

ERS format implementation and radiation data processing in open-source program QGIS

The screenshot displays the QGIS interface with a map of Italy. A radiation data overlay is visible, consisting of a series of overlapping, colored lines (ranging from blue to red) that trace a path across the country. The left sidebar shows the 'Layers' panel with a legend for 'DEMO_ERS2.0_Area1_Italy_v01_without_spectra' and a 'Radiation Toolbox (DEV)' with options for 'Load and Edit', 'Stats', 'Plot', 'Maps', and 'Settings'. The right sidebar shows a log window with the following text:

```
DEMO_ERS2.0_Area1_Italy_v01_without_spectra.ers — Kate
Soubor Úpravy Pohled Projekty Záložky Sezení Nástroje Nastavení nápověda
Nový Otevřít... Uložit Uložit jako... Zavřít Zpět Znovu
DEMO_ERS2.0_Area1_Italy_v01_without_spectra.ers
/* measuring methods and parameters
/*
ISW windows integrals with stripping
ISWT exp(-mueh*h)
/* used windows lower and upper energy
ISWE1_Kalium 1370.00
ISWE2_Kalium 1570.00
ISWE1_Uran_2 1660.00
ISWE2_Uran_2 1860.00
ISWE1_Thorium 2410.00
ISWE2_Thorium 2810.00
ISWE1_TOT 400.00
ISWE2_TOT 2810.00
/*
/* data export starts here
/*
PA demo_point-0001;CD 2015-04-01;CT 12:12:12;PE 14.960050;PN 38.383420;PH 49; AD
PA demo_point-0002;CD 2015-04-01;CT 12:12:13;PE 14.960210;PN 38.383610;PH 50; AD
PA demo_point-0003;CD 2015-04-01;CT 12:12:14;PE 14.960380;PN 38.383800;PH 52; AD
PA demo_point-0004;CD 2015-04-01;CT 12:12:15;PE 14.960540;PN 38.384000;PH 54; AD
PA demo_point-0005;CD 2015-04-01;CT 12:12:16;PE 14.960690;PN 38.384220;PH 60; AD
PA demo_point-0006;CD 2015-04-01;CT 12:12:17;PE 14.960840;PN 38.384430;PH 65; AD
PA demo_point-0007;CD 2015-04-01;CT 12:12:18;PE 14.960990;PN 38.384660;PH 76; AD
PA demo_point-0008;CD 2015-04-01;CT 12:12:19;PE 14.961140;PN 38.384880;PH 83; AD
PA demo_point-0009;CD 2015-04-01;CT 12:12:20;PE 14.961290;PN 38.385110;PH 86; AD
PA demo_point-0010;CD 2015-04-01;CT 12:12:21;PE 14.961440;PN 38.385330;PH 88; AD
PA demo_point-0011;CD 2015-04-01;CT 12:12:22;PE 14.961590;PN 38.385560;PH 88; AD
PA demo_point-0012;CD 2015-04-01;CT 12:12:23;PE 14.961750;PN 38.385770;PH 88; AD
PA demo_point-0013;CD 2015-04-01;CT 12:12:24;PE 14.961910;PN 38.385980;PH 86; AD
PA demo_point-0014;CD 2015-04-01;CT 12:12:25;PE 14.962070;PN 38.386190;PH 84; AD
PA demo_point-0015;CD 2015-04-01;CT 12:12:26;PE 14.962240;PN 38.386390;PH 83; AD
PA demo_point-0016;CD 2015-04-01;CT 12:12:27;PE 14.962400;PN 38.386590;PH 80; AD
PA demo_point-0017;CD 2015-04-01;CT 12:12:28;PE 14.962580;PN 38.386780;PH 79; AD
PA demo_point-0018;CD 2015-04-01;CT 12:12:29;PE 14.962760;PN 38.386960;PH 78; AD
PA demo_point-0019;CD 2015-04-01;CT 12:12:30;PE 14.962940;PN 38.387130;PH 79; AD
PA demo_point-0020;CD 2015-04-01;CT 12:12:31;PE 14.963120;PN 38.387300;PH 79; AD
PA demo_point-0021;CD 2015-04-01;CT 12:12:32;PE 14.963310;PN 38.387460;PH 79; AD
PA demo_point-0022;CD 2015-04-01;CT 12:12:33;PE 14.963510;PN 38.387610;PH 78; AD
```

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Introduction

Topics of this presentation

- ERS file description and history**
- what is new in ERS 2.0?**
- QGIS and radiation data**
- sample ERS files**
- QGIS ERS plugin**

ERS format

- ERS means *European Radiometric and Spectrometry* format
- ERS 1.0 format was developed in the framework of the European ECCOMAGS project, version 2.0 followed later
- plain-text format, easy to read&write compared to other formats like XML-based ANSI 42.42 *.n42 files

The screenshot shows a text editor window with two tabs: 'ANSI 42.42' and 'ERS 2.0'. The 'ANSI 42.42' tab displays XML code for a radiometric instrument, including details like manufacturer (Mobiles R Us), model name (iCarTop), and component versions. The 'ERS 2.0' tab displays a plain-text data export starting with a comment and followed by a list of measurement points (PA demo_point-0001 to PA demo_point-0016) with their corresponding coordinates and energy values.

- mistakes can be easily found and corrected in a simple text editor
- used in many airborne gammaspectrometry exercises
- focussing on data from mobile measurement systems

ERS 2.0 format

- more details about ERS format in the report (publicly available):

ResearchGate or [Recruit researchers](#) [Join for free](#) [Login](#)

See all > [194 Figures](#) [Download citation](#) [Share](#) [Download full-text PDF](#)


International Intercomparison Exercise of Airborne Gamma-Spectrometric Systems of the Czech Republic, France, Germany and Switzerland in the Framework of the Swiss Exercise ARM17

Technical Report (PDF Available) · October 2018 *with* 192 Reads
Report number: PSI Bericht Nr. 18-04, Affiliation: Paul Scherrer Institut

[Cite this publication](#)

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Lubomir Gryc	Christophe Debayle 9.51 · Institut de Radioprotection et de Sûreté Nucléa...

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Shortened link: www.bit.ly/ARM17report

ERS 2.0 format

- 2.0 version replaces older 1.0
- but still plain-text format, easy to read&write
- changed delimiters, raw spectra now in the same row as other data

The screenshot shows a software window titled "DEMO_ERS1.0_Area1_Italy_v01_without_spectra.ers - Káte". The interface includes a menu bar (Soubor, Úpravy, Pohled, Projekty, Záložky, Sezení, Nástroje, Nastavení, nápověda) and a toolbar (Nový, Otevřít..., Uložit, Uložit jako, Zavřít, Zpět, Znova). The main area displays two tabs: "DEMO_ERS1.0_Area1...thout_spectra.ers" and "DEMO_ERS2.0_Area1...thout_spectra.ers".

ERS 1.0 Data: Each point is represented by a single line of text containing all data for that point, separated by semicolons. Example: "N "demo_point-0001" CD "2015-04-1Z" CT "12-12-12Z" PE 14.960050 PN 38.383420 PH 49 AD_K-40 2.512445e+02 AD_U-238 9.557773e+01 AD_Th-232 1.181432e+01 AA_Cs-137 1.219730e+03 DHSR 1.922147e-05".

ERS 2.0 Data: Each point is represented by multiple lines of text, with the first line containing the point identifier and the subsequent lines containing the data fields separated by semicolons. Example: "PA demo_point-0001;CD 2015-04-01;CT 12:12:12;PE 14.960050;PN 38.383420;PH 49;AD_K-40 2.512445e+02;AD_U-238 9.557773e+01;AD_Th-232 1.181432e+01;AA_Cs-137 1.219730e+03;DHSR 5.766440e-02".

The status bar at the bottom shows "Řádek 41, sloupec 191" and "VLOŽIT Soft Tabs: 4 (8) UTF-8 Normal".

QGIS

- part of our map processing workflow for several years
- we have few licenses for commercial GIS SW (MapInfo and ArcGIS), but QGIS on almost every field PC

Benefits and reasons for deployment:

- available for free (for commercial use too)
- can be deployed on any number of computers and easily ensure their mutual substitutability in the field etc.
- flexibility - the ability to legally customize software and tools for user needs without having to deal with software developers, licenses etc.

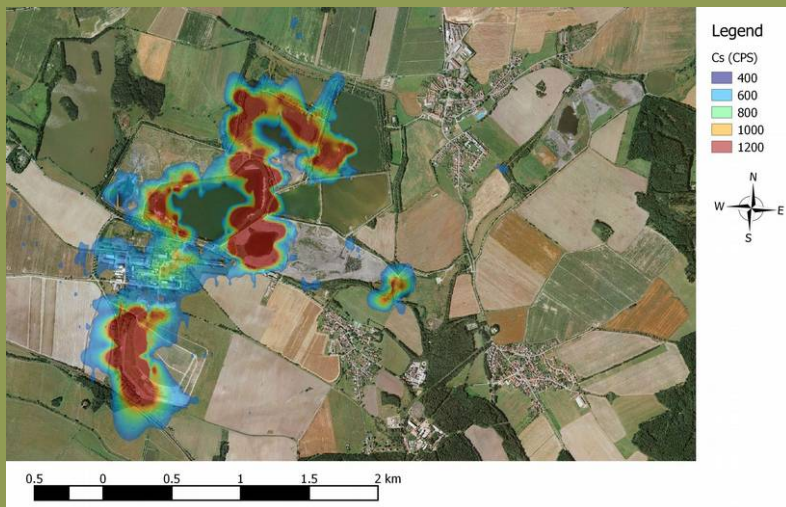
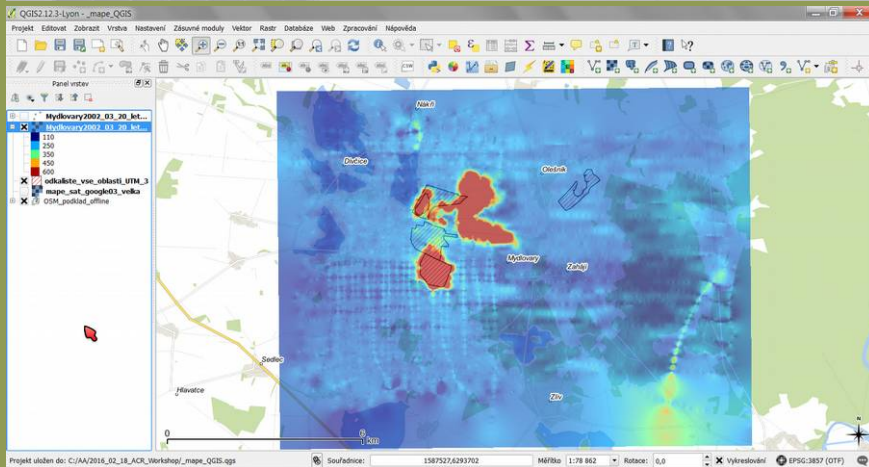
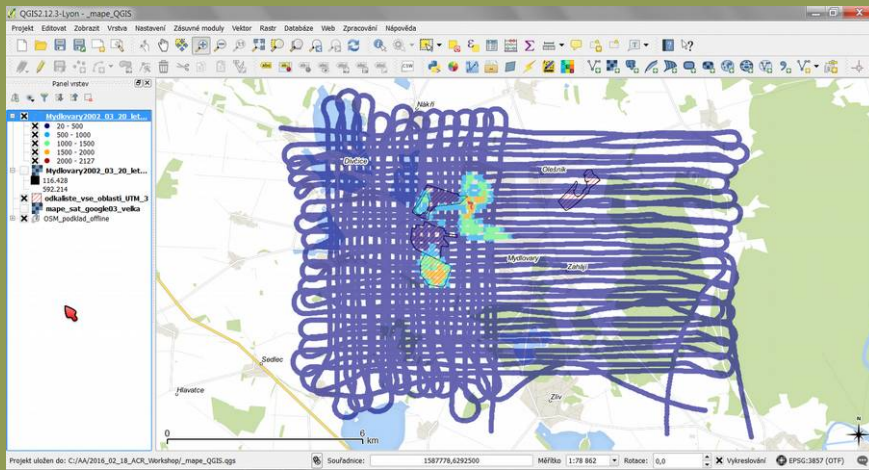
→ demand for ERS support in QGIS



www.qgis.org



GPLv3
Free Software
Free as in Freedom




ERS 2.0 sample files

- for development of the QGIS plugin and also to help spreading the ERS format we needed some “public” measurements
- so we created data from real measurements and turned them into demo files (changed location, time, date) and made them available to download from GitHub:

openeodata / ERS_-_European_Radiometric_and_Spectrometry_format /

juhele Added draft vrsion of ERS 2.0 files Latest commit 9d63c55 on 12 Mar

..	
Docs	Update readme.md
ERS_color_styling	Update readme.md
package_1A_ERS1.0_demo_data_ITALY_preview2_detail.jpg	Add files via upload
package_1A_ERS1.0_demo_data_ITALY_rev1.7z	ERS 1.0 with corrected header
package_1B_ERS2.0_DRAFT_demo_data_ITALY.7z	Added draft vrsion of ERS 2.0 files
package_1_source_demo_data_ITALY.7z	Add files via upload
package_2A_ERS1.0_demo_data_PERU_preview.jpg	Add files via upload
package_2A_ERS1.0_demo_data_PERU_rev1.7z	ERS 1.0 with corrected header
package_2B_ERS2.0_DRAFT_demo_data_PERU.7z	Added draft vrsion of ERS 2.0 files
package_2_source_demo_data_PERU.7z	Add files via upload



Shortened link: www.bit.ly/ERSdata

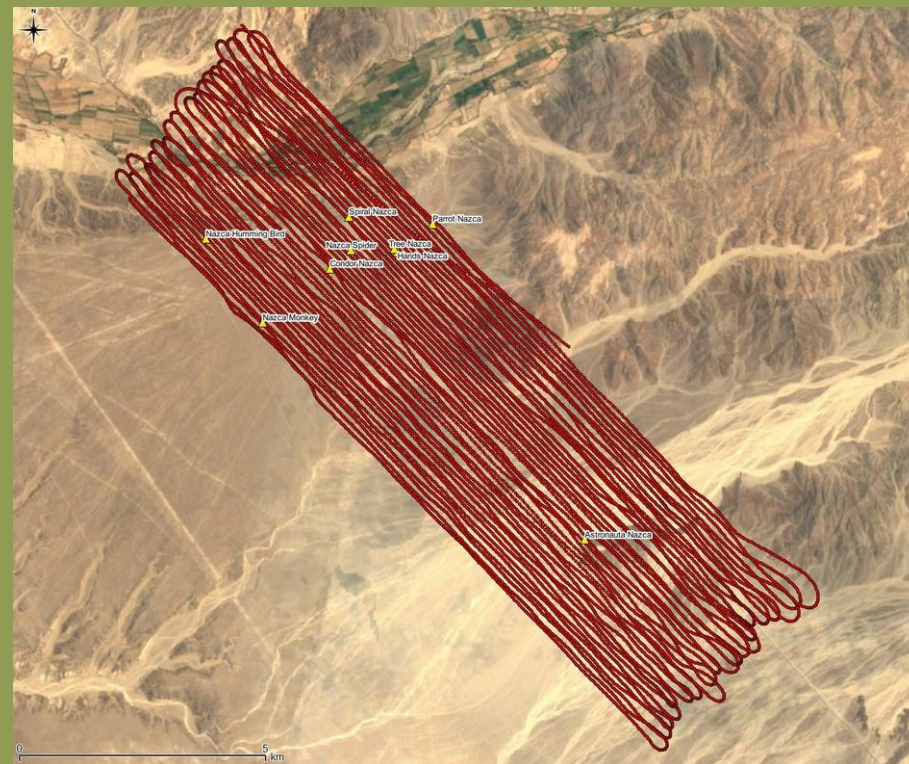
ERS 2.0 airborne demo datasets

Demo 1 - Italy (Vulcano)



background map: Microsoft® BingTM Maps via QGIS OpenLayers plugin

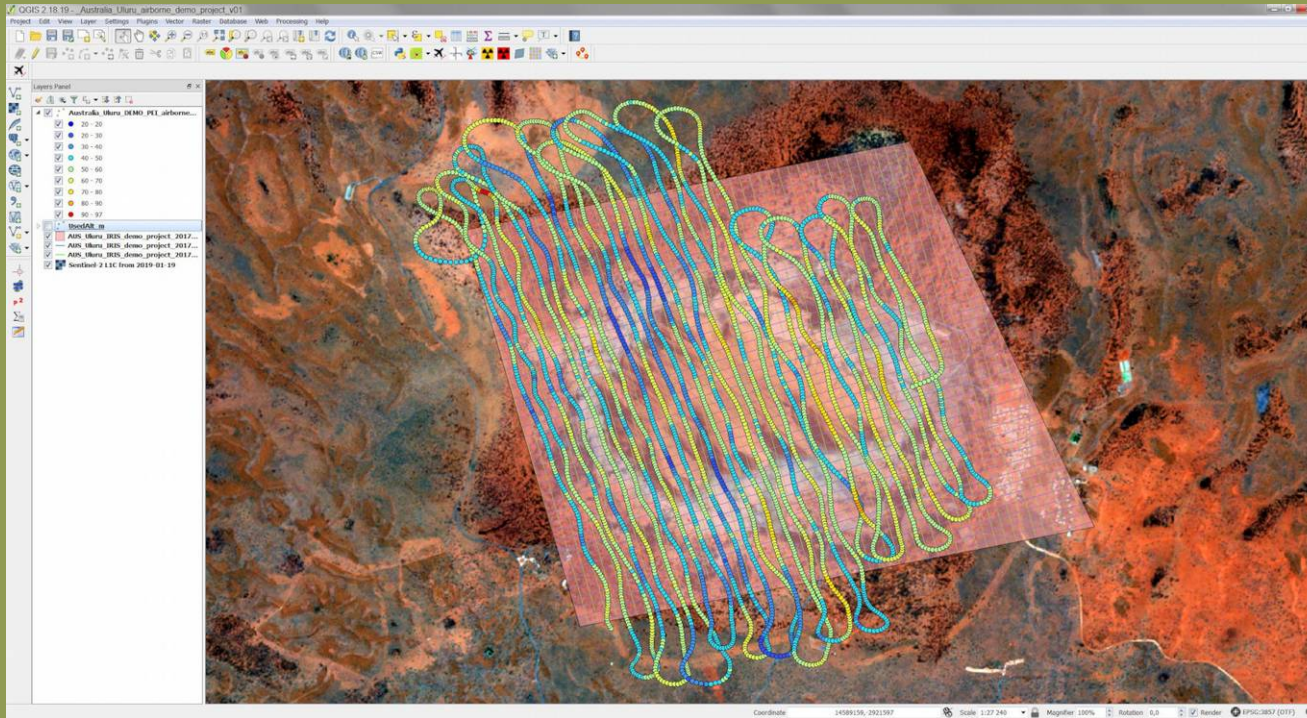
Demo 2 - Peru (Nazca plain)



background map: Microsoft® BingTM Maps via QGIS OpenLayers plugin

- "source" data in CSV and OGC GeoPackage formats
- ERS 1.0 and 2.0 data - version with/without spectra, first version also includes 256 channel raw gamma spectra measured with IRIS high volume NaI(Tl) scintillation detector carried in a helicopter

Demo airborne dataset „Uluru“



background map: Contains modified Copernicus Sentinel data [2019] processed by Sentinel Hub

includes:


- PEI format files
(raw “measured” data)
- PEI format flight project
(polygon, survey lines etc)
- CSV & GeoPackage
- QGIS project

planned for future:

- ERS 2.0
- ANSI 42.42

- includes 512 channel raw gamma spectra measured with high volume NaI(Tl) scintillation detector carried in a helicopter

QGIS and ERS 2.0 files

- **QGIS 3.x (www.qgis.org) selected as base as support for QGIS 2.x ended in 2019**
- **the plugin is called “Radiation Toolbox” - developed for SÚRO by OpenGeoLabs Ltd. **
- **ERS is one of the supported formats (currently plugin also supports loading PEI files from devices by NUVIA Dynamics Inc. / formerly PICO Envirotec Inc.)**
- **plugin is currently able to directly load ERS 2.0 files in QGIS (with some default color style applied) as a new map layer**
- **default style uses DHSR (microSv/h) and „Swiss“ color scale**
- **user can view all layer values in attribute table and perform further data processing and styling using built-in QGIS tools and plugins**
- **tested both in Windows and in Linux (should work on Mac too...)**





Radiation Toolbox plugin - ERS 2.0 support

- currently, only reading ERS files is possible, no editing/saving ERS

The image displays the QGIS interface with the Radiation Toolbox plugin installed. The main window shows the 'Radiation Toolbox (DEV)' dialog box with the 'Load and Edit' tab selected. The 'Import radiation data' button is highlighted with a red arrow. A secondary window, 'Load radiation data file', is open, showing a file explorer view of the file system. The file explorer shows a directory structure with the following files selected:

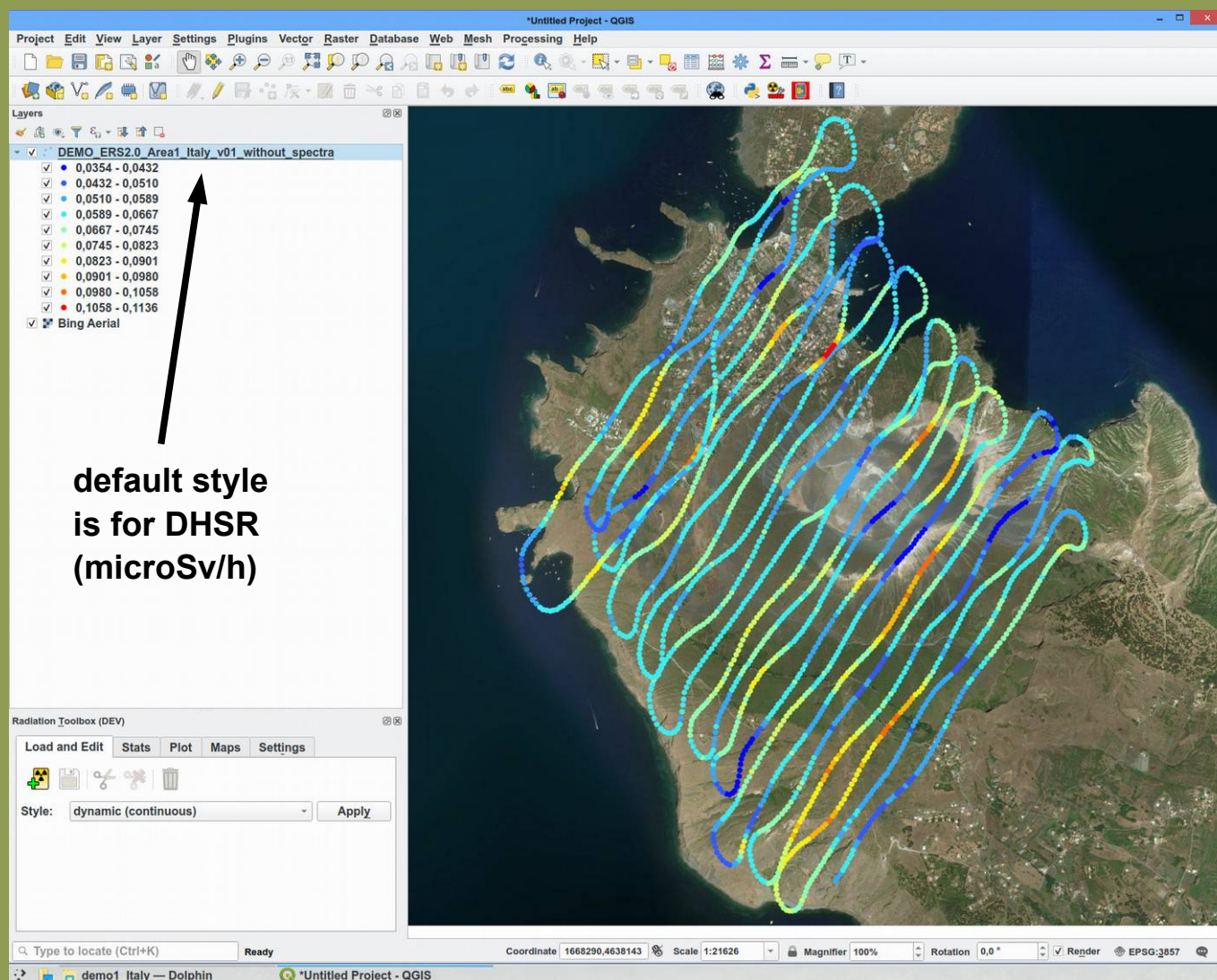
- demo1_Italy
- package_1B_ERS2.0_demo_data
- DEMO_ERS2.0_Area1_Italy_v01_without_spectra.ers
- DEMO_ERS2.0_Area1_Italy_v02_with_spectra.ers

The file explorer also shows the file name 'DEMO_ERS2.0_Area1_Italy_v02_with_spectra.ers' and the mask 'ERS files'. The 'Otevřít' (Open) button is highlighted with a red arrow.



Radiation Toolbox plugin - ERS 2.0 support

- the default color automatically adjusts to input data value range
- user can later manually change style or apply own one



default style
is for DHSR
(microSv/h)

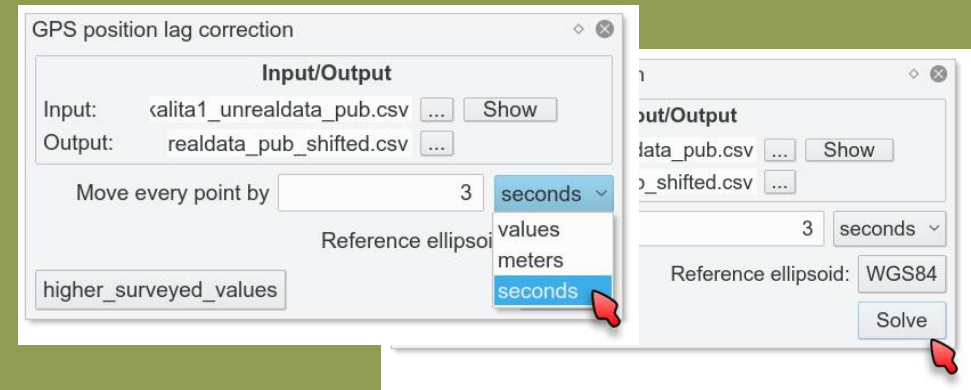
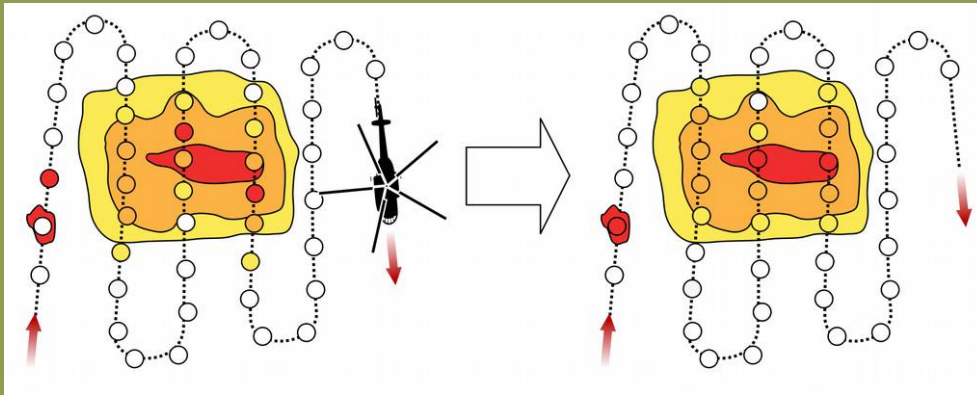
saving to ERS is not
yet possible, but you can
save the layer in standard
GIS formats like:
- GeoPackage
- Esri Shapefile
etc.



Future development of Radiation Toolbox for QGIS

possible implementation of new features in future:

- **GPS position lag correction**
(= adding features from older QGIS2 plugin)



- **simple editing (crop and save the data as new file)**
- **saving data in ERS and other radiation data formats**

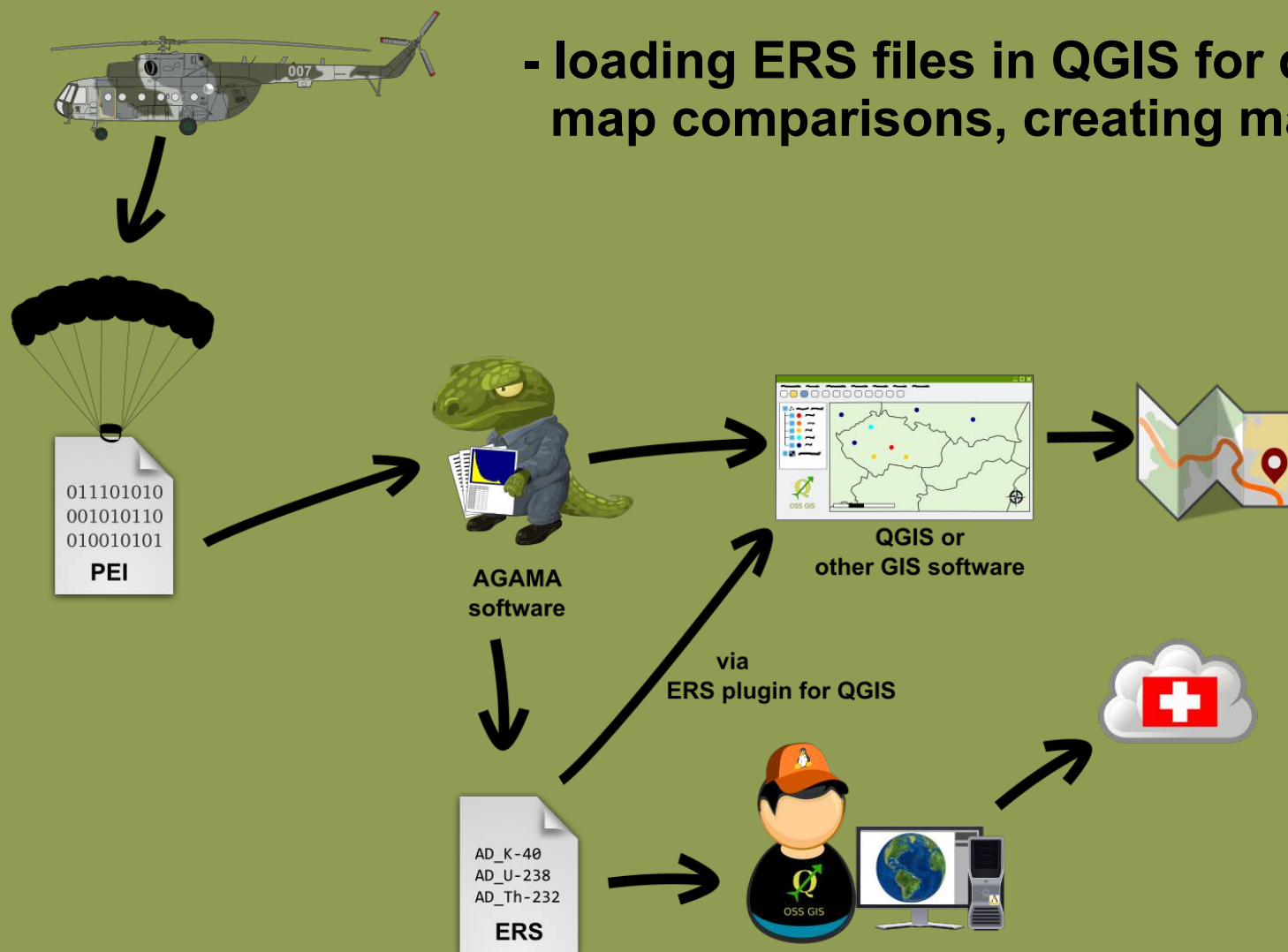
depends on available funding...



Use of Radiation Toolbox during exercise like ARM17

- advanced gammaspectrometry data processing using new AGAMA software → ERS 2.0 file

- loading ERS files in QGIS for quick checks, map comparisons, creating map outputs etc.



this is how ARM17 data processing in Switzerland would look like with our new tools

Thank you for your attention :-)

