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# **JRODOS:**

# Implementation in Switzerland

11 October 2017

Cyrill von Arx and Markus Oberle

ENSI

- 1. Introduction to JRODOS
- 2. Features of the release '2017FebruaryUpdate1'
- 3. Implementation in Switzerland
- 4. Conclusion and Outlook

#### 1. Introduction to JRODOS

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# 1. Introduction to JRODOS

What is JRODOS?

- Decision support system for nuclear emergencies with Java-based user interface
   → easy to use yet permit a broad range of applications
- Calculation kernel is modular (~ 25 modules): atmospheric dispersion modelling, nuclide deposition, food contamination and dose calculation, effect of emergency protection measures, etc. Combination of modules into 'model chains'.
- Server-client architecture
- Used in > 15 countries
- Operational system for emergency protection in AT, DE, FI, NL, SK and CH
- Mainly developed by Karlsruhe Institute of Technology (KIT)
- Yearly RODOS User Group (RUG) meeting defines development goals



# **1. Introduction to JRODOS**

Client user interface

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JRODOS in Switzerland | HARMO18 | M. Oberle, C. v. Arx

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# 2. Features of the release '2017FebruaryUpdate1'

Main new features of Server

- New dose conversion factors: ICRP 109 (Database vol. 3.0) and Petoussi-Henss et.al., Phys Med Biol. 2012; 57: 5679-5713
- Separate treatment of chemical forms of lodine for dose calculation (previously only aerosol)
- Mother/daughter build-up in air concentration and ground deposition inside ADM
- Eight important mother-daughter pairs forcibly calculated if mother/daughter present in ST
- Improvements to meteo pre-processor (faster GRIB parsing, wind field, rain)
- Early emergency action simulation possible over 48 hours (module 'EmerSim')
- Particle size distribution can be modified (ADMs RIMPUFF, DIPCOT, LASAT)
- Up to 25 radio-ecological regions in model FDMT
- Up to 1008 time intervals (7 days \* 24 hrs \* 6 ten-minute intervals)

### 2. Features of the release '2017FebruaryUpdate1'

Main new features of Client user interface

- Compact result listing for nuclide-specific results
- User groups
- Transfer of user-specific Client start-up settings to other users
- Many small changes/improvements

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Software

'2017FebruaryUpdate1' since 1 June 2017

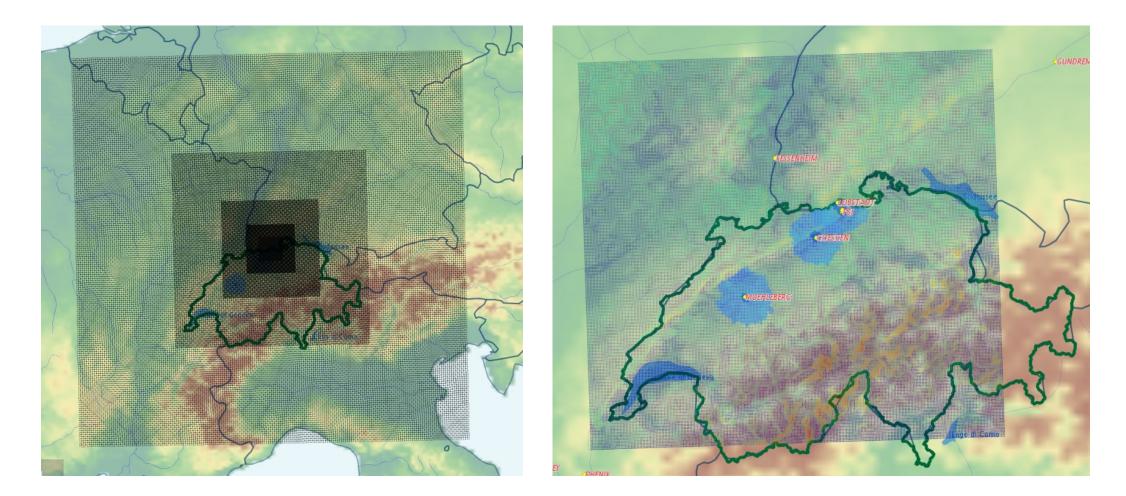
Configuration of JRODOS includes

- Swiss coordinates
- country maps of various resolutions
- use of COSMO-1 NWP data from MeteoSwiss (1 km spatial resolution, 10 min time resolution, 24 hrs prediction time)
- LASAT dispersion model
- ENSI grid with 5 rings (~35'000 cells each)

Implementation in ERO:

- Hourly dispersion simulation for all nuclear installation locations with unit source
- Import of XML from ST estimation program
   ADAM STEP (based on level 2 PSA)
- Export of results to measurement rings' software MADUK and from there to EP partners

Calculation domain and NWP data range



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Hardware

System structure:

- 3 server systems
  - (2 operational and 1 test systems)
- 4 client systems
  (3 operational and 1 training systems)
- 2 NWP data handling systems (incl. virtual SFTP servers and failover provisions)

New hardware per 1 June 2017 :

Lenovo x3850 X6 Server with 4 Intel Xeon E7-8890 v3 sockets with 18 cores @ 2.5 GHz each, 256 GB RAM, ca. 4 TB memory

Multiple LASAT (ADM) calls distributed over available cores  $\Rightarrow$  up to 12 parallel simulations without significant overhead

Performance figures

#### **Benchmark case**

- 24 hrs simulation with 10 min time step
- ENSI grid with 1 ring and 250 m
   horizontal resolution
- ST with two parallel emission of 2 hrs each, 140 nuclides each
- $\Rightarrow$  50 min runtime

Using 29 nuclides only: 15 min runtime

«Typical simulation» (i.e. emergency case)

- 8 hrs simulation with 10 min time step
- ENSI grid with 1 ring and 250 m horizontal resolution
- ST with two parallel emissions of 2 hrs,
  29 nuclides
- $\Rightarrow$  5 min runtime

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# 4. Conclusion and Outlook

Verdict: With the release 'February 2017 Update 1' JRODOS has reached a stable and mature state, permitting use in emergency protection context and satisfying high availability requirements.

ENSI envisions further developments:

- Further optimisation of parallelisation of LASAT in JRODOS
- Pre-processing of NWP data for most common calculation grid configurations
- Export functionality of project into file to permit restrictions on exported quantities

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## Thank you for your attention!

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