Karlsruhe Institute of Technology

The current status of the JRodos System

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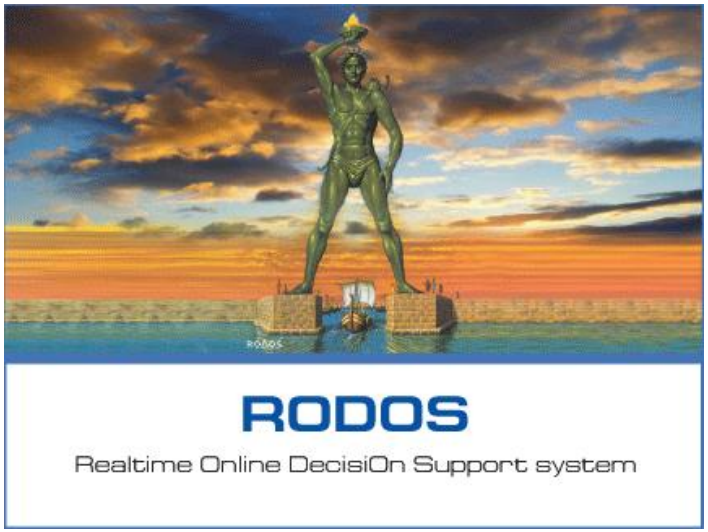
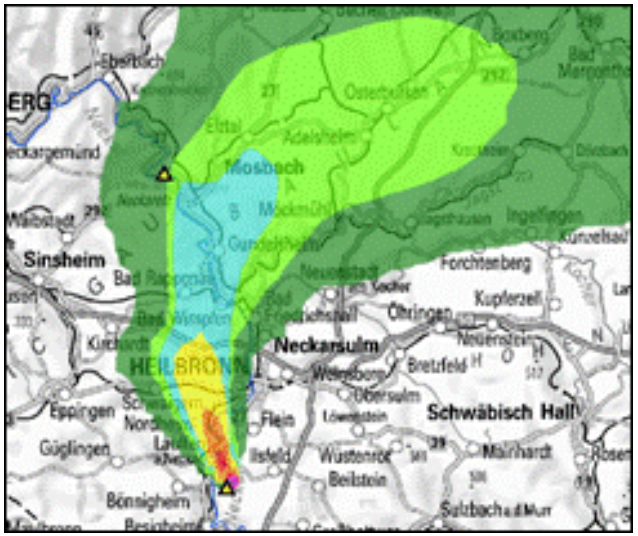
Institute of Nuclear and Energy Technologies

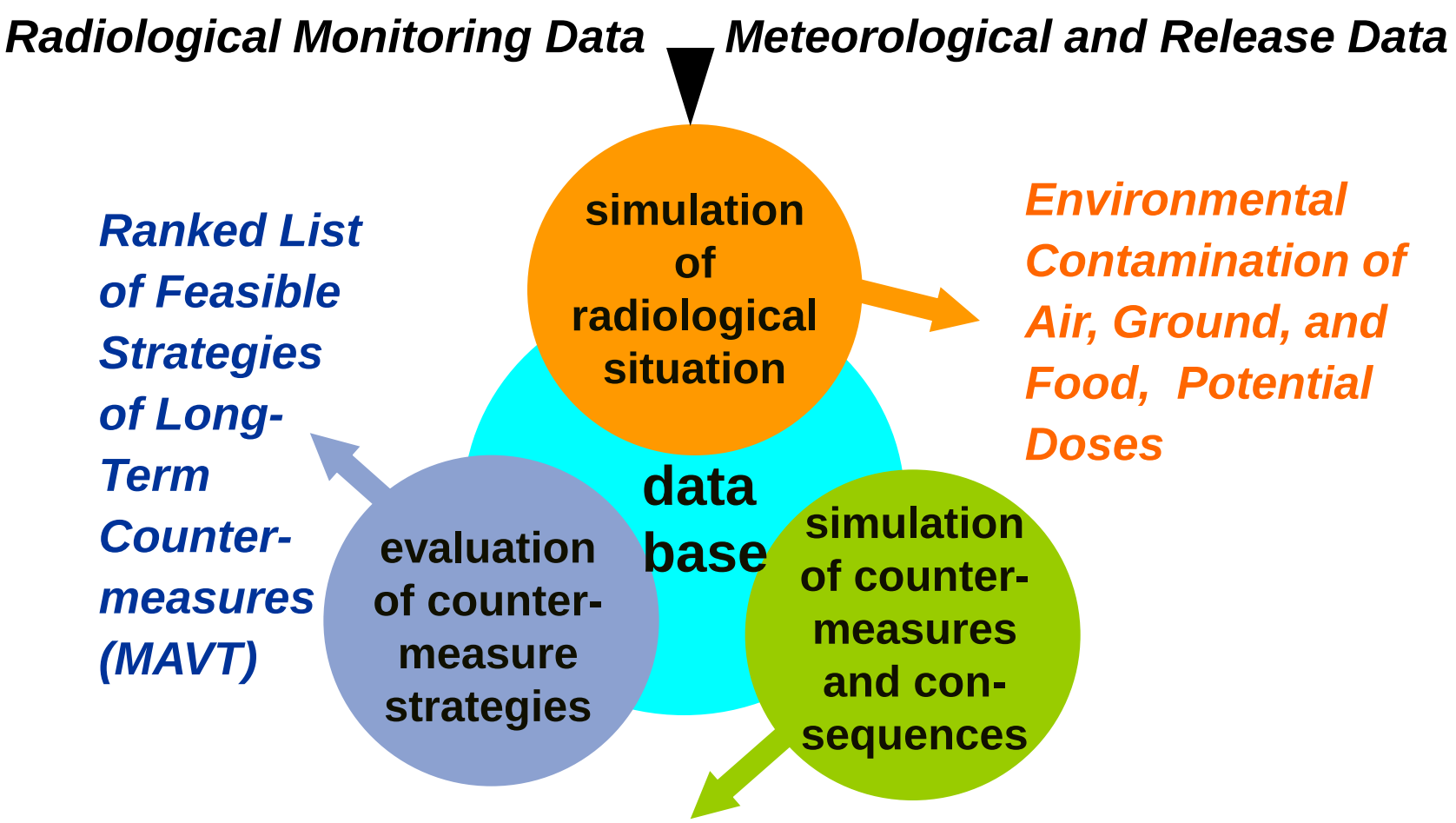




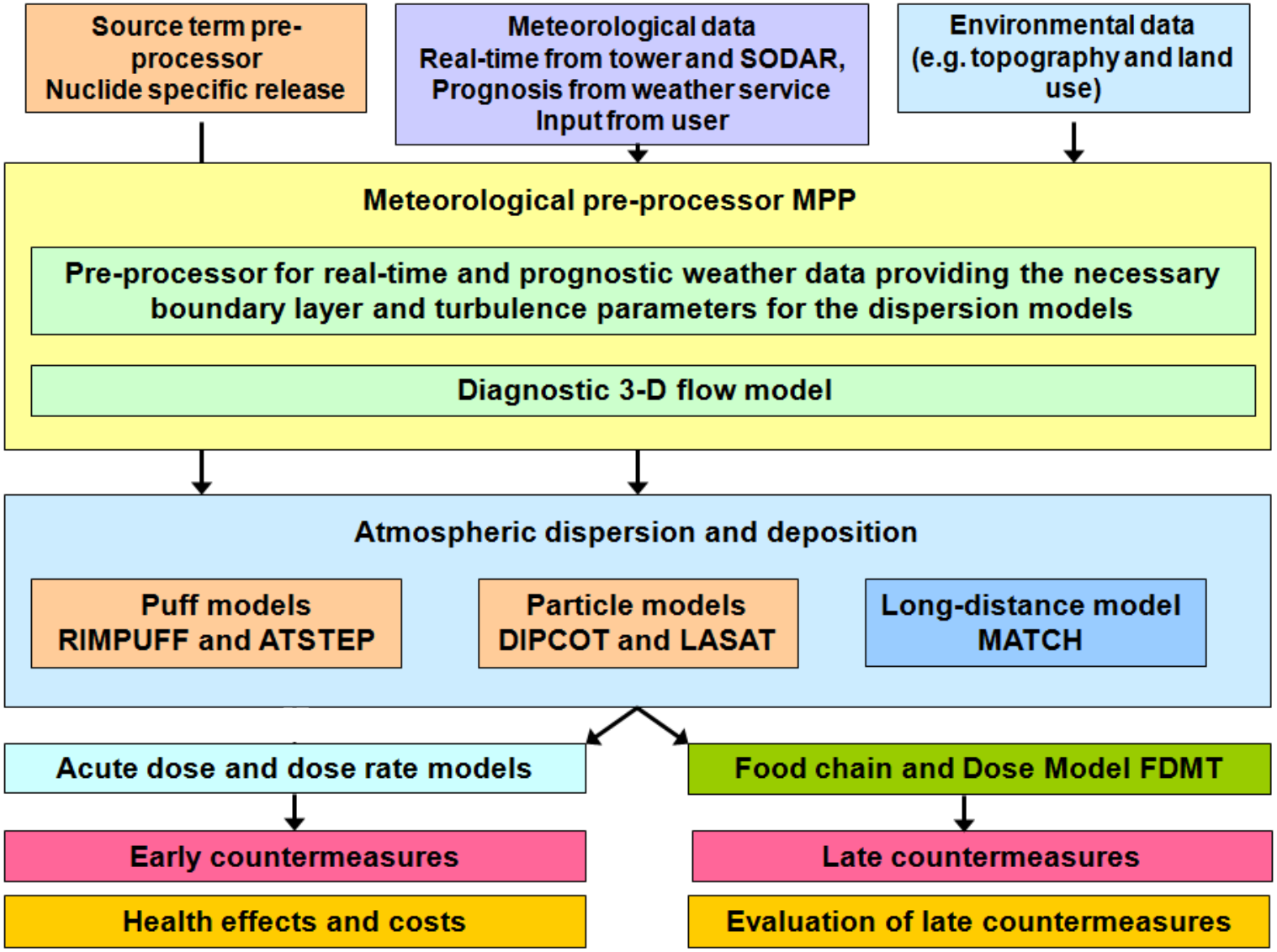
Key features of RODOS
Real-time On-line Decision Support system

- Multi-user operation in national/regional emergency centres for off-site nuclear emergency management
- Support of information for decision-making
  - on local / national / regional / European scales,
  - in all phases of an accident,
  - for all relevant early and late countermeasures.
- Wide IT applicability - HP-UX and Linux (RODOS), Microsoft Windows, Linux and Mac OS (JRodos)

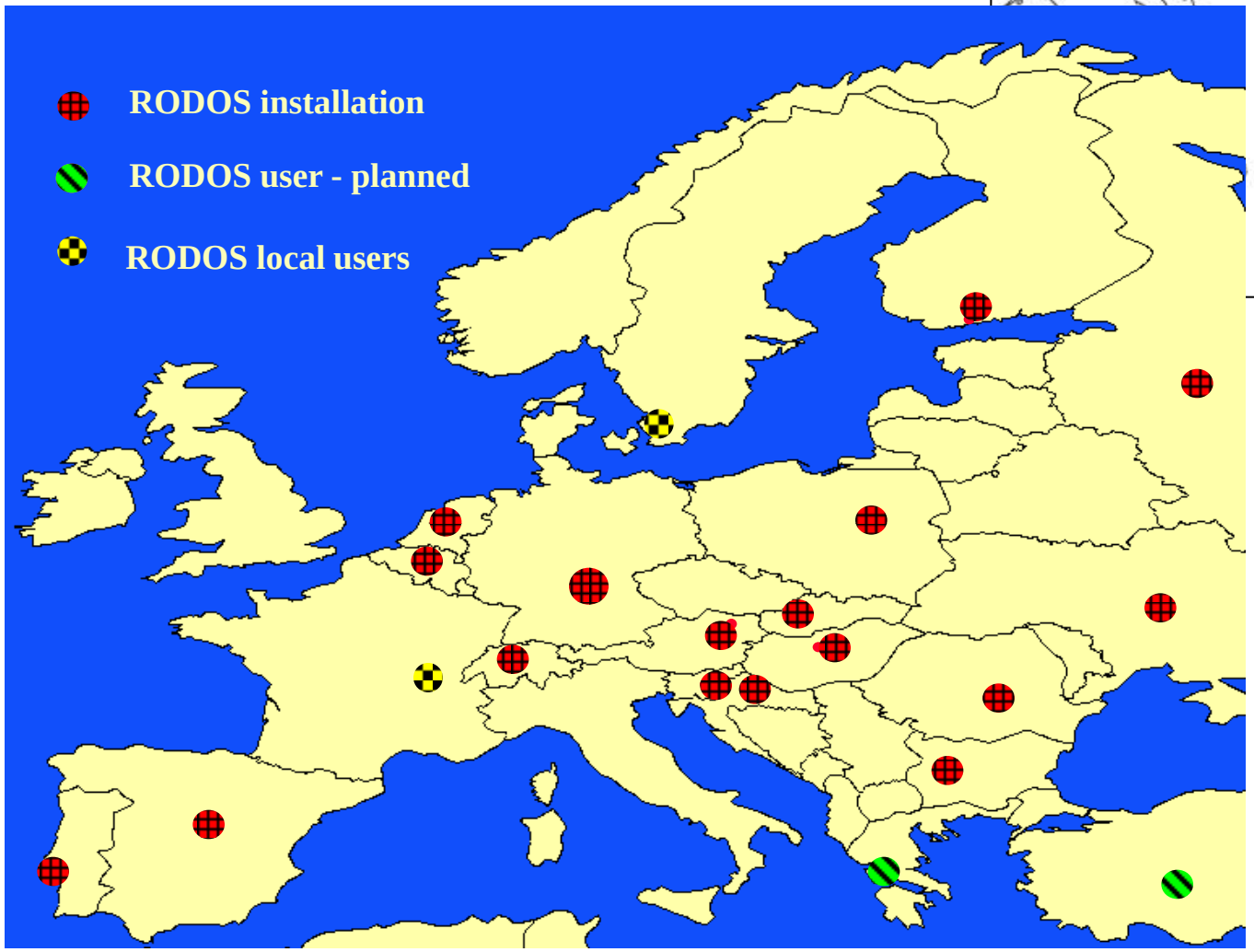
JRodos: Tasks, input data, output

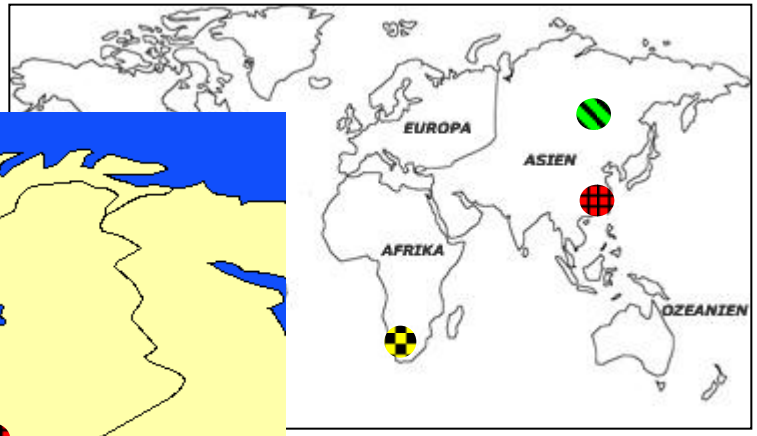


Assessment of radiological situation - JRodos models



JRodos users world wide (2014)



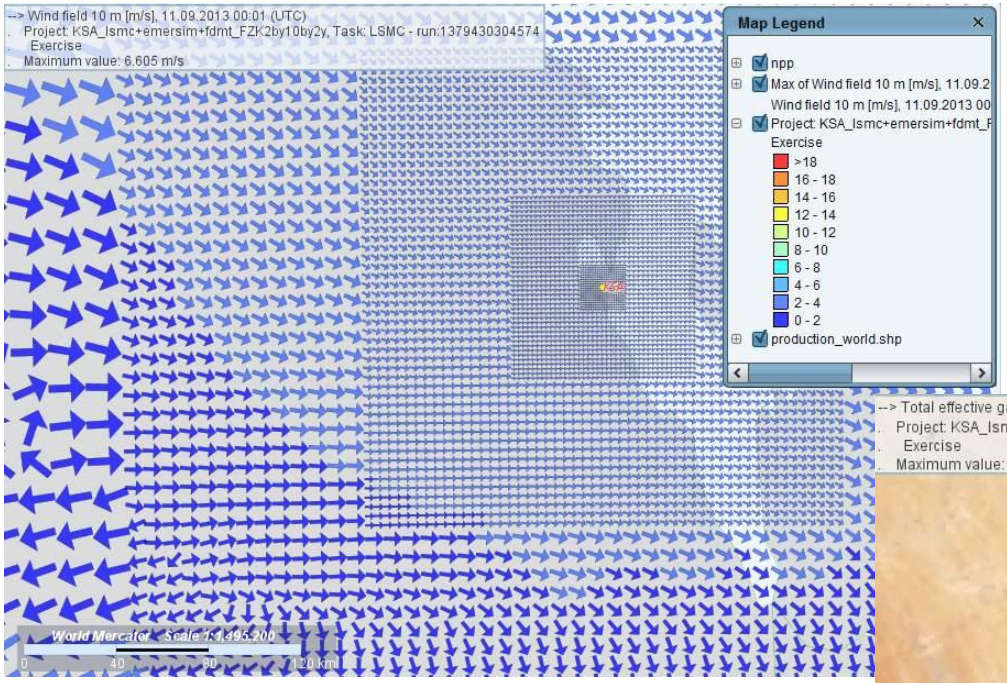


2013 Agreement signed with National Nuclear Energy Agency of Indonesia

World-wide application

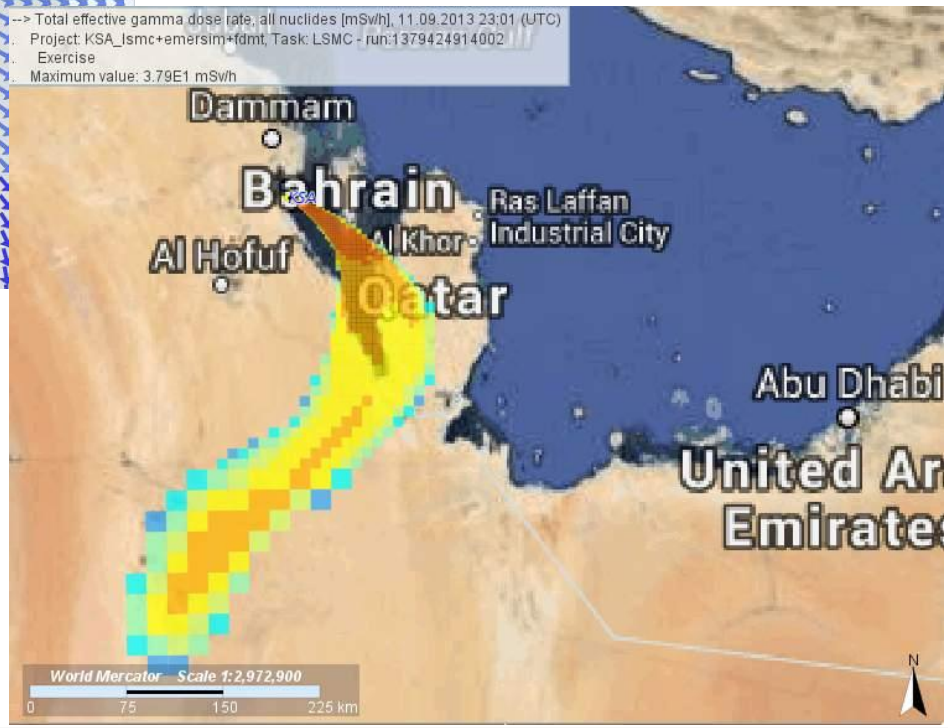
- Develop a support system that uses freely available meteorological data world wide and adapt this data to the near range applicability
  - Service could be provided by a national weather service
  - If not global NOMADS data are available
    - World wide forecast data for several days are available
    - Re-analysis for detailed recalculation is also available
    - Important to scale the global data down to the area of interest – via WRF

JRodos world-wide - application example with NOMADS re-analysis data for September 2013



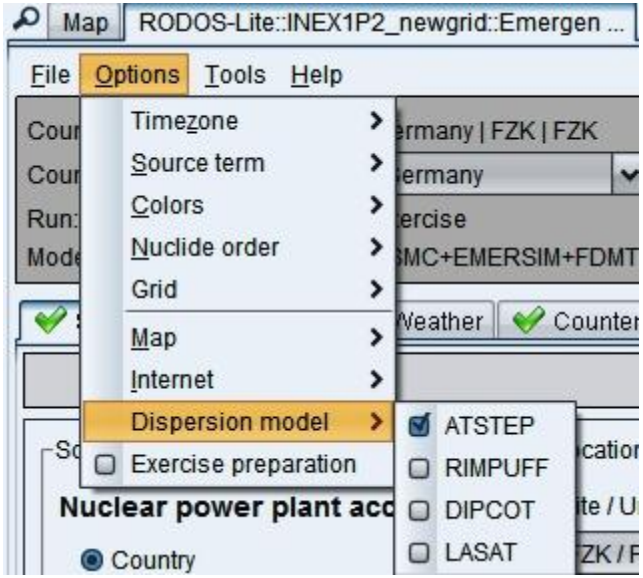
Left: Wind field in 10 m height; NOMADS re-analysis data for 11.9.2013, for Saudi-Arabia (JRodos screen shot)

Right: Total effective gamma dose rate, using the NOMADS weather data for a fictive release from a fictive reactor in Saudi-Arabia (JRodos screen shot)



LASAT

- LASAT (Lagrangian Simulation of Aerosol Transport)
- Three-dimensional Lagrangian particle model with variable time step
- The dispersion of trace substances is simulated utilizing a random walk process on a computer
  - Transport by the mean wind field, dispersion in the atmosphere, sedimentation of heavy aerosols, deposition on the ground, washout by rain and wet deposition, gamma submersion (cloud radiation). Thermal plume rise is covered parametrically
  - Highly parallelized

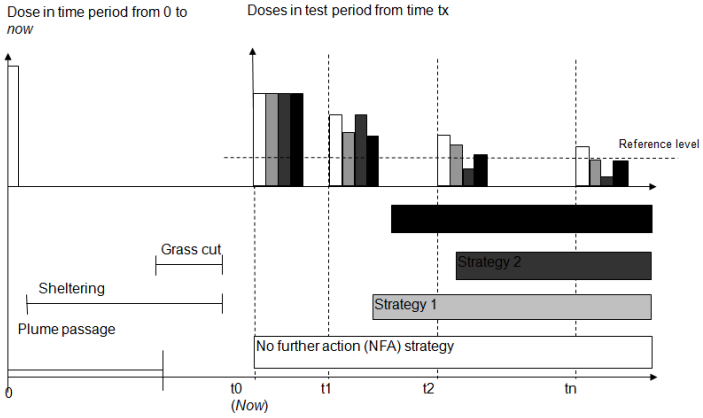


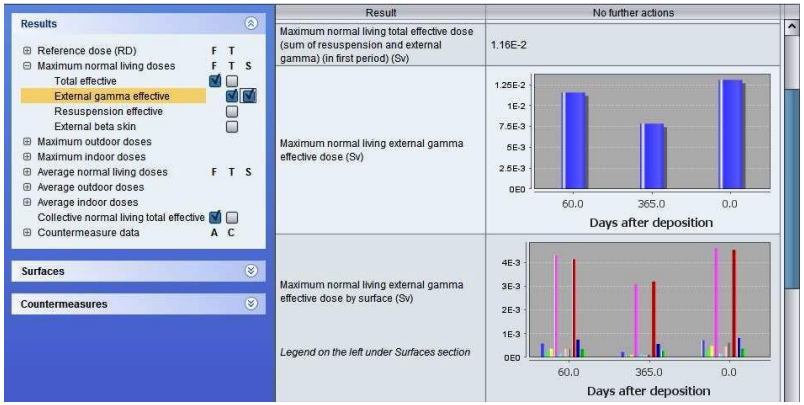
New ICRP recommendations

- Expand the simulation models for the new “residual dose” approach of ICRP-103
  - So far existing models treat countermeasures individually
  - The new recommendations requested that all exposure pathways should be taken into account in the countermeasure simulations
- As result, the ICRP model has been developed
  - Screening for individual measures or combinations including food
  - There is still the need to further develop such a model for operational use and in developing countermeasures strategies in a national regulatory framework

Inhabited area modelling

- Improvement of ERMIN
  - Development of a wizard that facilitates the development of decontamination strategies
- As result, ERMIN-2 was developed
  - The wizard exists, which guides the user through the selection of measures based on the contributing surfaces
  - How to further develop the tool by integrating objectives such as costs or others in the strategy selection – beyond NERIS-TP





Recurrent job launcher (former Continuous Mode)

- This tool allows to initiate and kick-start prognostic calculations with a fixed release scenario that shall be carried out in a recurrent manner with a user-given frequency for one or more predefined nuclear power plant (NPP) blocks – can run continuously
- By default, the launcher will kick calculations with the standard JRodos Emergency model chain
- Input
  - the target NPP units
  - the release time pattern (round the release start to minutes, hours, days)
  - the desired project name template
  - a pre-fabricated RODOS-Lite XML serving as project template

Statistic data generation tool

- Possible areas for application:
  - Statistical analysis for countermeasure planning
  - Site evaluation
- Allows to generate results for more than one weather sequences
- 2-5 years of meteorological data should be available
- The user defines the time interval of interest – from days up to years
- One scenario is used and for each day of the time interval one start date is defined randomly
- Pre-defined results are stored in a separate folder for further evaluation by statistics software (e.g. MATLAB)

Future development

- Improvement of the atmospheric and aquatic dispersion models within the European project PREPARE
- Support of source term reconstruction via the usage of atmospheric dispersion models and dose monitors around the NPP
- Identification of research topics in the frame of the NERIS Platform and RODOS Users Group (RUG)
  - Strategic research agenda with topics such as uncertainty and usage of a DSS
  - Requests of users via the RUG

Conclusions

- JRodos is applicable in all phases of an emergency
- It contains models for the atmospheric and aquatic pathways
- It can be installed centrally and used remotely from as many users as necessary – dependent on the power of the servers in the RODOS centre
- Customisation is possible to national conditions applying national criteria for evacuation, sheltering and iodine distribution
- Customisation of the foodchain model to Chinese conditions will start 2015
- System is freely available and KIT offers support contracts

Thank you very much for your attention

Questions?

https://resy5.iket.kit.edu/

RODOS User Group; Maintenance

- RODOS User Group (RUG) promotes the use of the system, identifies tasks for improvements, and serves for non-committal information exchange between RODOS Lx/Ux and JRodos users
  - Next RUG meeting: April 2015, 21 – 22

- All JRodos user who signed the standard agreement of use with KIT can download the usual updates or new builds (e.g. via the resy5 exchange server)

General support and how to get it

- Standard agreement between KIT and user, from year to year, from 5000 Euro upwards
  - In 2011, 13 organisations signed maintenance contracts with KIT covering the maintenance of the existing Linux RODOS versions and JRodos
  - Each contract contained a budget of 5000 Euros that equals 66 hours of KIT work
  - The standard contract covers bug fixing and general support; distribution key: 0.5 for general bug fixes, 0.5 for general support
  - Please (!) report bugs via the BUGZILLA tool and not by telephone or mail - in the past, several bug fixing activities went unrecorded and unbilled because the message was only send by mail

General support (cont'ed); special contracts

- In 2010 and 2011 there were not enough bugs or requests for support; the remaining resources were used for funding of general developments such as
  - Ad-hoc: Upgrading JRodos for the Fukushima-Daiichi incident
  - Response to user wishes expressed e.g. during RUG meetings e.g. "JRodos Worldwide", JRodos Zoom Lock tool
- Special contract, like billing on the clock of used working hours, with a pre-defined upper limit, for example, contract with BfS; there may be some overlap, though, e.g. bug reporting from BfS was partly covered from the overall maintenance contracts and from that of BfS
- Special contract about defined tasks and deliverables that are accounted for separately, for example, contract with ENSI