



SURO - STÁTNÍ ÚSTAV RADIČNÍ OCHRANY v.v.i NATIONAL RADIATION PROTECTION INSTITUTE



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STÁTNÍ ÚSTAV RADIČNÍ OCHRANY
v.v.i.
NATIONAL RADIATION PROTECTION INSTITUTE

SURO – public research institute

established by State Office for Nuclear Safety (SONS) in 1995

it continues the long-lasting tradition of the Centre of Radiation Hygiene of the National Institute of Public Health in Prague

Budget 115 mil CZK (research 50-60 %)

Mission of the Institute:

***To support SONS in the field of radiation protection and nuclear safety
(new from 2017)***

- ***Research***
- ***Measurements, expertise, data acquisition and data processing ,
intercomparison measurements, preparation of methodology,
guidance, recommendation, legislation .. education, public
information,***

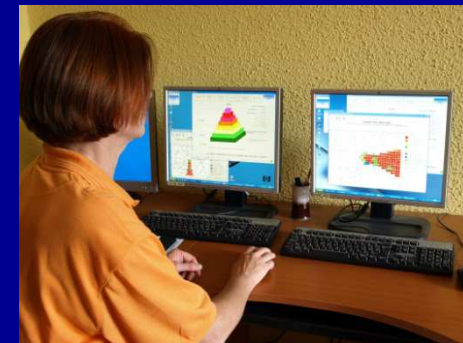
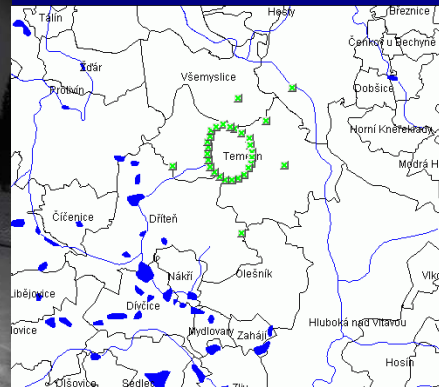
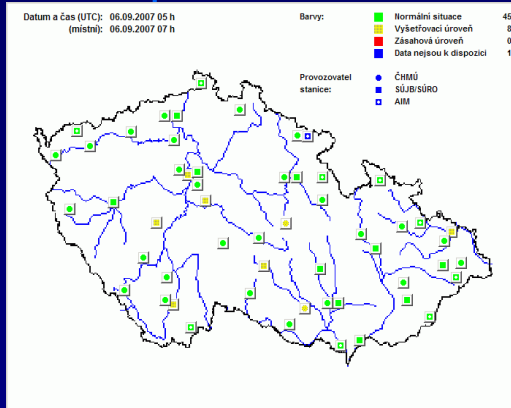
Emergency preparedness

Early Warning Network



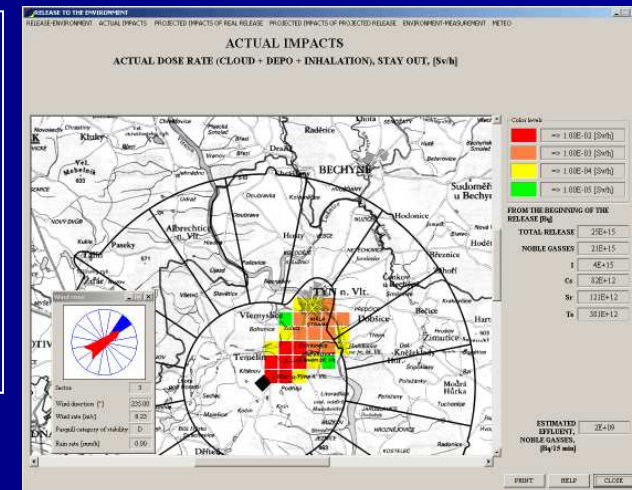
1) Early Warning Network

data → to central dbase (10 min interval), web presentation for public
<https://www.sujb.cz/aplikace/monras>



2) Emergency Response Center II - Computer Codes („este“, Havar, EU Rodos, ..)

as support instrument for off-site emergency response (in pre-release phase and release phase of accident)

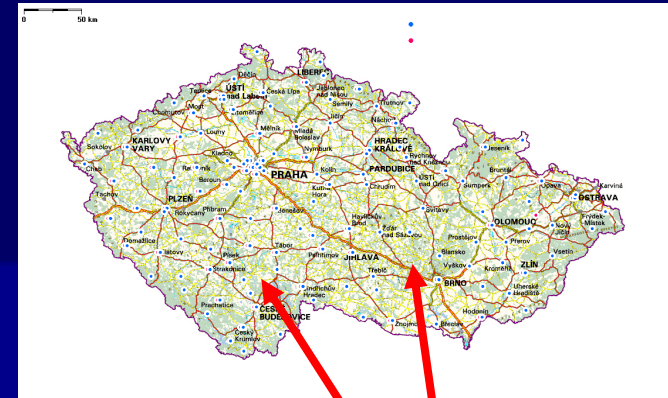


TLD network (termoluminiscent dosimetry)

CZ territory (SUJB, SURO)

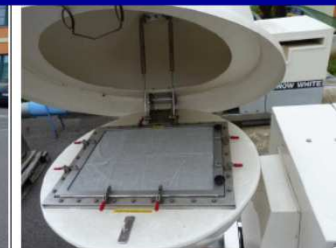
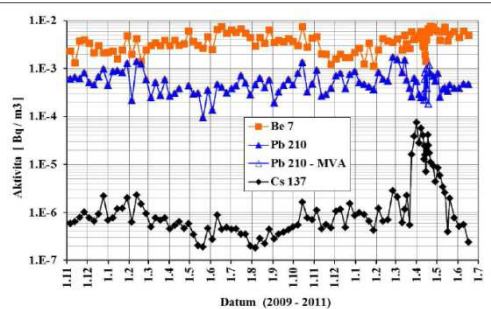
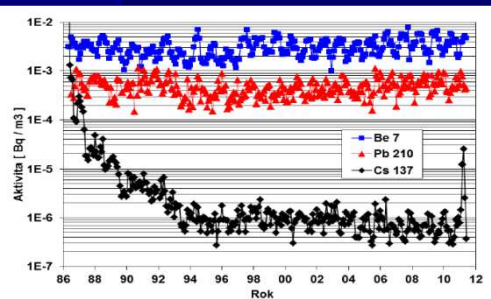
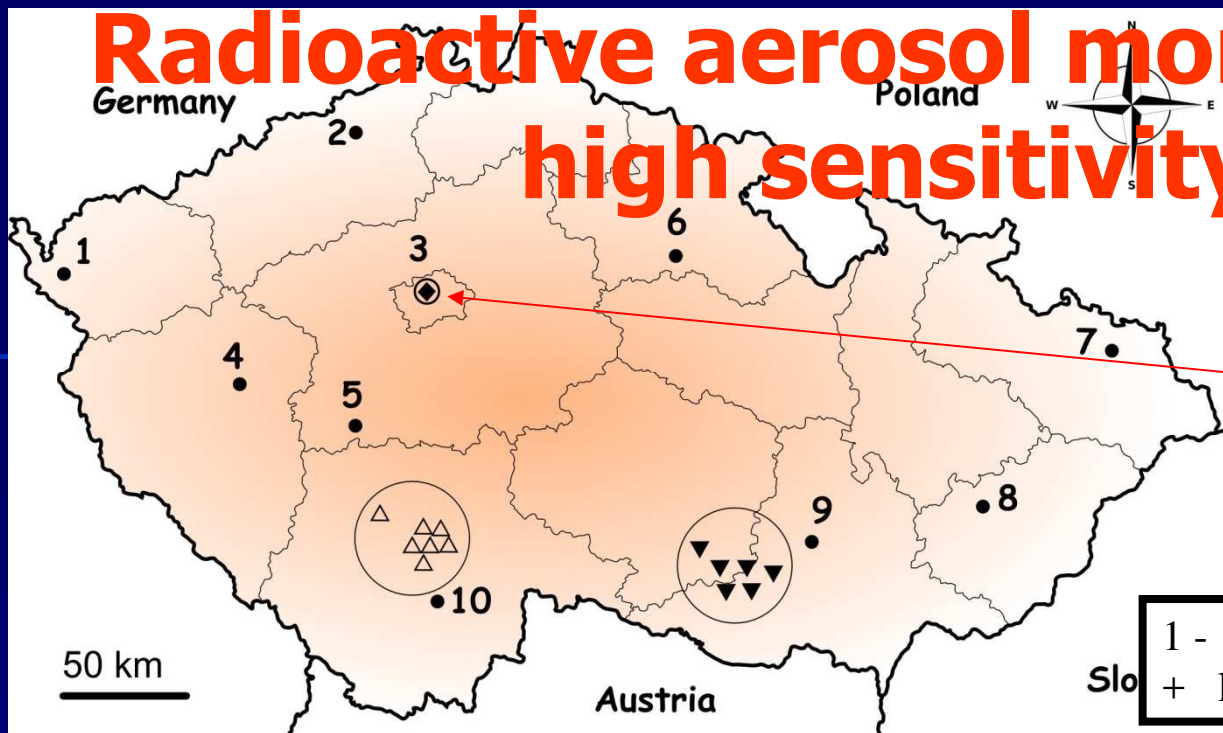
- Some 200 points (incl. in the buildings) (3 month period)
- data → central dbase

+ local independent dosemeters - NPP Temelin, Dukovany



local TLD 70 points (NPP Temelin, Dukovany)

Radioactive aerosol monitoring – high sensitivity



Mobile Groups

(car-borne and air-borne monitoring with special equipment, emergency monitoring and analysis of extraordinary events)



Equipment:

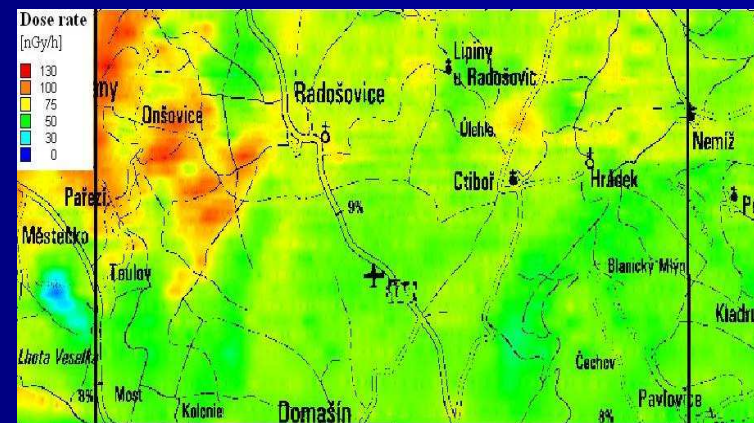
portable spectroscopy (HpGe, scint), air samplers, dose rate meters (GPS), alfa measurement,.. Dron, robot



2 experts

in monitoring group CTBTO
(Comprehensive Nuclear-
Test-Ban Treaty
Organization)

Mobile group – airborne measurements



System IRIS (integrated radiation information system, airborne gamma spectroscopy)

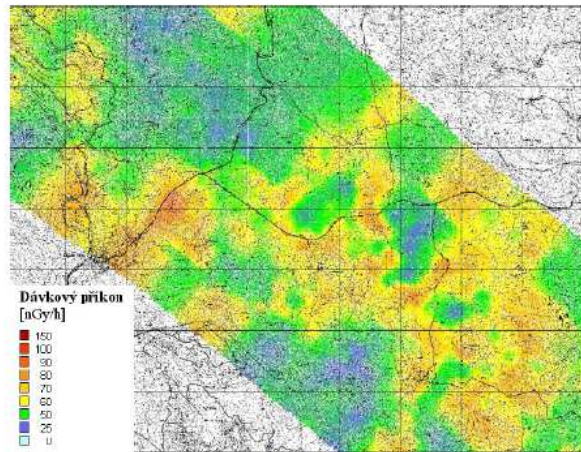
Nal(Tl) spectrometry 4*4 dm³)

(HpGe spectrometry is also used)

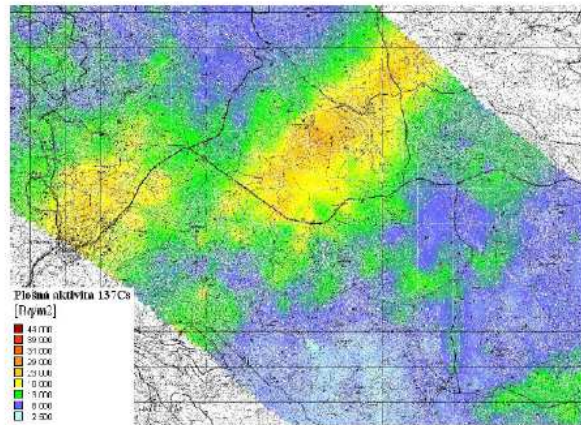
Air borne monitoring

Cs-137 (IRIS detectors)
South Bohemia (Šumava)

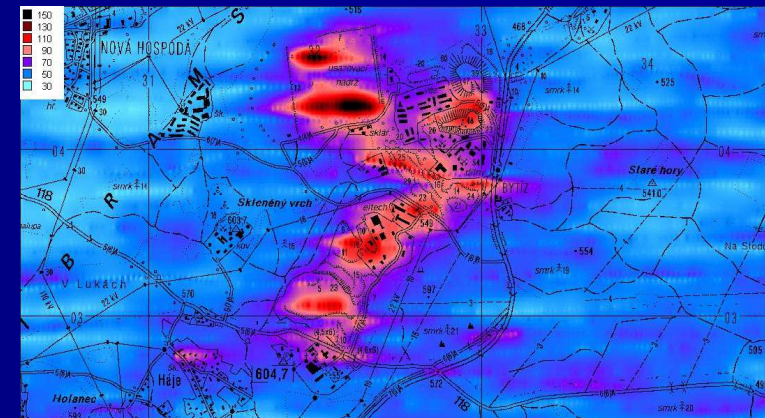
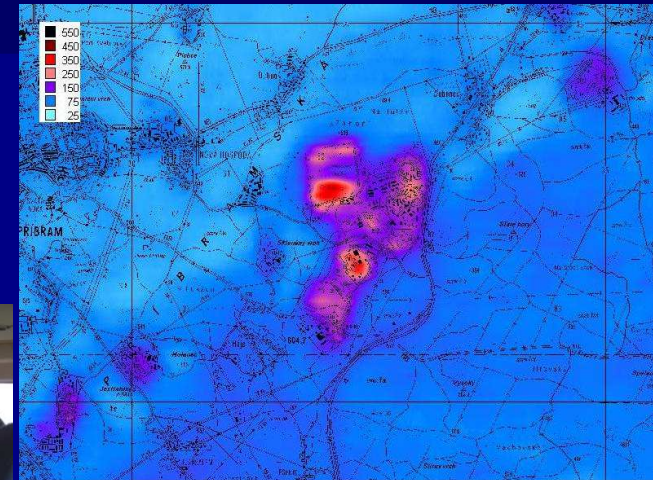
Uranium tailings
Dose rates [nSv/h]; (IRIS)

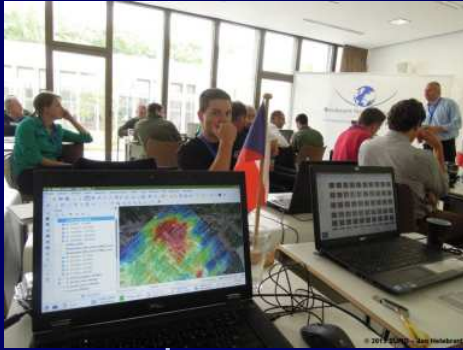


Obr. 17: Letecké monitorování - dávkový příkon



Obr. 18: Letecké monitorování - plošná aktivita Cs-137





International exercises (airborne groups)

- SÚRO (CZ),
- Commissariat à l'énergie atomique – CEA (France)
- Institut de radioprotection et de sûreté nucléaire – IRSN (France)
- Nationale Alarmzentrale – NAZ (Swiss)
- Bundesamt für Strahlenschutz – BfS a Bundespolizei-Flugdienst Germany



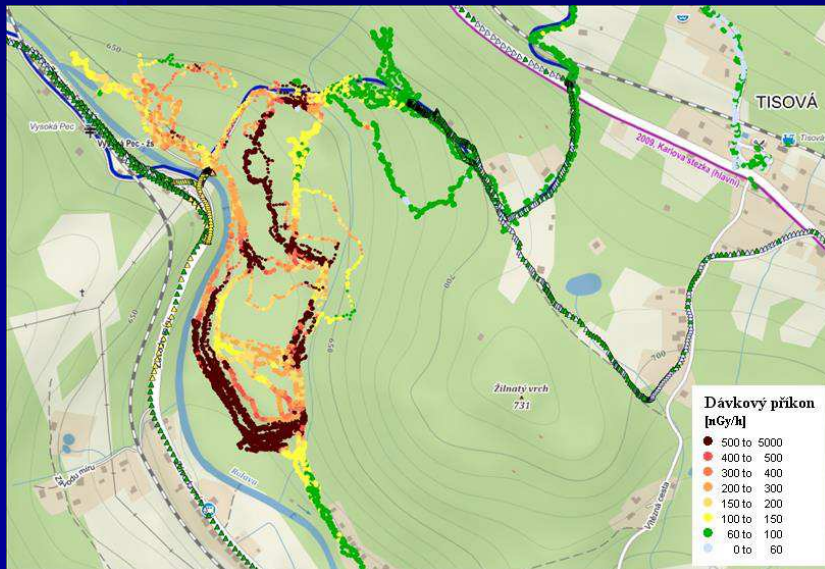
Research projects (examples)

supporting SONS and Ministry of Interior (security)

Project: Mostar

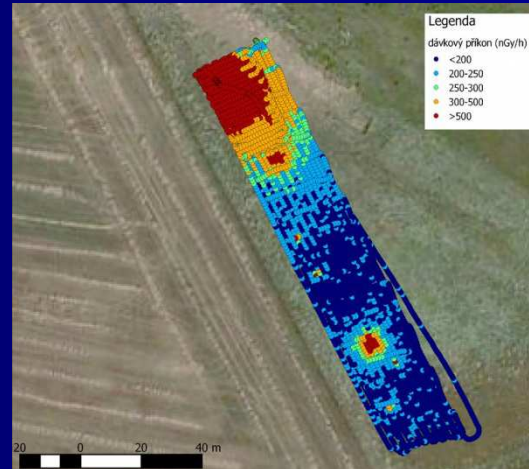
carborne monitoring -
Directional detectors

on-line and stand-alone
(blackout) monitoring dose rate
and aerosol radioactivity)



Project : Innovative airborne monitoring + UAV Drone Radiation Monitoring + Robots Radiation Monitoring

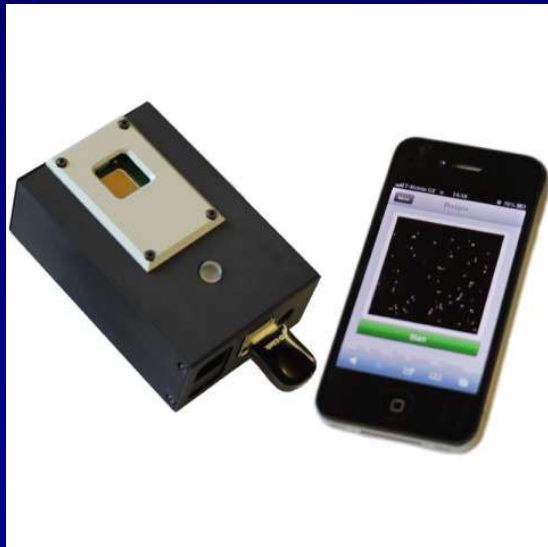
SURO participated at Airborne Radiometrics International Exercise 2017 (Switzerland)



Project EU ECHORD –Radioroso



MORPHEUS - robot



Project : New detectors : TimePix pixel detector (with IAEP Prague and CERN)

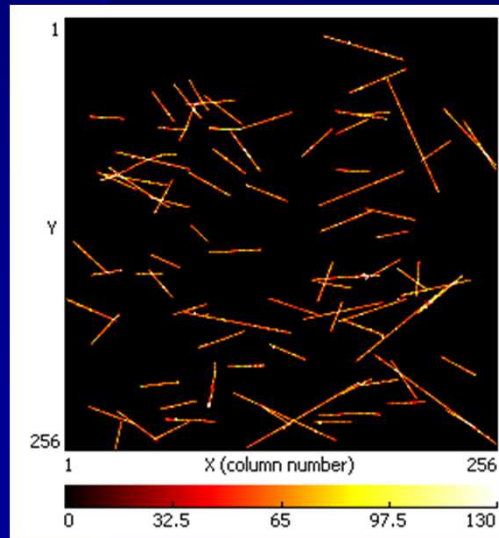
- ◆ TimePix device + USB readout interface
- ◆ 256x256 pixels, 55 μ m pitch, area 1.4 \times 1.4 cm², thickness typ. 300 μ m (Si) or 1mm (CdTe)
- ◆ Detected radiation forms clusters
- ◆ Possibility to distinguish various types of radiation using cluster analysis

USB Lite

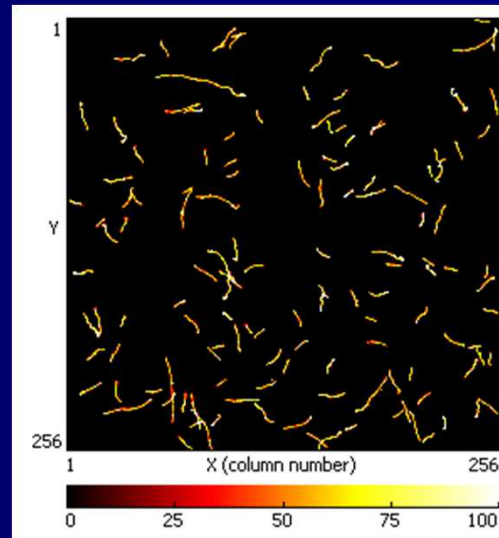


Typical signature for various radiation:

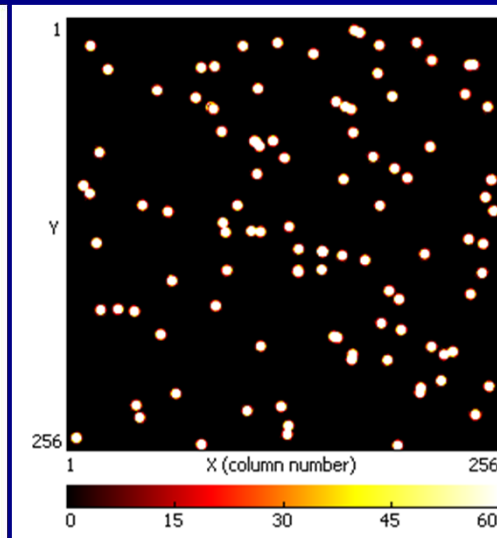
3D fitted data



Muons



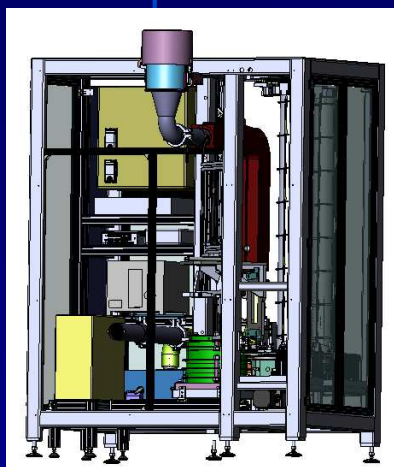
Electrons



Alpha particles

HAMRAD project

Emergency high sensitive radioactive aerosol monitor HpGe
with automatic remote data transmission



Project :

Sophisticated system for monitoring I-131 in thyroid gland in case of large amount of potentially contaminated children

Old system

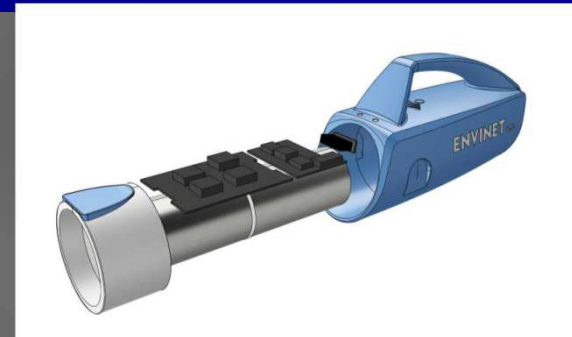


research project:

sophisticated system for monitoring I-131 in thyroid gland in case of large amount of potentially contaminated children

6 measuring points, el.chip for children, central PC (integrated electronic)

100 children/hour





6 measuring points, el.chip for children, central PC (integrated electronic)

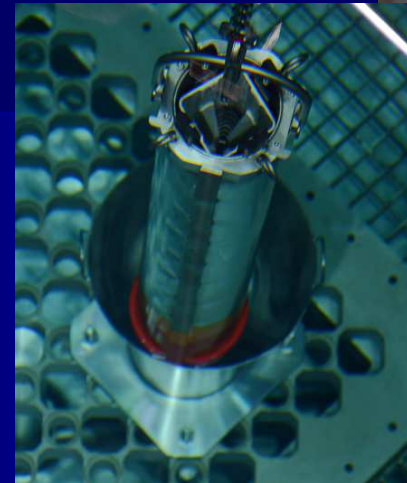
100 children/hour



Project : MONTE

(Nuclear faculty reactor for mobile groups realistic exercise)

Irradiation facility with realistic radionuclides and fission spectra



Project : Citizens measurement and their incorporation in radiation protection (emergency etc) - the pros and cons

whether we like it or not, people buy detectors and carry out measurements

| | | | | | | |
|--|---|--|---|---|--|---|
|  |  |  |  |  |  |  |
| SOEKS 01M Plus Generation 2 Geiger Counter Radiation Detector Dosimeter ★★★★★ 8 \$224.46 | GQ GMC-320-Plus Geiger Counter Nuclear Radiation Detector Meter Beta Gamma X ray test... ★★★★☆ 72 \$118.00 ✓Prime | RADEX RD1212 Advanced Radiation Detector / Geiger Counter with Online Software ★★★★★ 116 \$199.95 ✓Prime | Greentest, High Accuracy Radiation Detector ,Personal Geiger Counter/ Nitrate Tester Combo... ★★★★★ 7 \$126.99 ✓Prime | Corentium Home by AirThings, Radon Gas Detector, USA version in pCi/L ★★★★★ 213 \$199.99 ✓Prime | TM-91 Geiger Counter and Nuclear Radiation Monitor: Measures Beta, Gamma and X-ray... \$356.00 ✓Prime | International Medcom Radalert 100X Radiation Detection Meter \$450.00 ✓Prime |

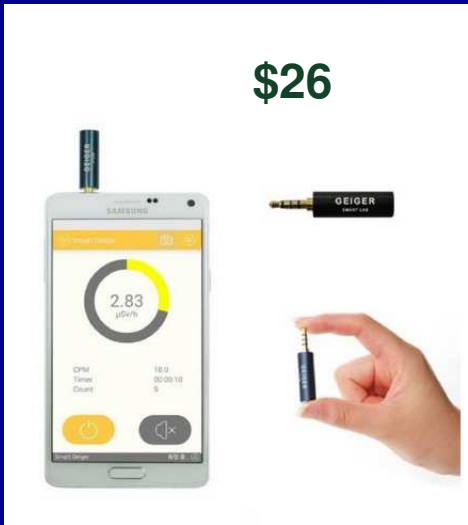
Ad fe

\$650

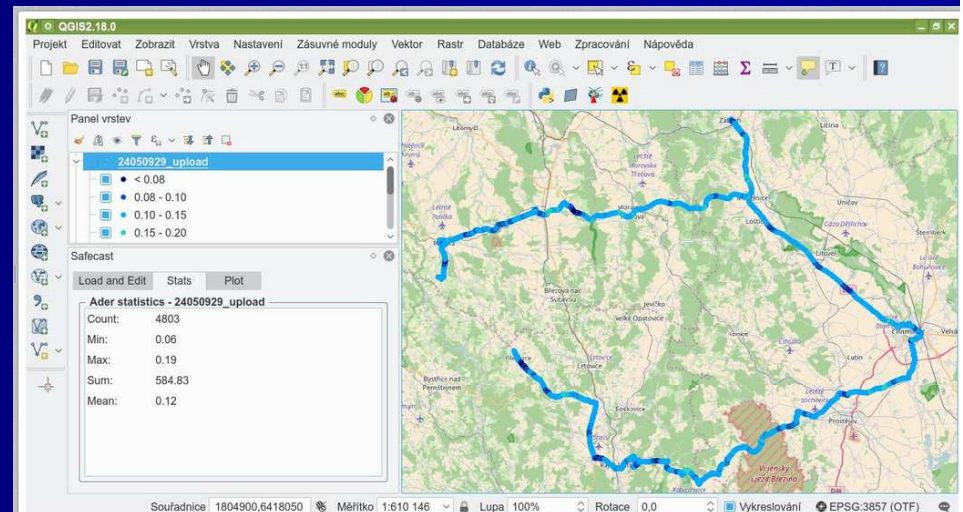
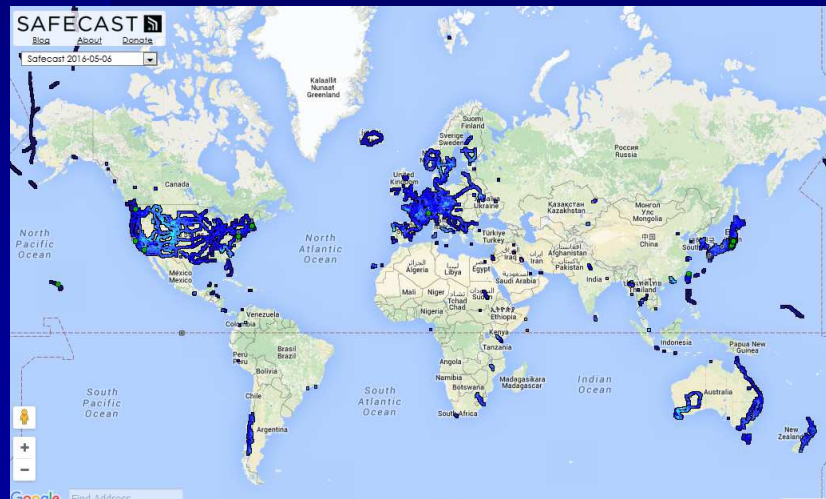
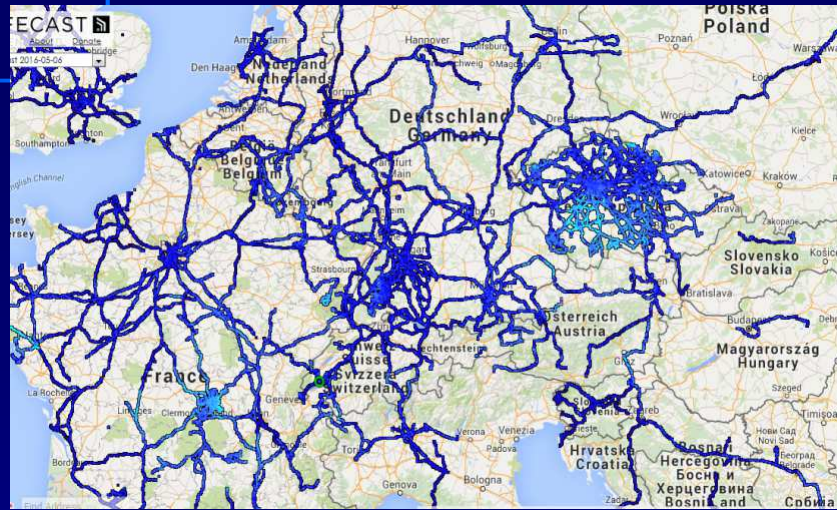


Smart geiger for Smartphone

\$26



SURO analyze availability of SAFECAST Data - preparing independent simple mapping software for citizens measurement (municipalities) and incorporation to national system (MONRAS – SONS)



Monitoring Laboratories

**(for emergency, monitoring
of NPP, etc)**

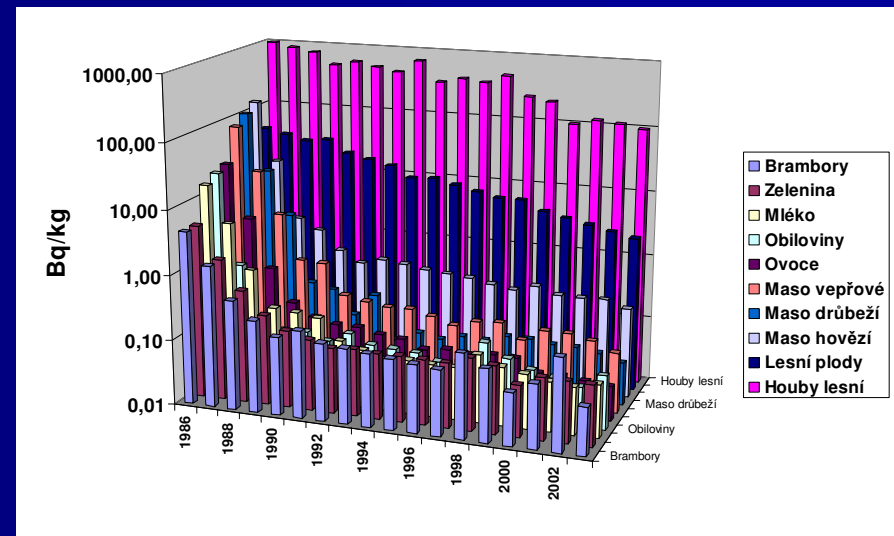
Central laboratory (spectrometry gamma,alpha, beta (SURO))



(cooperation with RC SUJB, State veterinary institute , Water Research Institute)

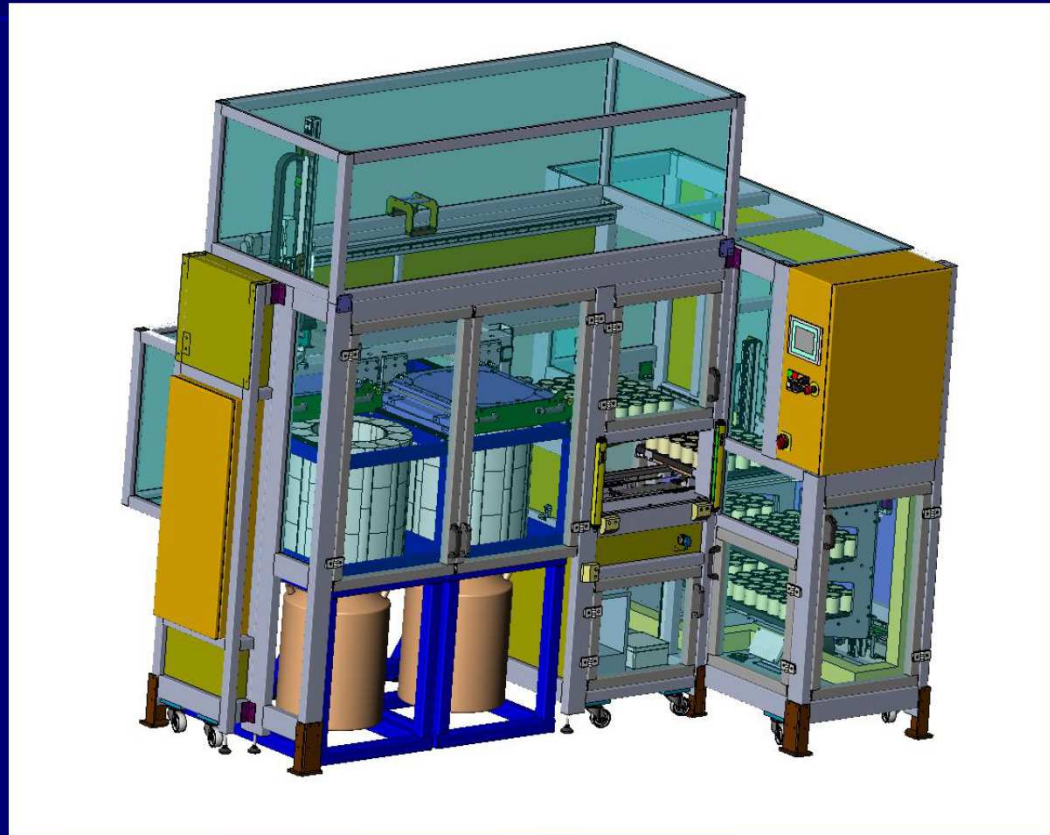
AIM: identify long-term trends and detecting any deviations

in the atmosphere,
137Cs, 90Sr, 239+240Pu, 85Kr, 3H, 14C;
in waters, 3H, 137Cs, 90Sr;
in foodstuffs, 137Cs, 90Sr;

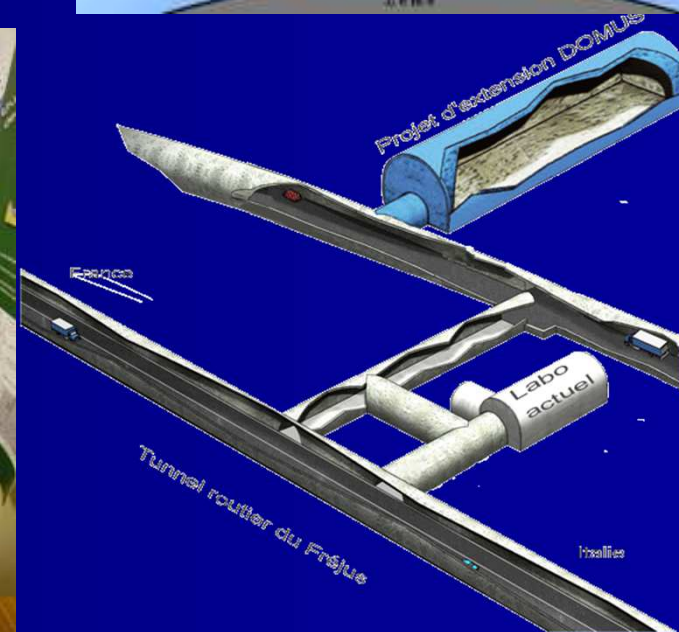
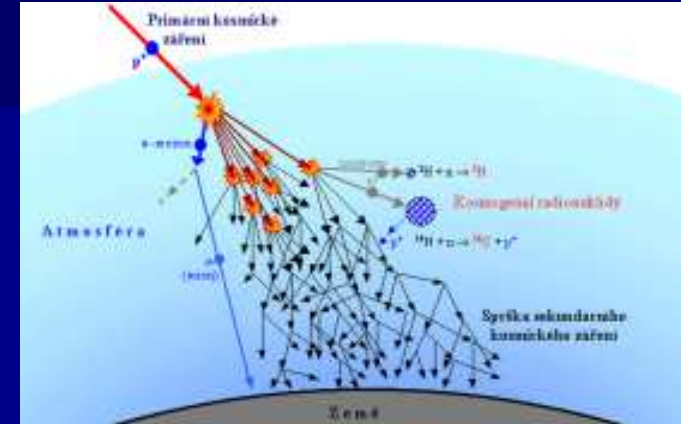
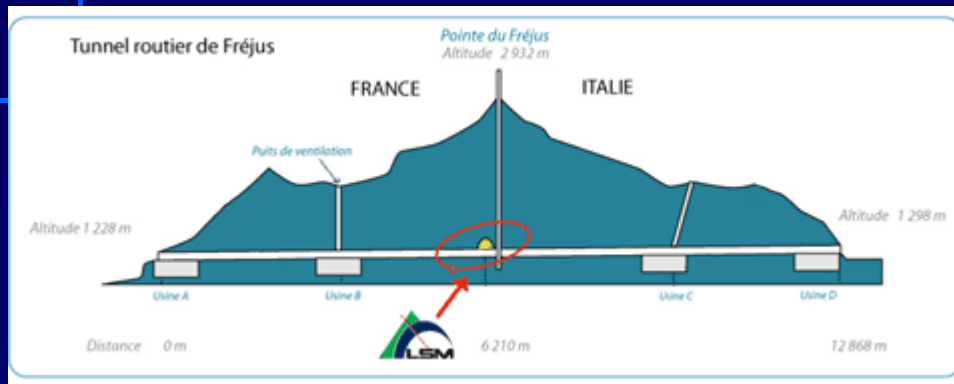


- **gamaspectroscopy system capacity emergency ~ 1000 samples / day**
- **Data → central database**
- **Data annually sent to Joint Research Centre ISPRA ... REM (Radioactivity Environmental Monitoring)**

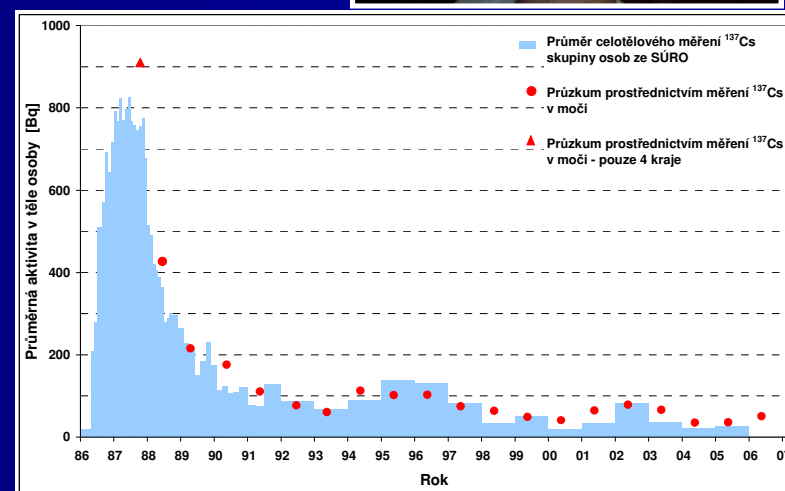
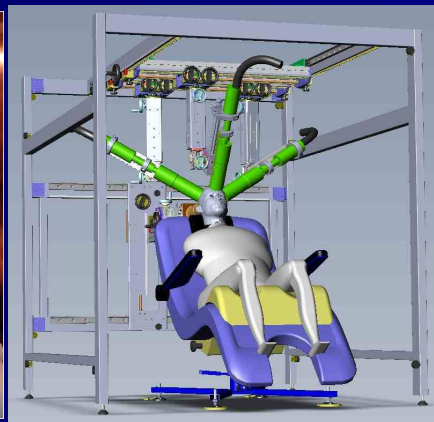
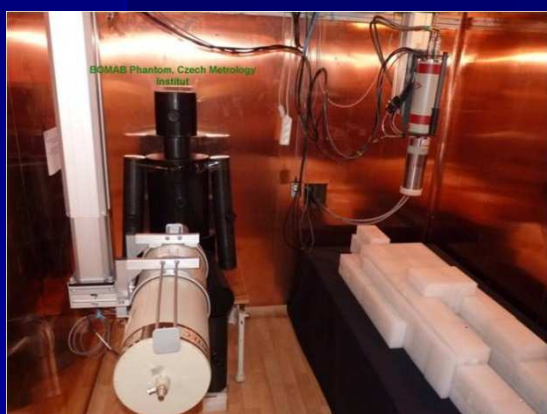
Gamma automat prototype



Ultra low level gamma counting SURO HpGe det. at LSM (Laboratoire Souterrain de Modane, France)



Internal contamination (whole body counter)



Transportable „whole body counter“



- 1 HpGe detectors,
- 2 portable HpGe
- thyroid gland I-131 (scint.)



On site internal contamination measurements
of wild boar hunters



Laboratory for TL, OSL and Electronic Dosimetry

- radiation monitoring network
- medical exposure and research
- retrospective dosimetry (mobil phone..)



TLD: RADOS DOSACUS



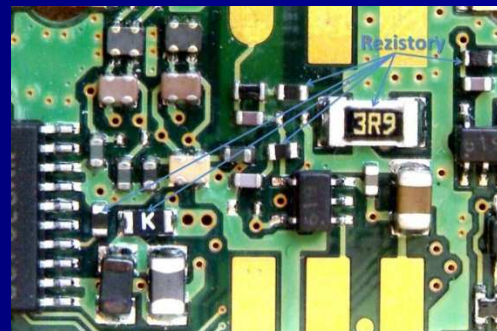
Harshaw 660 Lite



El. Dosimetry -RADOS DBR



Retrospective dosimetry (OSL) (for person without dosimeters)



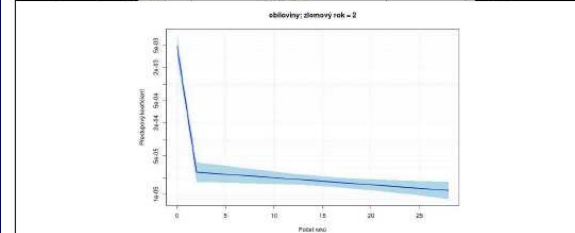
Project : Remediation , countermeasures in case of NPP accident late phase (impact on agriculture, land cover)

Radionuclide transer factor from soil to plant: Chernobyl data.



Tabulka 1.3: $T_{F-agreg}$ agregovaný přestupový koeficient s konfidenčními intervaly a jeho časový vývoj: obilniny-produkt

| rok od nehody | $T_{F-agreg}$ | $T_{F-agreg}$ - konfidenční interval (dolní mez) | $T_{F-agreg}$ - konfidenční interval (horní mez) |
|---------------|---------------|--|--|
| 0 | 4,8E-03 | 3,1E-03 | 7,5E-03 |
| 1 | 3,49E-04 | 2,6E-04 | 4,7E-04 |
| 2 | 2,50E-05 | 1,70E-05 | 3,80E-05 |
| 3 | 2,50E-05 | 1,70E-05 | 3,60E-05 |
| 4 | 2,40E-05 | 1,70E-05 | 3,40E-05 |
| 5 | 2,30E-05 | 1,60E-05 | 3,30E-05 |
| 6 | 2,20E-05 | 1,60E-05 | 3,10E-05 |
| 7 | 2,20E-05 | 1,60E-05 | 3,00E-05 |
| 8 | 2,10E-05 | 1,60E-05 | 2,80E-05 |
| 9 | 2,10E-05 | 1,60E-05 | 2,70E-05 |
| 10 | 2,00E-05 | 1,50E-05 | 2,60E-05 |
| 11 | 1,90E-05 | 1,50E-05 | 2,50E-05 |
| 12 | 1,90E-05 | 1,50E-05 | 2,40E-05 |
| 13 | 1,80E-05 | 1,50E-05 | 2,30E-05 |
| 14 | 1,80E-05 | 1,40E-05 | 2,20E-05 |
| 15 | 1,70E-05 | 1,40E-05 | 2,10E-05 |
| 16 | 1,70E-05 | 1,40E-05 | 2,10E-05 |
| 17 | 1,60E-05 | 1,30E-05 | 2,00E-05 |
| 18 | 1,60E-05 | 1,30E-05 | 2,00E-05 |
| 19 | 1,50E-05 | 1,20E-05 | 1,90E-05 |
| 20 | 1,50E-05 | 1,20E-05 | 1,90E-05 |
| 21 | 1,40E-05 | 1,10E-05 | 1,80E-05 |
| 22 | 1,40E-05 | 1,10E-05 | 1,80E-05 |
| 23 | 1,40E-05 | 1,00E-05 | 1,80E-05 |
| 24 | 1,30E-05 | 1,00E-05 | 1,80E-05 |
| 25 | 1,30E-05 | 1,00E-05 | 1,70E-05 |
| 26 | 1,30E-05 | 9,00E-06 | 1,70E-05 |



Thank you