Citizen Monitoring in the Czech Republic progress achieved during the last year

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Involvement of stakeholders and general public

plays one of the key roles in the process of effective solving problems in emergency preparedness, response and remediation on affected territories.

To accomplish these tasks, it is necessary to gain the participants´ confidence to information on radiation situation provided by the authorities.

Czech Republic: Security Research supported by Ministry of Interior

ID 20152019028 **RAMESIS** - research (SURO & UTEF CTU) and commerce (NUVIA)

„Radiation Monitoring Network for institutions and schools to assure early awareness and enhancing safety of citizens“

Improvement safety of population through introducing of radiation monitoring system at level of institutions, schools and citizens in accordance with current international trends. Instrumentation including central application for receipt, storage, administration and publication of monitoring results will be analyzed, projected, developed and obtained. System will be implemented at selected institutions and schools, incl. training and informational materials for understanding radiation problems.

Objectives of the project:

- design, development, operational testing and implementation of **tools for supporting citizens radiation monitoring networks**
  (detectors, communication, central database/application for local&web data presentation)
- preparation of **information materials**, methodic, manuals, guides etc. for users&**public**
- preparation the system for possible future integration of results of citizens monitoring into official **Radiation Monitoring Network**

Roles of participants in RAMESIS project

SURO - **project coordinator**

- formulation of requirements for design and parameters of detectors, monitoring network and central database/application,
- communication to public
- testing functionality of both detectors and network
- preparation of information materials, documents, guides etc. for users & public
- implementation of mobile monitoring

NUVIA design and realization of **central database/application**

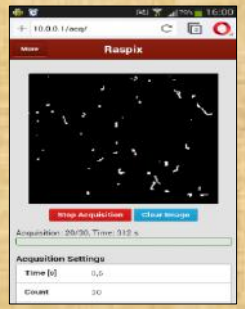
- for receiving, storing and processing measurement results and publication on web

UTEF **development of detectors**

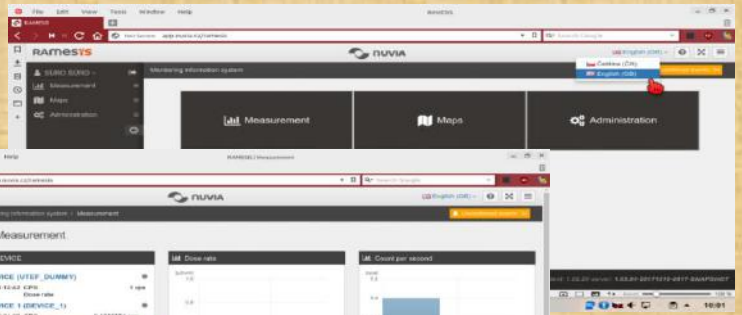
- for **fixed stations** network based on Si-diode
- advanced detectors based on pixel Si/GaAs detectors for schools

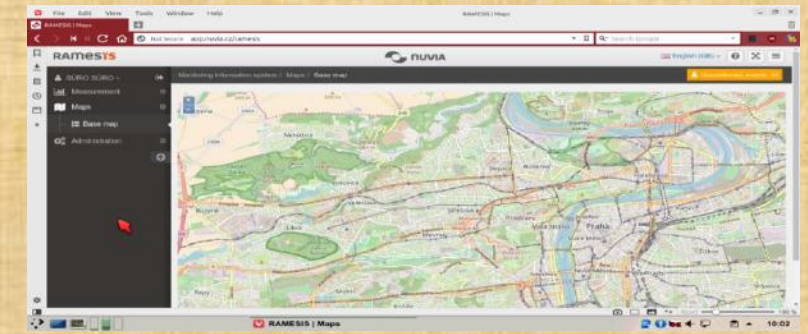
Progress of the RAMESIS project (up to spring 2018)

UTEF - **development of detectors** for **fixed stations** network (Si-diode/opt. CsI) and of advanced **detectors for schools** (pixel Si/GaAs detectors)

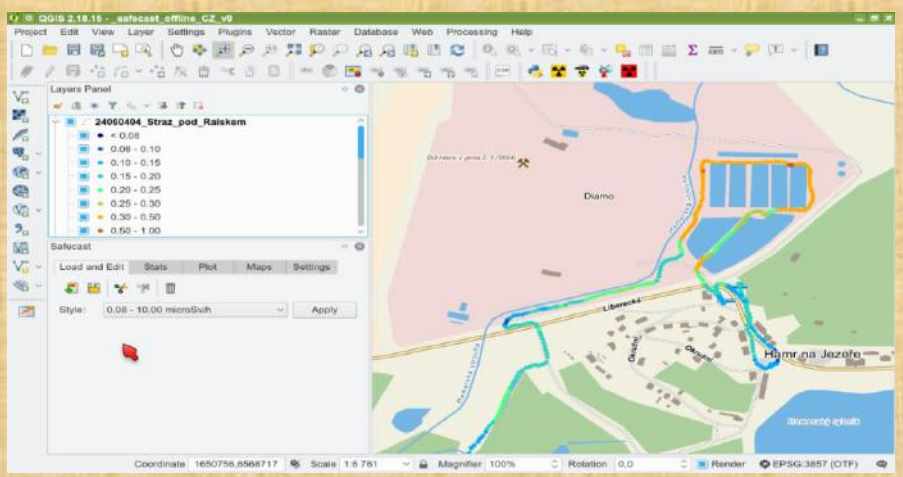


NUVIA - development of central application





Map presentation of monitoring results on local PC

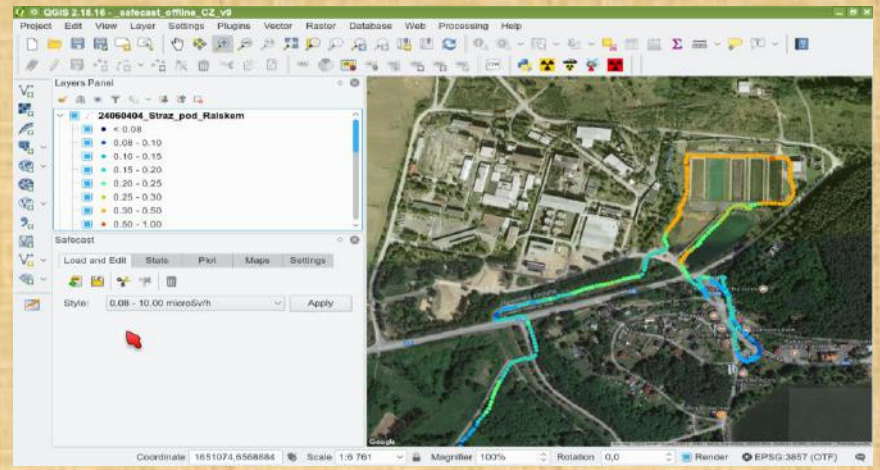


QGIS* using off-line maps

- prepared by SURO
- based on OpenStreetMap
- vector offline maps of the Czech Republic available for download, ~ 5 GB (unpacked data)
- other countries/regions on demand

QGIS* using on-line maps

- Google
- Bing
- OpenStreetMap
- ...



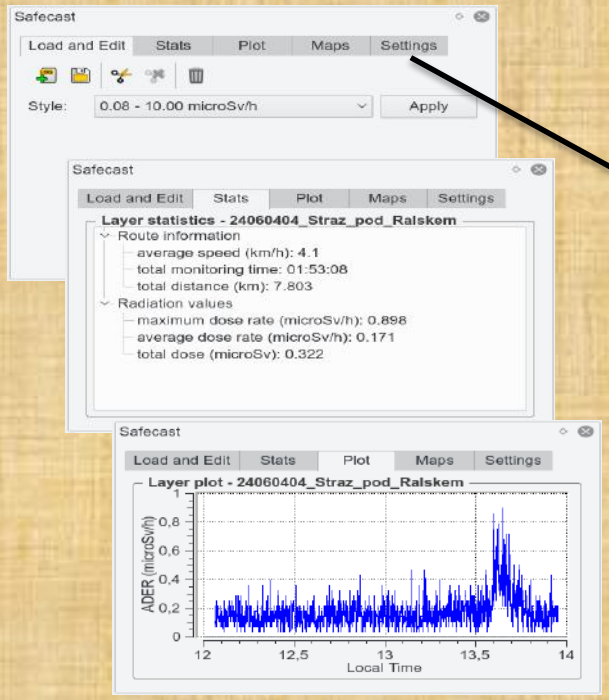
SURO provides support for users:

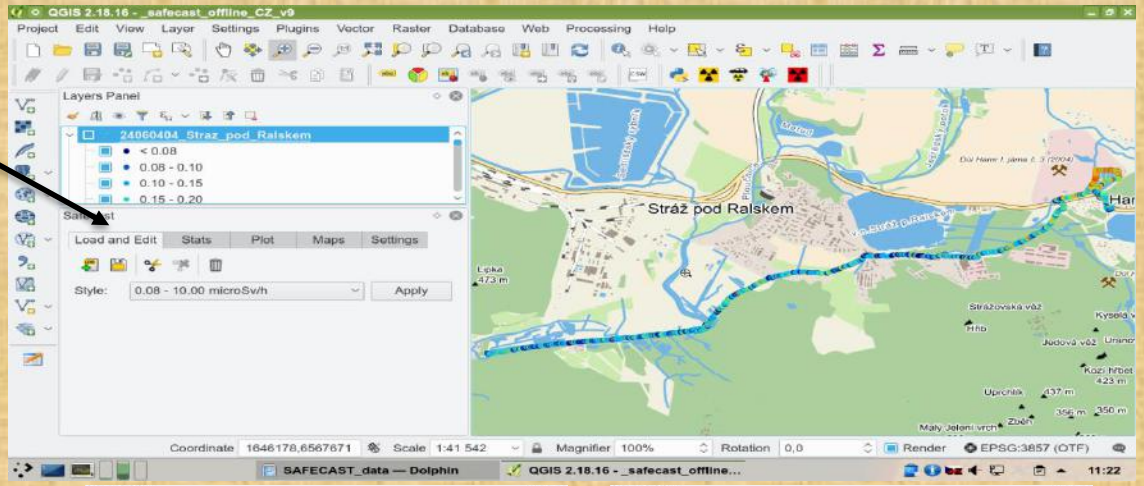
- information, guides etc. on wiki
- plugins* for data processing

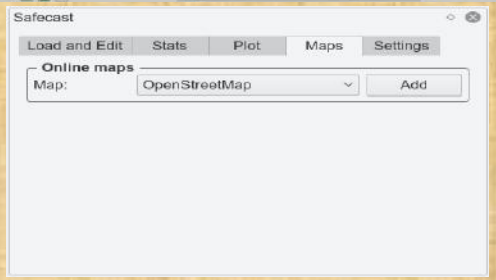
(* Open Source projects)

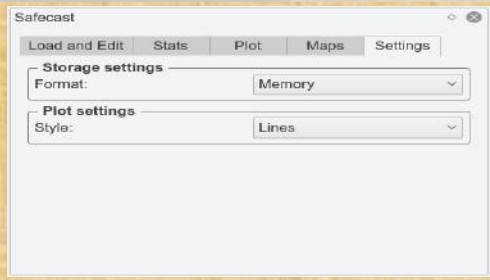
SURO provides **mapping software**, **tools** and **map-data** for citizens, schools, municipalities etc.

enabling measurement results processing and presentation on local level based on open source solutions





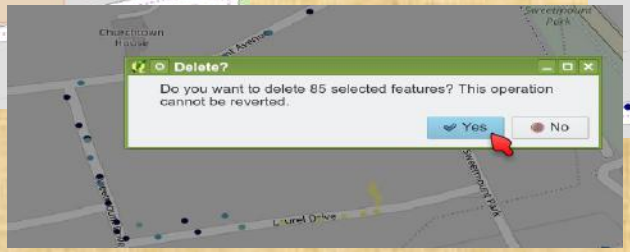




Cross-platform solution

QGIS plugins for processing SAFECAST data

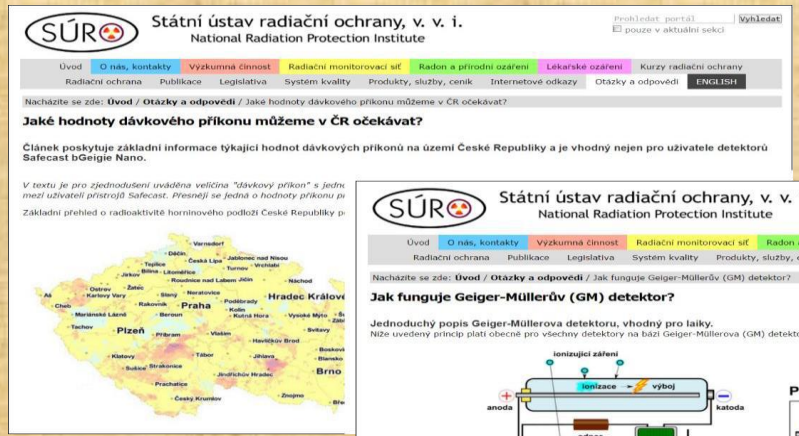
- simple input data by direct reading *.LOG files from Safecast SD card
- possibility to easily remove selected parts of data not intended to share (personal/private information protection etc.)

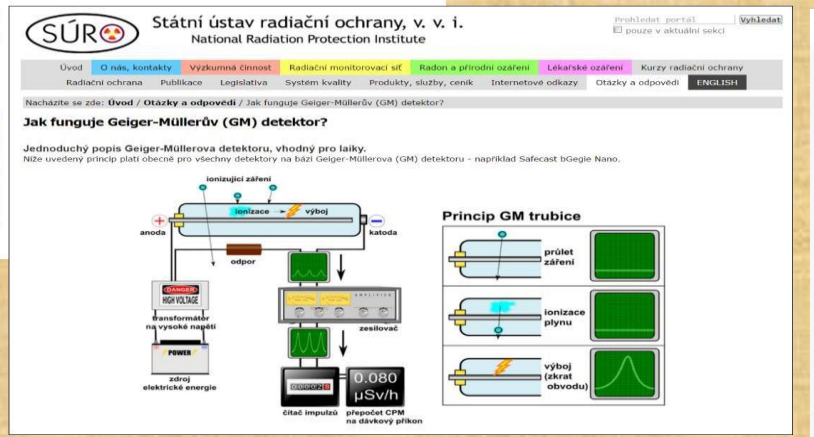


Information materials for users and public

documents prepared by SURO available

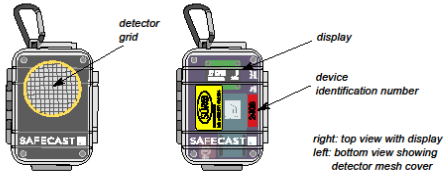
- on www.suro.cz
- on Wikipedia (synchronized)
- on WIKI Powered By MediaWiki & powered by debian



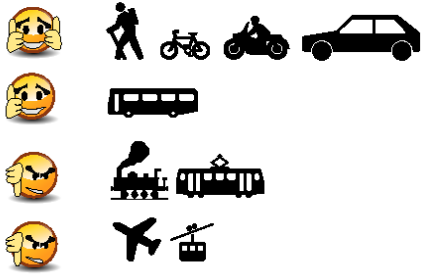


Information materials for users and public

SAFECAST bGeigie Nano detector - recommendations on how to measure



1) Suitability of different vehicles:



Walking measurement is probably the best way to get high quality data, but somewhat time consuming.

In addition to walking measurements you can of course place the detector on a bicycle, in a car, etc. However, it makes not much sense to measure in a train or in a tram, since the detector is too high above the ground and often shielded with massive chassis of vehicle.

Measuring both in a cable car and in a plane would not do for this purpose. When riding in the cable car you do not know the height above ground and in addition to this the height also is varying. An aircraft is then too high above the ground having regard to the device sensitivity. You also have no information on the height; furthermore GPS inside an aircraft has either a bad signal or does not work at all..

SAFECAST bGeigie Nano detector - recommendations on how to measure

2) walking measurement

The ideal position of the detector is in a standard height of about 1 meter above the ground, the detector grid facing down. This applies, for example, if you have the detector in a backpack on your back. Such a placement is often not possible; nevertheless another placement of the detector is also acceptable.

If you need a detector placed differently, e.g., to the side (side pocket, smaller backpack etc.), it is appropriate to avoid the detector measure "through you" or through the stacked bag - so that the grid was as close as possible in a sideward direction to an outer side of the backpack, rather than to your body.

The pictures below show a few examples. It should be mentioned that hand-carrying is not suitable for long-term measurements, as it is rather uncomfortable.

As well as, for example, in a shoulder bag or handbag it is recommended that a detector grid should be oriented facing away from the body in order to avoid useless shielding of the detector.

An example of backpack and hand placement

An example of detector placement in a sideward direction

SAFECAST bGeigie Nano detector - recommendations on how to measure

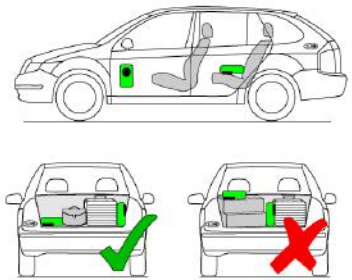
3) car-borne measurement

For travelling by car we can suggest a few options for detector placement, the most of which we also use during our measurements.

Although the SAFECAST website shows the photos with the device mounted on the side car window we do not recommend this position for our users. Using this position, you run the risk of device or window damage and the police could have objections against a device mounted on a window. None of our staff uses this position.

Likewise, we do not recommend placing the device on a dashboard – in case of sudden braking or a traffic accident the device can be thrown into a passenger area and cause an injury. Or it can fall under pedals and block e.g. a brake pedal. When placing the unit, focus your attention to ensure security of car passengers.

An example of placement in a car



Examples:

- **in side door plastic pocket detector facing out (preferred on a front-passenger side)**
- **on the seat, facing down**

In the luggage compartment:

- **on the left figure ... OK detector facing in a sideward direction to an outer side or facing down, at a bottom**
- **on the left figure ... WRONG**
- **all the luggage between the detector and outer space cause needless shielding**

SÚRO workers typically use one of the following options for car-borne measurements:

- on the car seat, the detector facing down
- at a bottom of car luggage compartment, the detector facing out (in a direction of front-passenger side) or alternatively facing down
- in a side plastic pocket in the passenger door, detector facing outward from the car

Information materials for users and public

SAFECAST bGeigie Nano accompanying document

ENGLISH

Purpose:
portable radiation detector with GPS

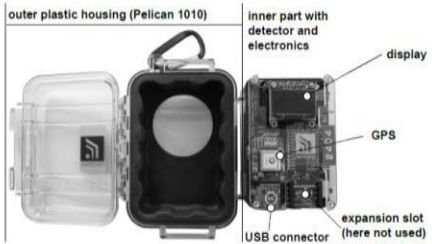
Use:
non-profit, community driven radioactivity mapping

Principle:
detects radiation going to the Geiger tube and saves the values together with GPS data to microSD memory card

The device does not transmit anything
- no wifi, no Bluetooth or other transmitter
- the device is not radioactive

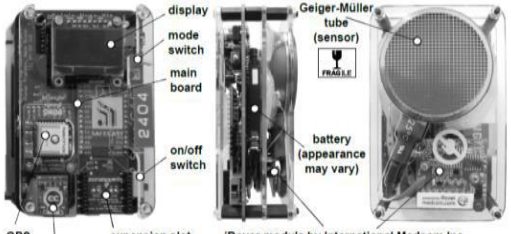
Contains standard Li-Ion battery like every smartphone

bGeigie layout



made in Inkscape & GIMP by Jan Helebrant / SURO.cz, 2015
English translation by Jan Helebrant & Jelena Buriánová

SAFECAST bGeigie Nano accompanying document - part 2



iRover module by International Medcom Inc. California, USA
- GM tube power supply (about 500 V, a few µA)
- do not touch when switched on

Approximate dose rate values for selected countries and places

common values	µSv/h	well known natural extremes	µSv/h
- Japan	... 0.040	- Guarapari (Brazil)	... up to 50
- France	... 0.068	- Kerala (India)	... about 2
- Finland	... 0.065	- Ramsar (Iran)	... 1-10
- Norway	... 0.073		
- Denmark	... 0.038		
- Poland	... 0.034		
- Canada	... 0.038		
- Austria, Belgium, USA	... 0.043		
- global average	... 0.055		

- airplane at an altitude of about 10 km - 5 µSv/h

For more information:

Official website:
www.nano.safecast.org

Complete documentation:
www.github.com/Safecast/bGeigieNanoKit/wiki/NANO-MANUAL

made in Inkscape & GIMP by Jan Helebrant / SURO.cz, 2015
English translation by Jan Helebrant & Jelena Buriánová

SAFECAST bGeigie Nano - measurement log

IMPORTANT INFO (more detailed in the manual):
- for data logging the lever has to be switched to the lower position marked "log / CPM"
- first ON must be in free space where GPS signal is available
- if you need to charge the bGeigie must be turned off !!!

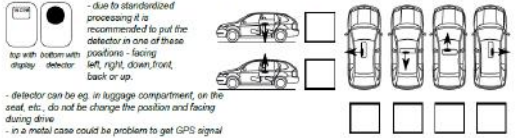
measurement date: 2017

measured by: .....

bGeigie number
(eg. 2354, inside the box, under the display, on the left side)

height above ground (meters)
(approximate height of the detector above ground)

detector facing - tick one option:
(orientation of the bottom side of the housing with a circular grille)



- due to standardized processing it is recommended to put the detector in one of these positions - facing left, right, down, front, back or up.

- detector can be eg. in luggage compartment, on the seat, etc., do not be change the position and facing during drive
- in a metal case could be problem to get GPS signal

measurement times: *(for repeated on/off - multiple measurements per day - write all)*

On Off Place (nearest city etc.)

Route description
(bigger cities on the route, notes etc.)

Did you carry something radioactive? YES NO
(radioactive sources, samples etc.)

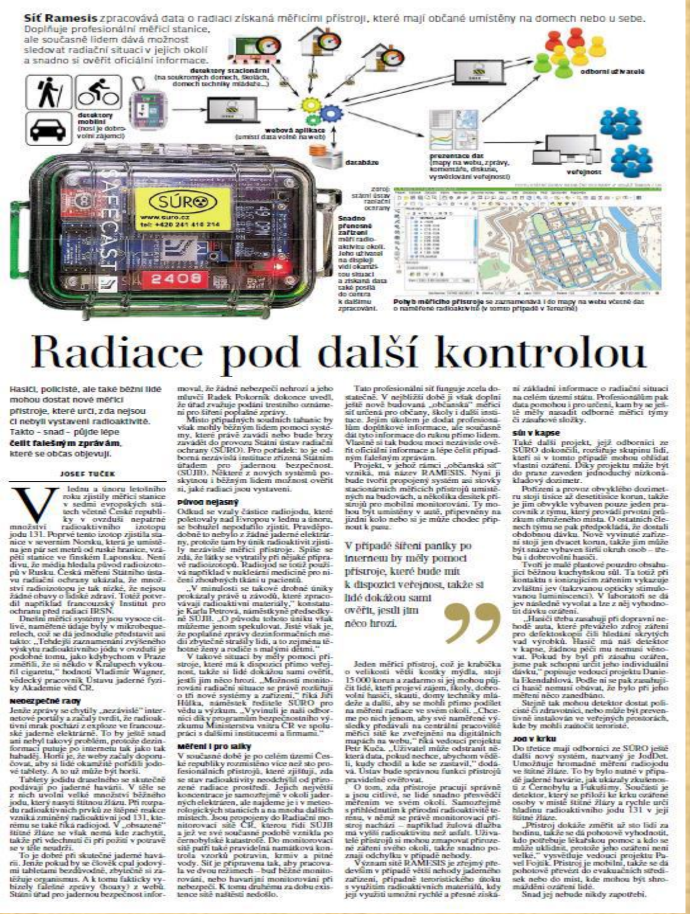
Page 1/1

made in Inkscape by Jan Helebrant / SURO.cz, 2015

Press Conference in SURO 16.8.2017

- **4 main TV channels - on-line! broadcast in Czech TV!**
- **10+ press media representatives** (incl. major national papers)
- other media and institutions

Lidové noviny – 4th brand leader*



Síť Ramesis zpracovává data o radiaci získaná měřicími přístroji, které mají občané umístěny na domech nebo u sebe. Doplňuje profesionální měřicí stanice, ale současně lidem dává možnost sledovat radiační situaci v jejich okolí a snadno si ověřit oficiální informace.

Radiace pod další kontrolou

Hasiči, policisté, ale také běžní lidé mohou dostat nové měřicí přístroje, které určí, zda nejsou či nebyly vystaveni radioaktivitě. Takto – snad – půjde lépe čelit falešným zprávám, které se občas objevují.

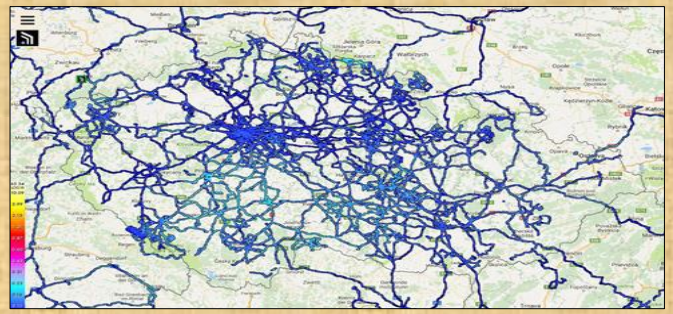
JOSEF TUČEK

V případě šíření paniky po internetu by měly pomoci přístroje, které bude mít k dispozici veřejnost, takže si lidé dokážou sami ověřit, jestli jim něco hrozí.

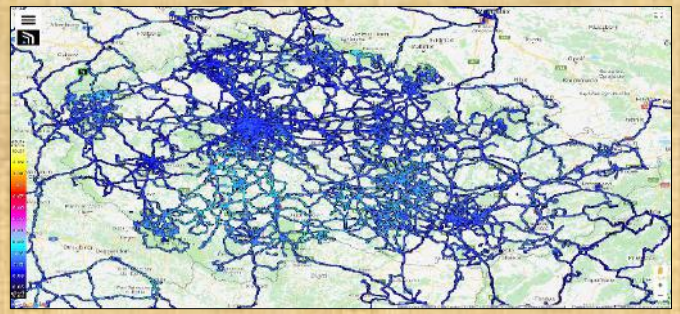
Progress of the RAMESIS project (up to spring 2018)

SURO - mobile monitoring utilizing SAFECAST bGeigie nano detectors

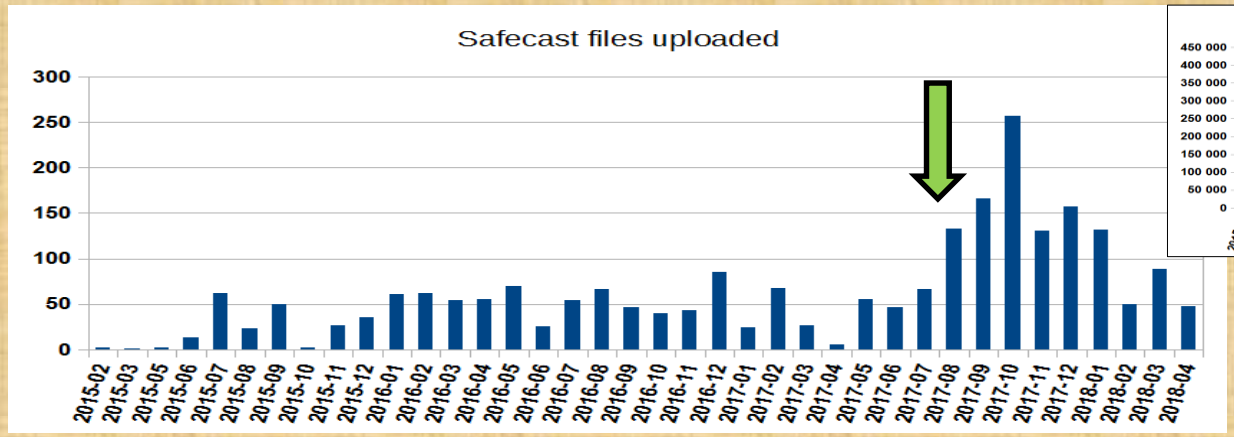
July 2015

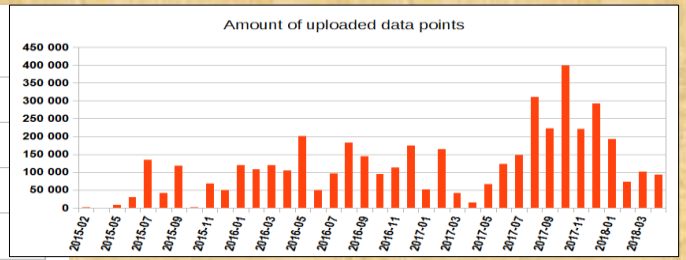


spring 2017



spring 2018





GeoForAll Lab

Department of Geomatics
Faculty of Civil Engineering
Czech Technical University in Prague

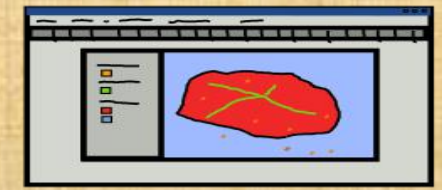
the Czech "branch" within the CTU, part of the international network covered by organizations:

Open Source Geospatial Foundation (OSGeo)

International Cartographic Association (ICA)

aimed at developing cooperation opportunities for academic, industrial and government organizations in the field of open-source GIS software and open data

Plugins developed by students for SÚRO

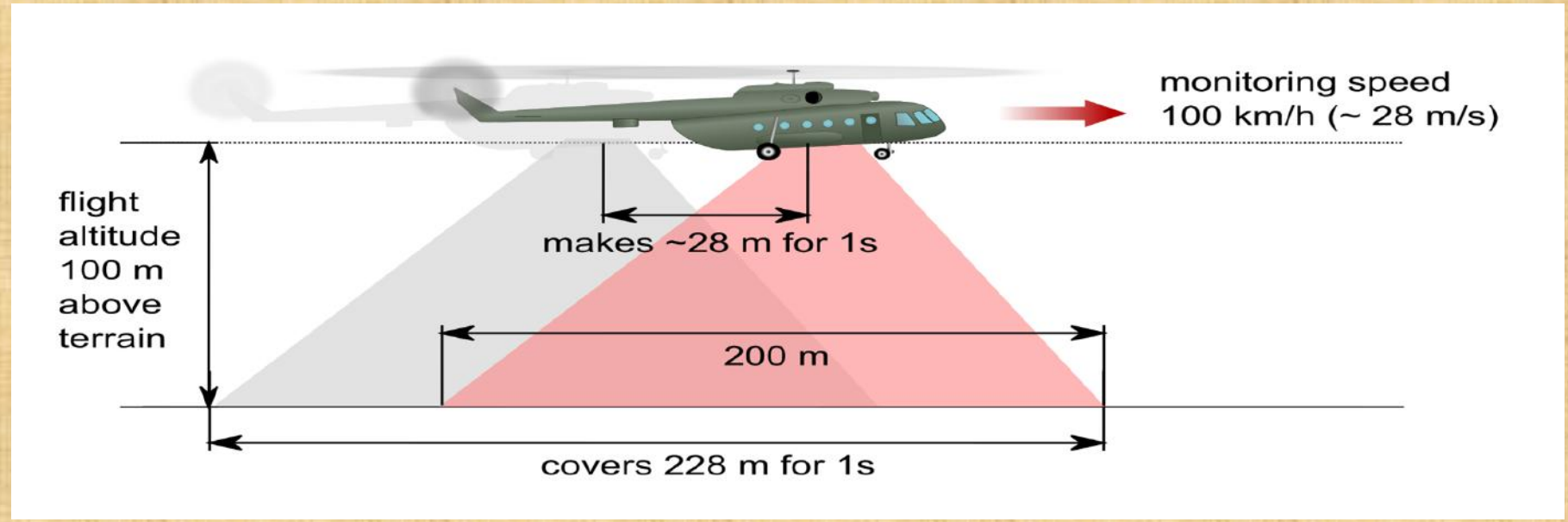


GPS Position Lag Correction Plugin

Problem to solve:

during airborne monitoring, the GPS coordinates are recorded at the beginning or at the end of the 1 second interval of the spectrometric measurement,

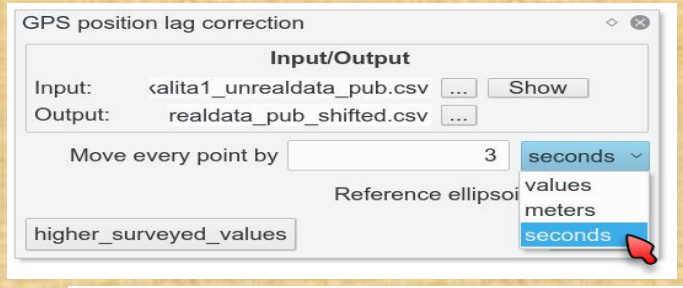
thereby shifting the coordinate to the measured point

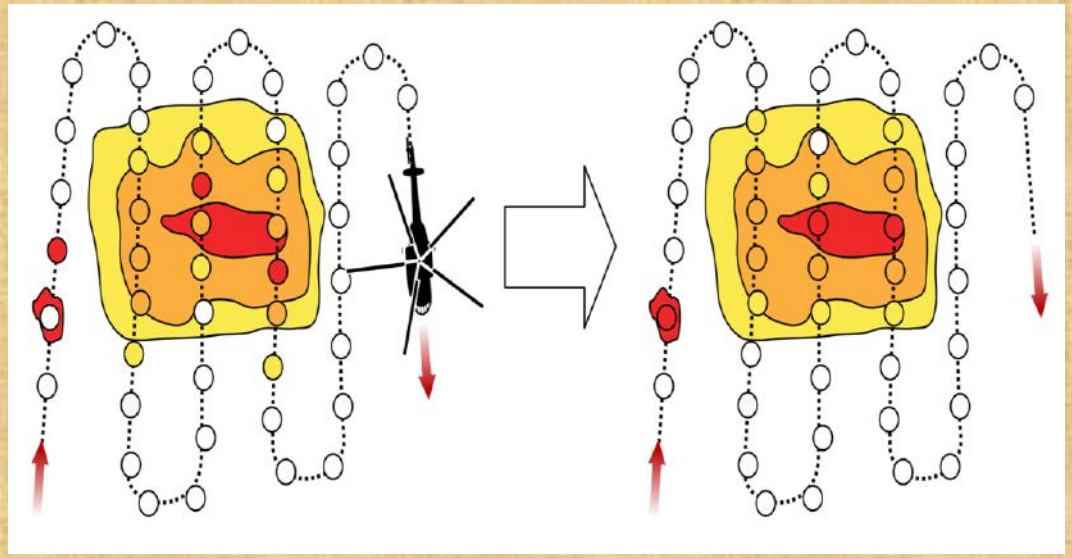


GPS Position Lag Correction Plugin

- this shift was <u>previously</u> solved manually - editing raw data in Excel/Calc, then transferring and loading to the map, checking, and possibly repeating the procedure
- shift based on knowledge of instrument parameters, experience, knowledge of the measured area

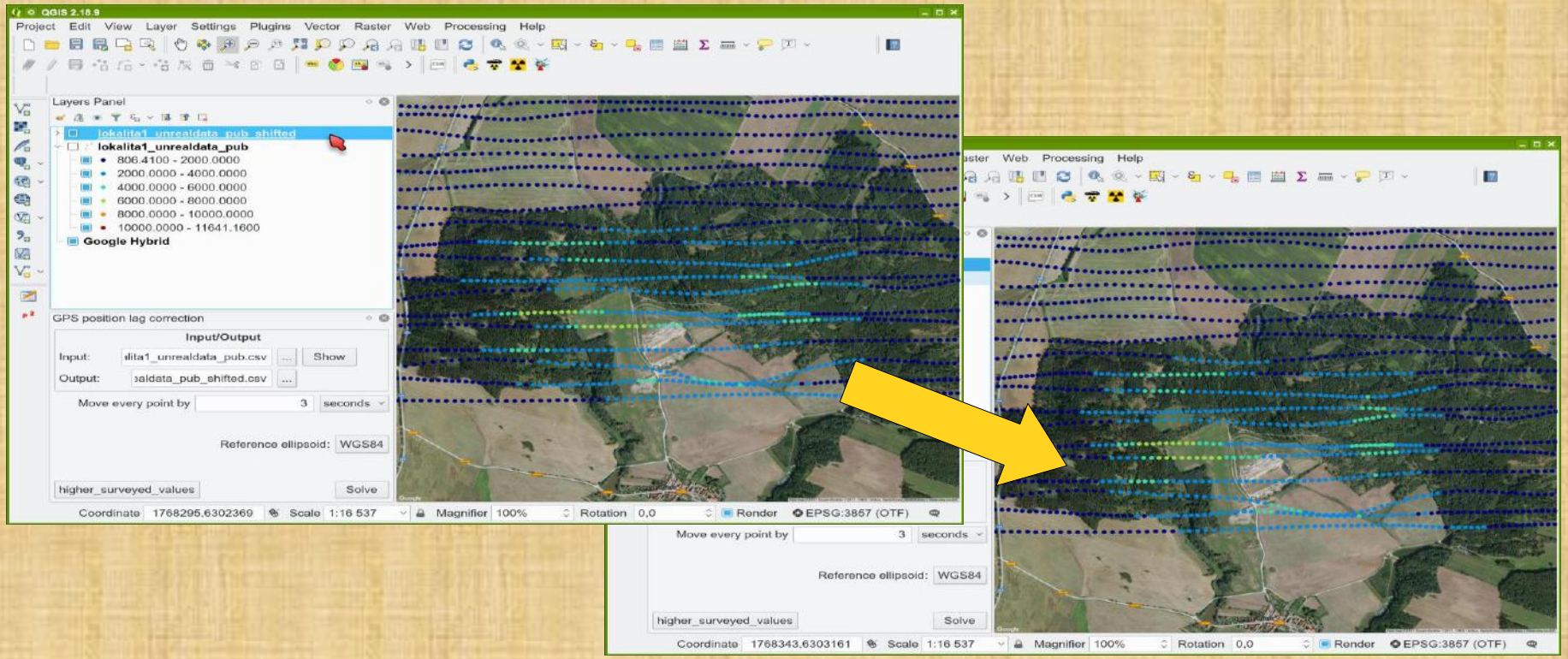
- <u>now</u> you can move the points interactively in the plugin and immediately see result on map





GPS Position Lag Correction Plugin

- plugin demonstration in action (3s shift):



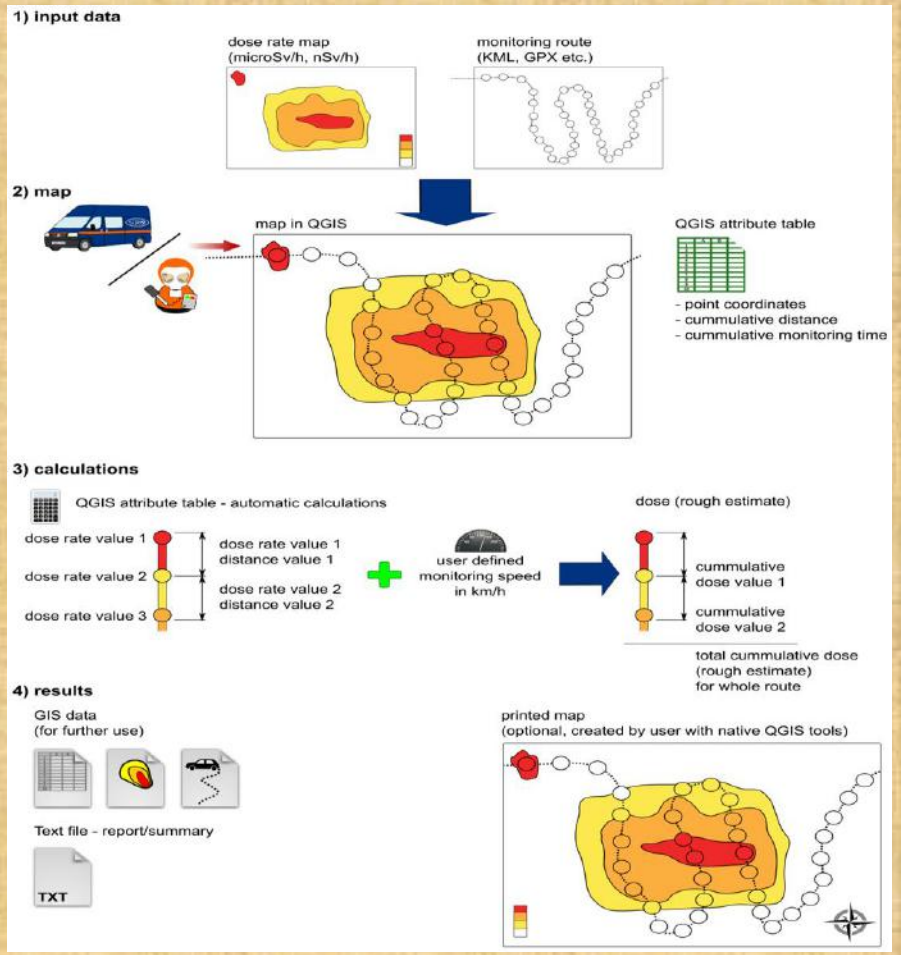
Ground Radiation Monitoring Plugin

Problem to solve:

- calculation of the obtained dose estimate for the monitoring vehicle crew using
  - interpolated dose rate map and
  - planned monitoring route

- dose rate map from:
  - prediction with SW like JRodos
  - interpolated real measurements (airborne etc.)

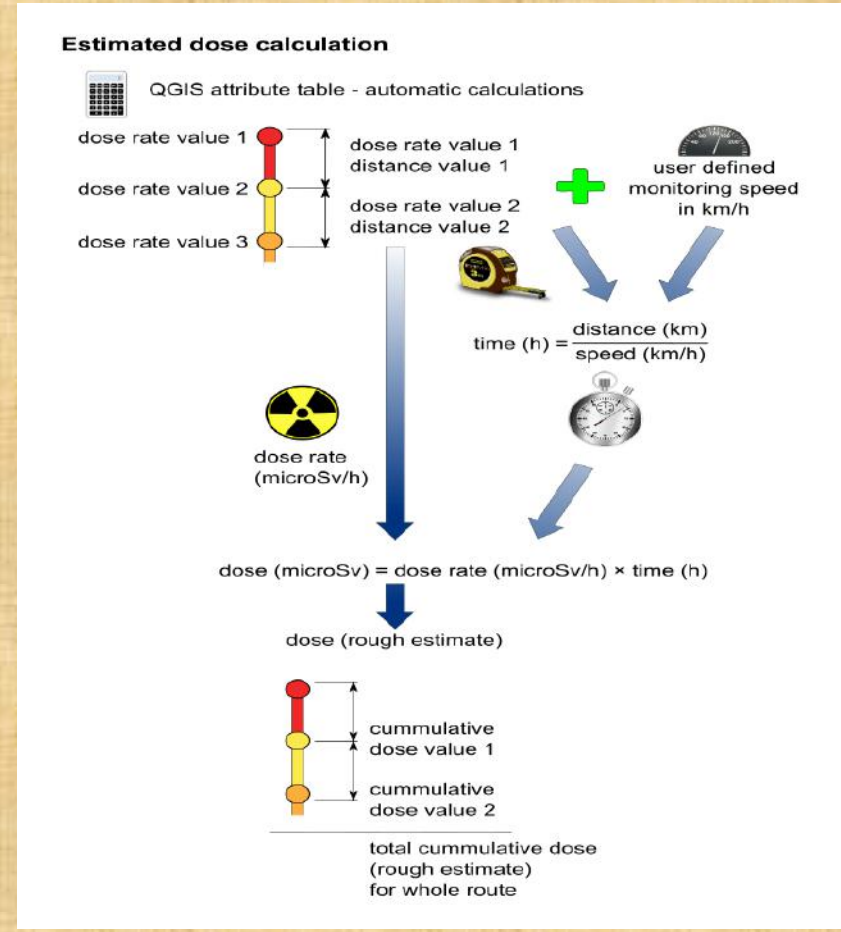
- routes planned for example with Google -(KML, GPX formats)



Ground Radiation Monitoring Plugin

- **performs calculation of dose estimate with constant monitoring speed,**
- **the distance between the route points is calculated from the coordinates**
- **the route from Google etc. has points only at the site of its direction change** (only a few points with values in a few-kilometer section => problem)

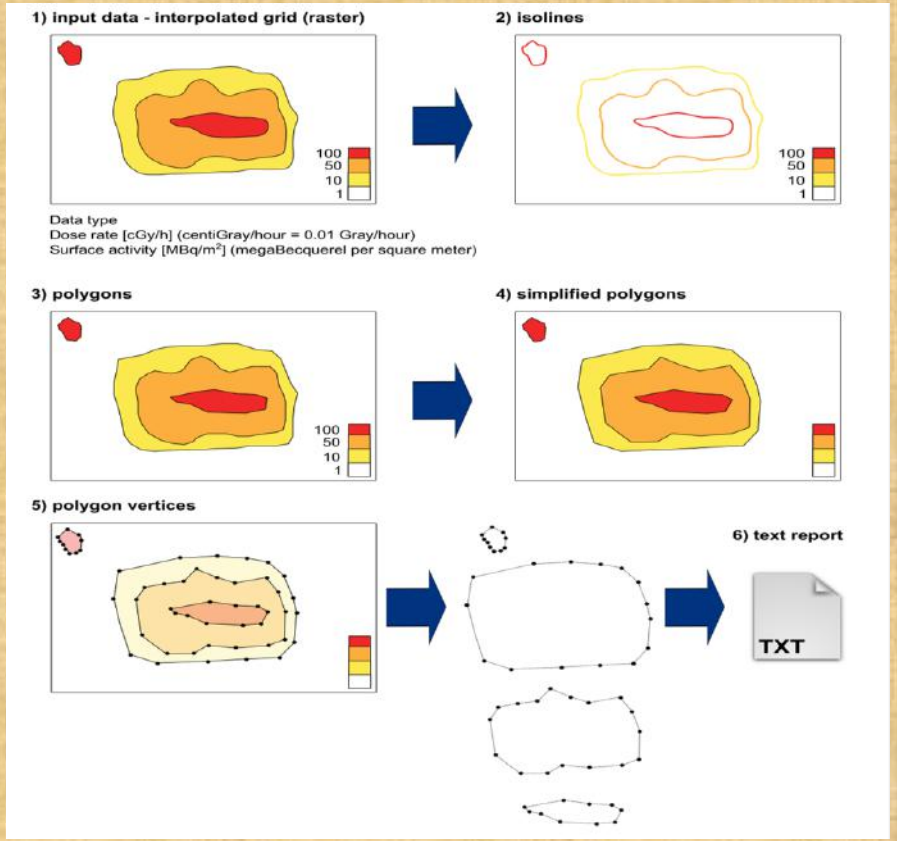
→ plugin solves the problem by creating additional "measuring points" along the route



Radiation Reconnaissance Results QGIS Plugin

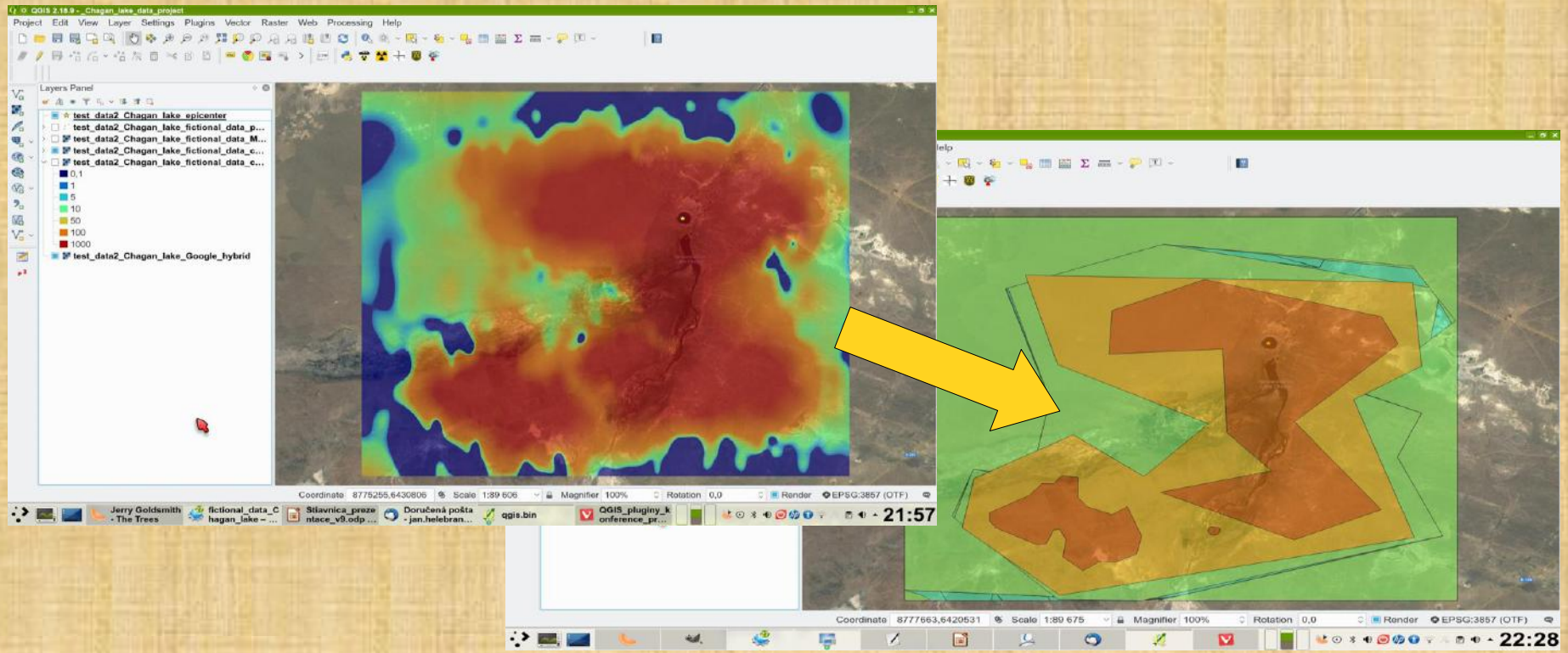
Problem to solve:

- create contour lines (according to specified parameters) from a raster map of dose rates or of surface contamination
- convert contours to polygons and simplify them to ensure that the number of vertices per polygon is not exceeded
- convert coordinates of the extracted vertices to the MGRS military system and generate text report according to NATO / Czech Army specifications



Radiation Reconnaissance Results QGIS Plugin

- plugin demonstration in action:



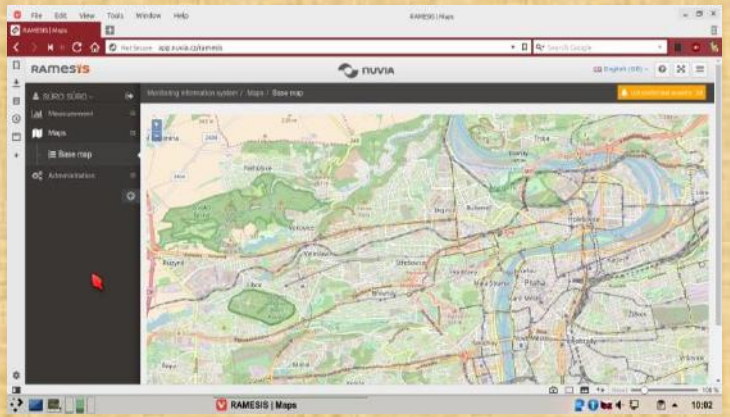
Conclusions

- **engaging public in monitoring** performed on voluntarily basis
  can help **keeping** or even **raising credibility** of public to recommendation on implementing of protective measures given by authorities,
  resulting into effective coping the emergency

- for proper understanding the radiation situation, giving chance for wide adopting necessary radiation protection measures by the public,
  the public must get appropriate information and education in advance

Thank you for your attention

Questions?



Demo of data presentation using QGIS

download from **www.bit.ly/safecast2018demo**