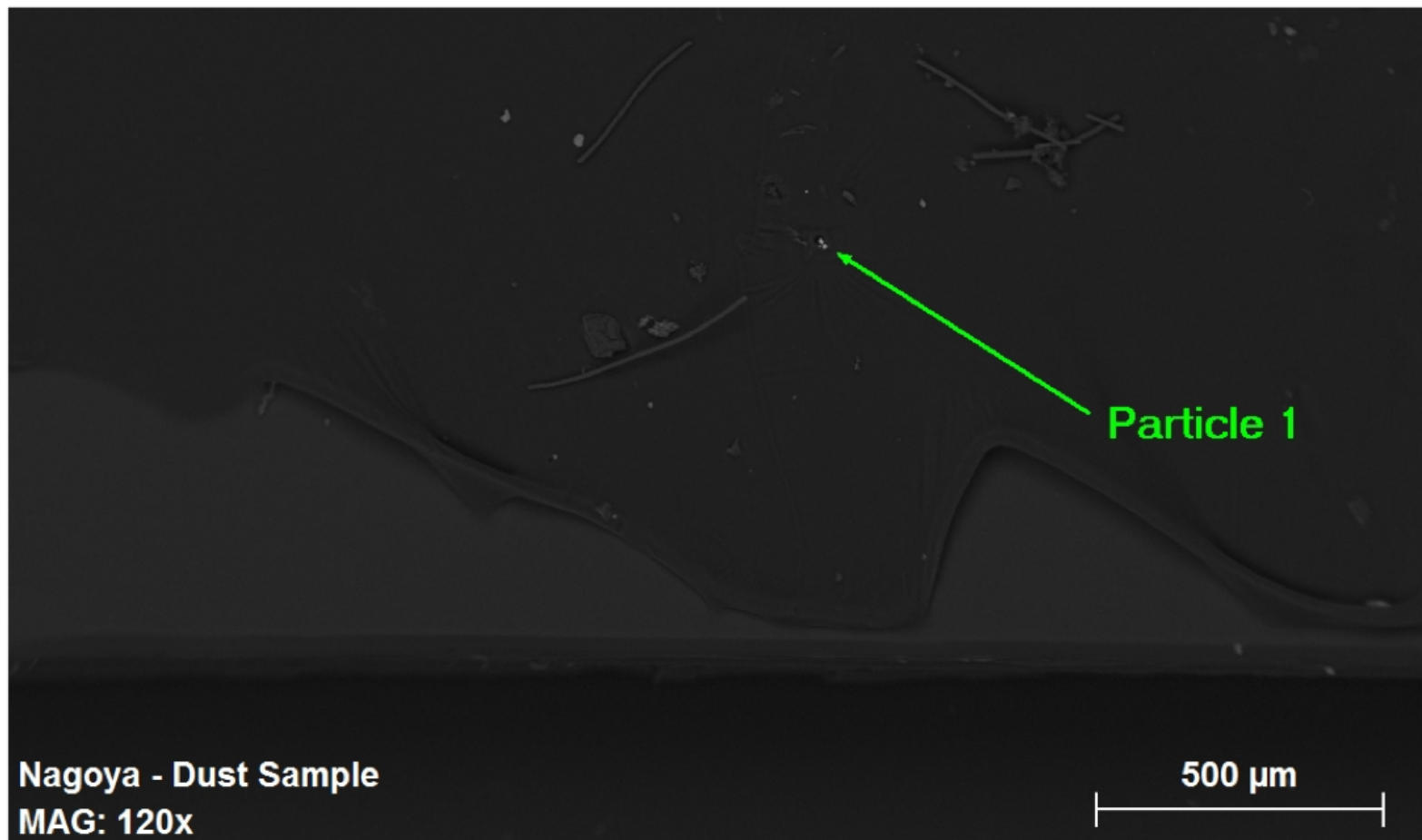


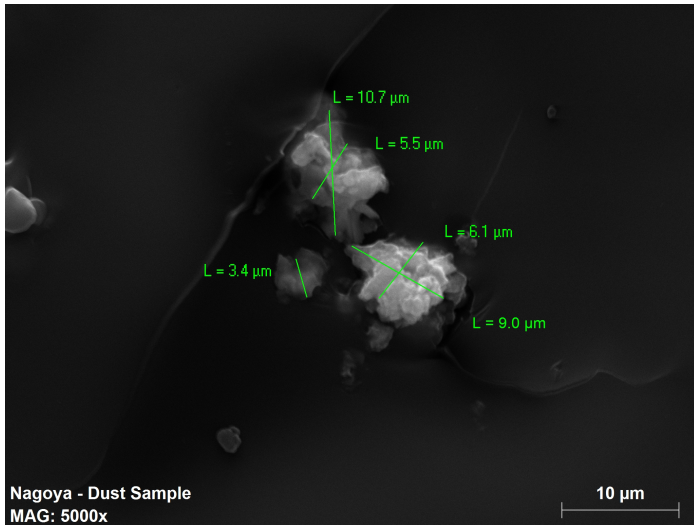
Fig. 1.13 Above, photomicrograph of processed uranium particles



120X Scanning electron microscope view of hot particle.

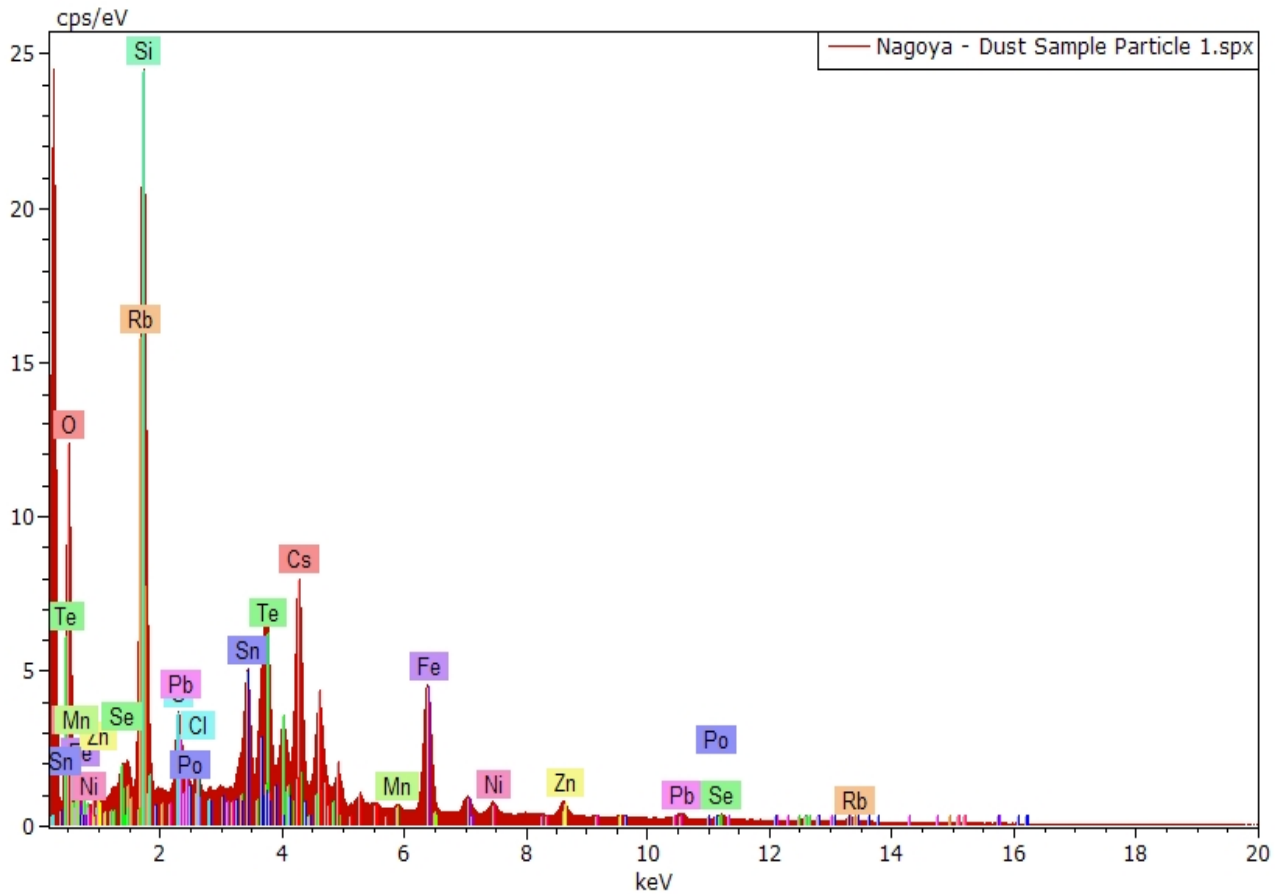


Nagoya, Japan, 433 km from Fukushima Daiichi, 5.2 PBq kg⁻¹

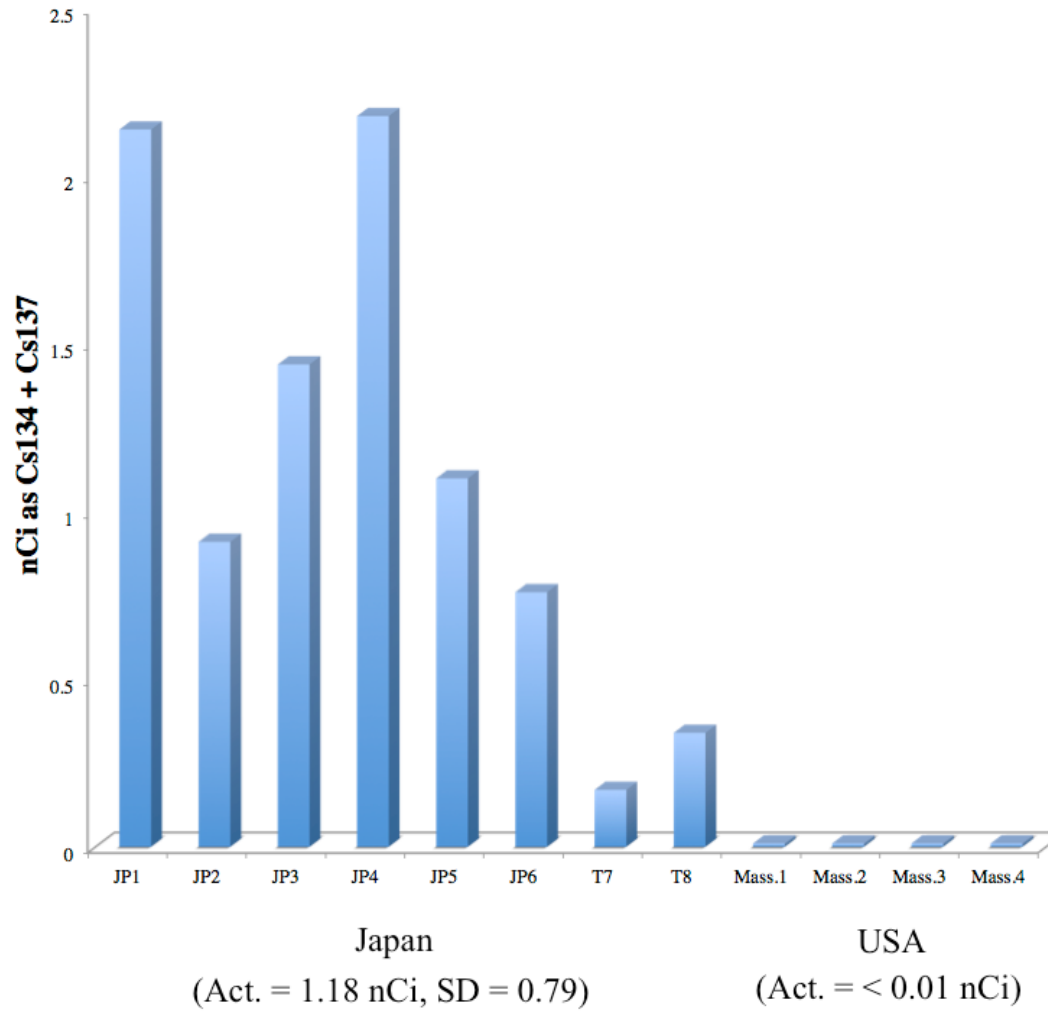


If parent material had $V = 1 \text{ M}^3$

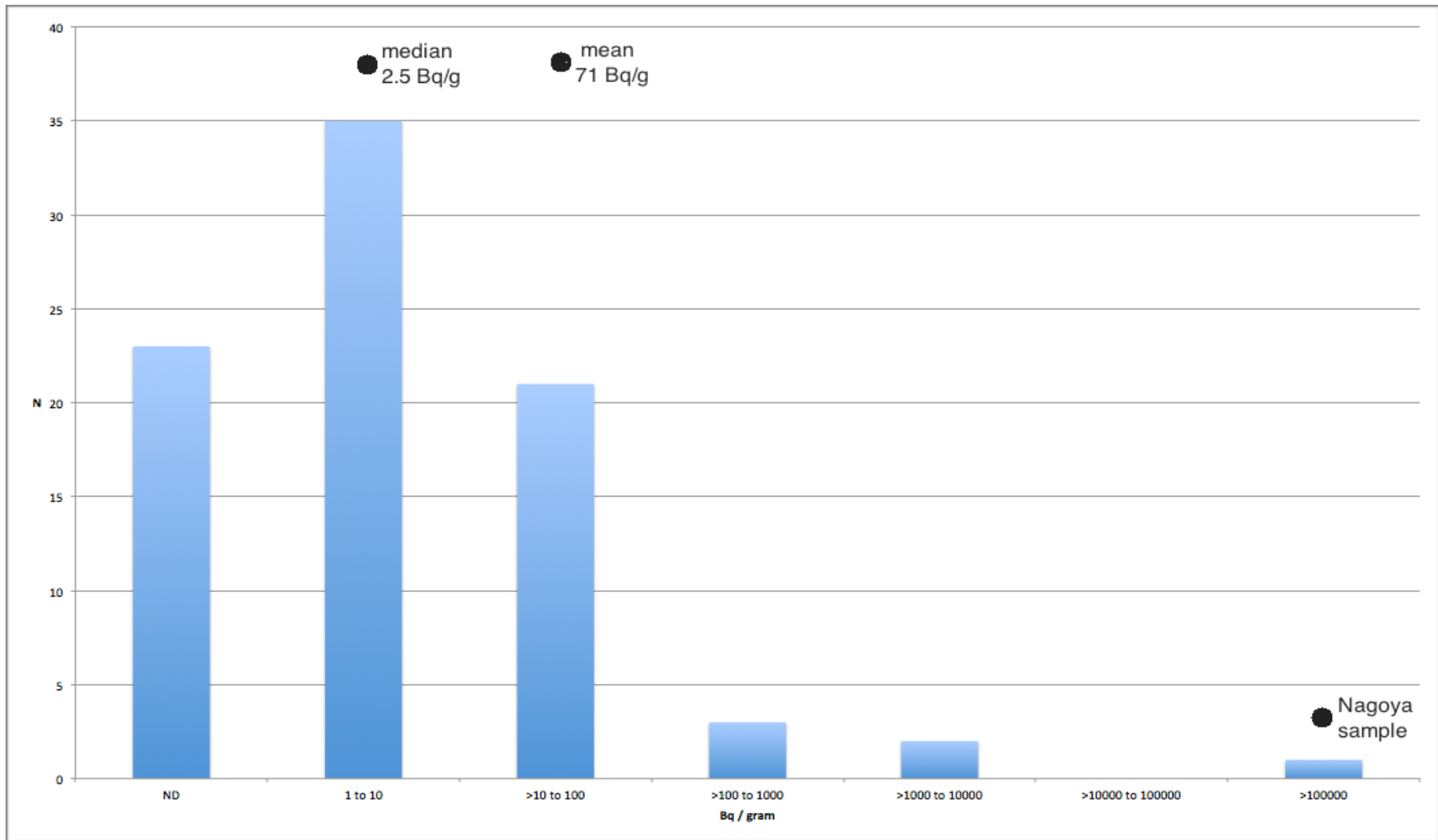
then $n = 5.0 \times 10^{11}$



Cesium activity: Japan vs. USA

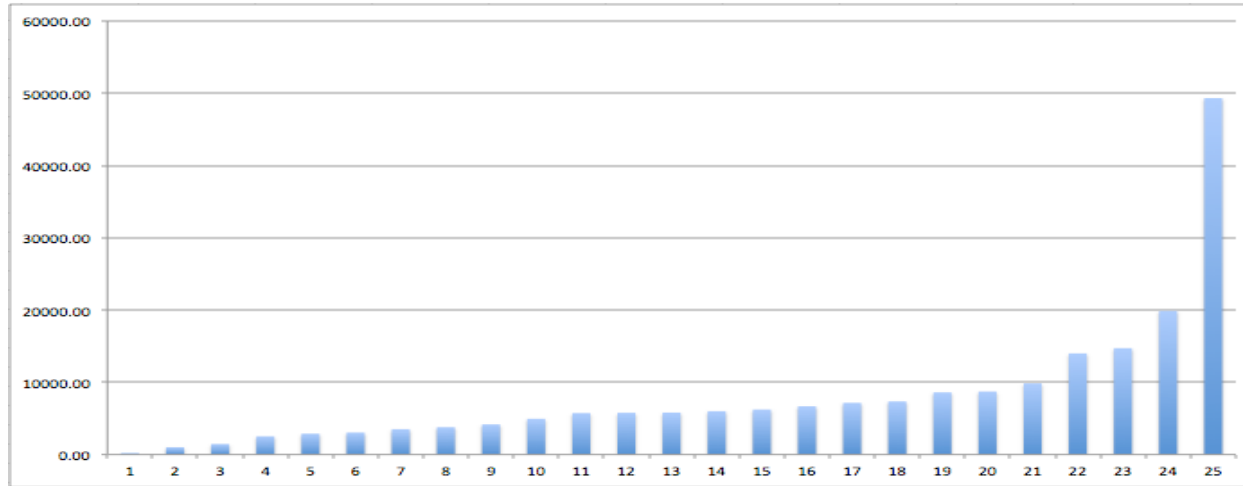


Post-Fukushima Japanese dust samples, and two possible errors

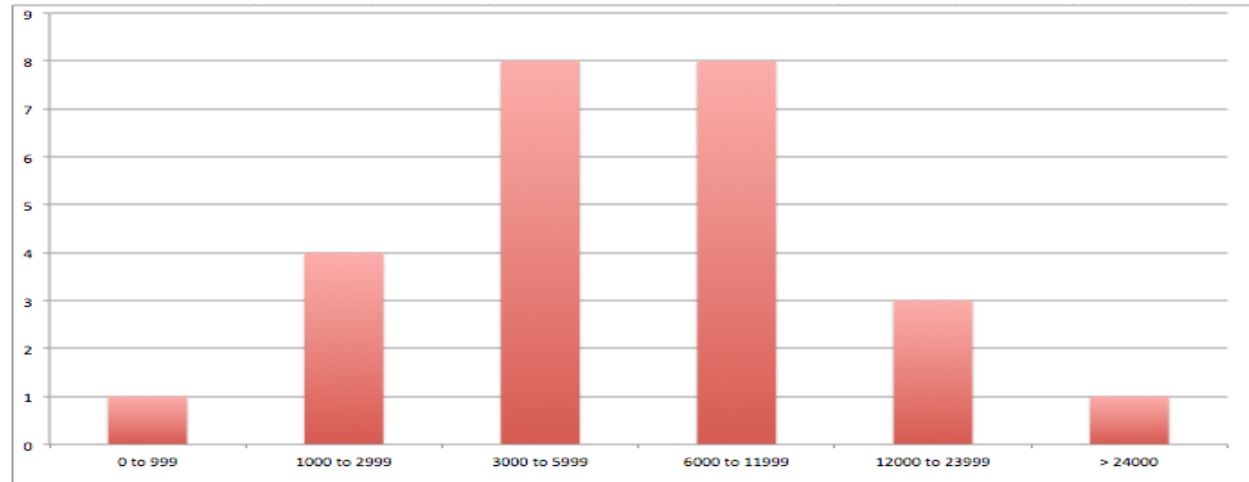


Compare to distribution of PFC pesticides in Cambridge, MA house dust

Total normalized peak area of perfluorinated compounds versus sample number



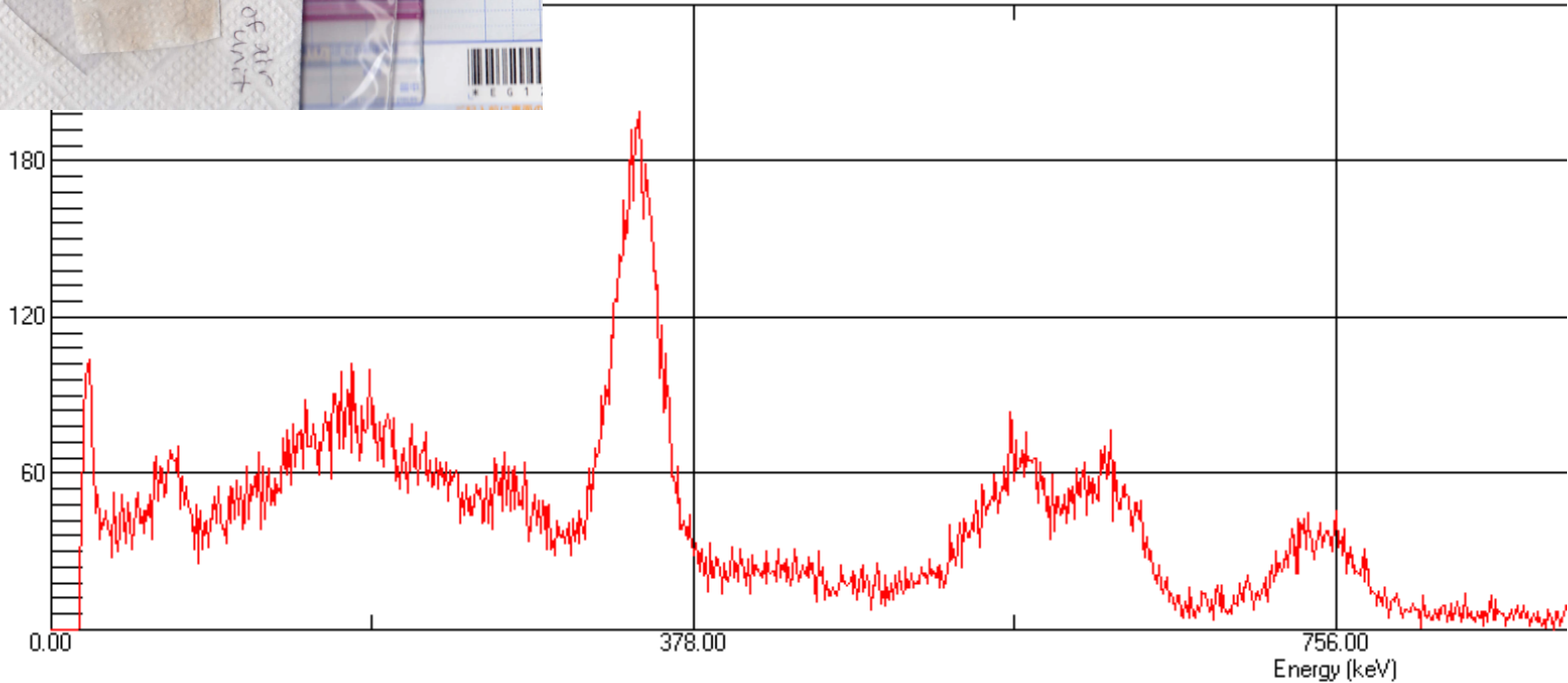
Number of samples in bin by total normalized peak area of perfluorinated compounds



Sampling Strategies

$^{131}\text{I} > ^{137}\text{Cs}$

FKD006Ssoil (2)



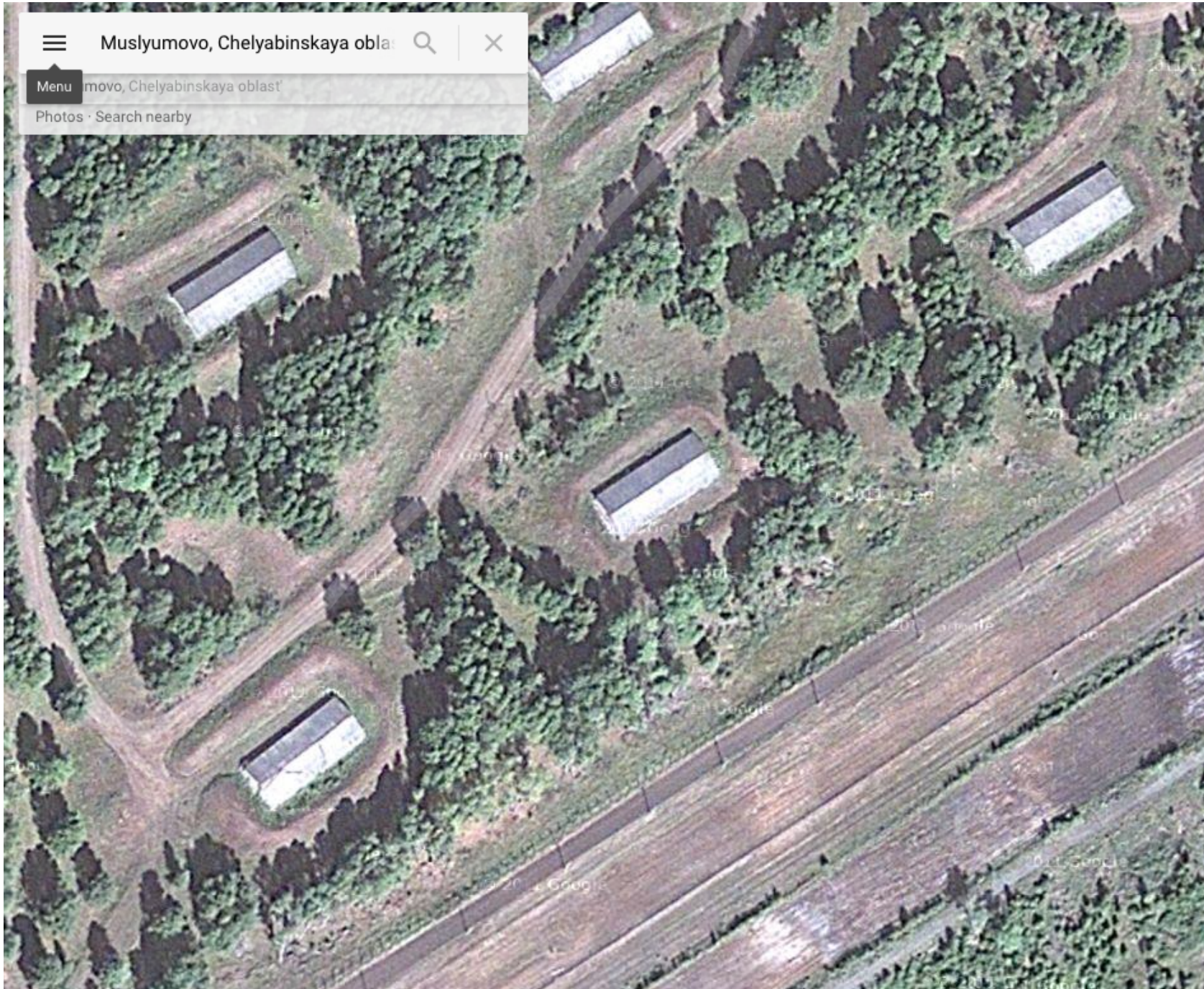
Acquired: 4/14/2011 2:40:37 PM
File: C:\Users\Jim\Desktop\FKDJAP~1\FKD006Ssoil (2).Chn
Detector: #1 COMPTON MCB 1































Sources of Funding

Funding for this study was received from Jeff Ubois and the John D. and Catherine T. MacArthur Foundation

The Lambert Firm, PLC, of New Orleans, LA

Hanford Challenge, Inc.

The Fairewinds Energy Education Foundation

The Bullitt Foundation of Seattle, WA

Smith Stag, LLC of New Orleans, LA

The George & Ellen Mitchell Foundation of Austin, TX.

Nonfinancial support from safecast.org