Big sets of modelling data available from preparedness phase in emergency context: use in different contexts to support countermeasure strategies

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Outline

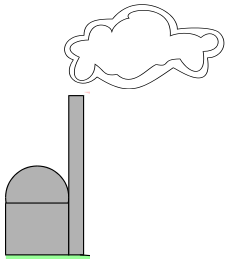
- **Hazard assessment for emergency planning based on modelling results**
  - Concept
  - Practical implementation
  - Analysis of the results (some examples)
  - Support for countermeasure strategies

Hazard assessment as basis for emergency planning

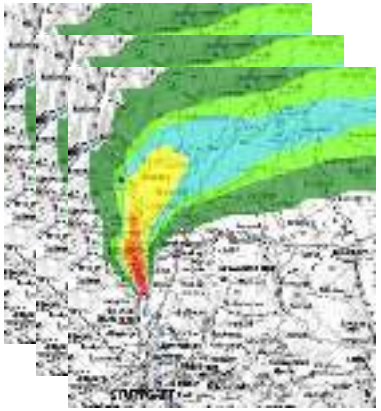
List of scenarios

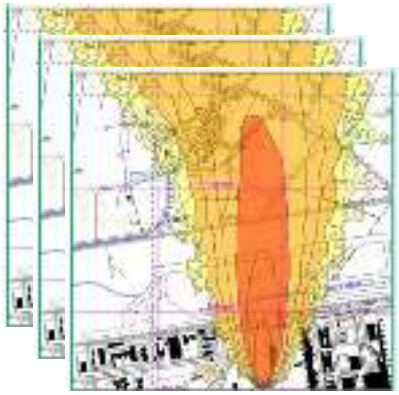
0. Unclear situation
1. NPP accident in Germany
2. NPP accident in neighbouring countries
3. NPP accident within Europe
4. NPP accident outside Europe
5. Accident in a nuclear facility
6. Terroristic attack
7. Transport accident
8. Radiological emergency situations
9. Satellite crash

Source terms (for planning)



Radiological consequence assessment





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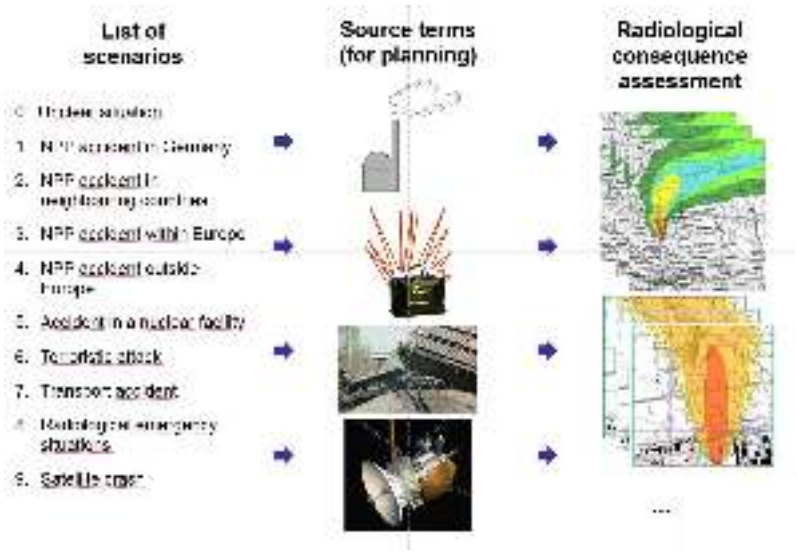
Hazard assessment as basis for emergency planning



List of scenarios	8
Selection of release sites	x 1-5
Selection of source terms	x 2-6
Selection of weather data	x 365
RODOS Simulations	≈ 10 000
Parameter for statistical analysis of results	x 12
Grid points	x 8056
Values	≈ 1E+9

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Hazard assessment – site selection

1. NPP accident in Germany
2. NPP accident in neighbouring countries
5. Accident in a nuclear facility
7. Transport accident

Research reactor

Grohnde

Philippsburg

Temelin

Leibstadt

3. NPP accident within Europe

Olkiluoto

870 km

Borssele

170 km

Flamanville

590 km

1530 km

Saporoshje

1360 km

Alamaraz

4. NPP accident outside Europe

Surry

6390 km

Belojarsk

2940 km

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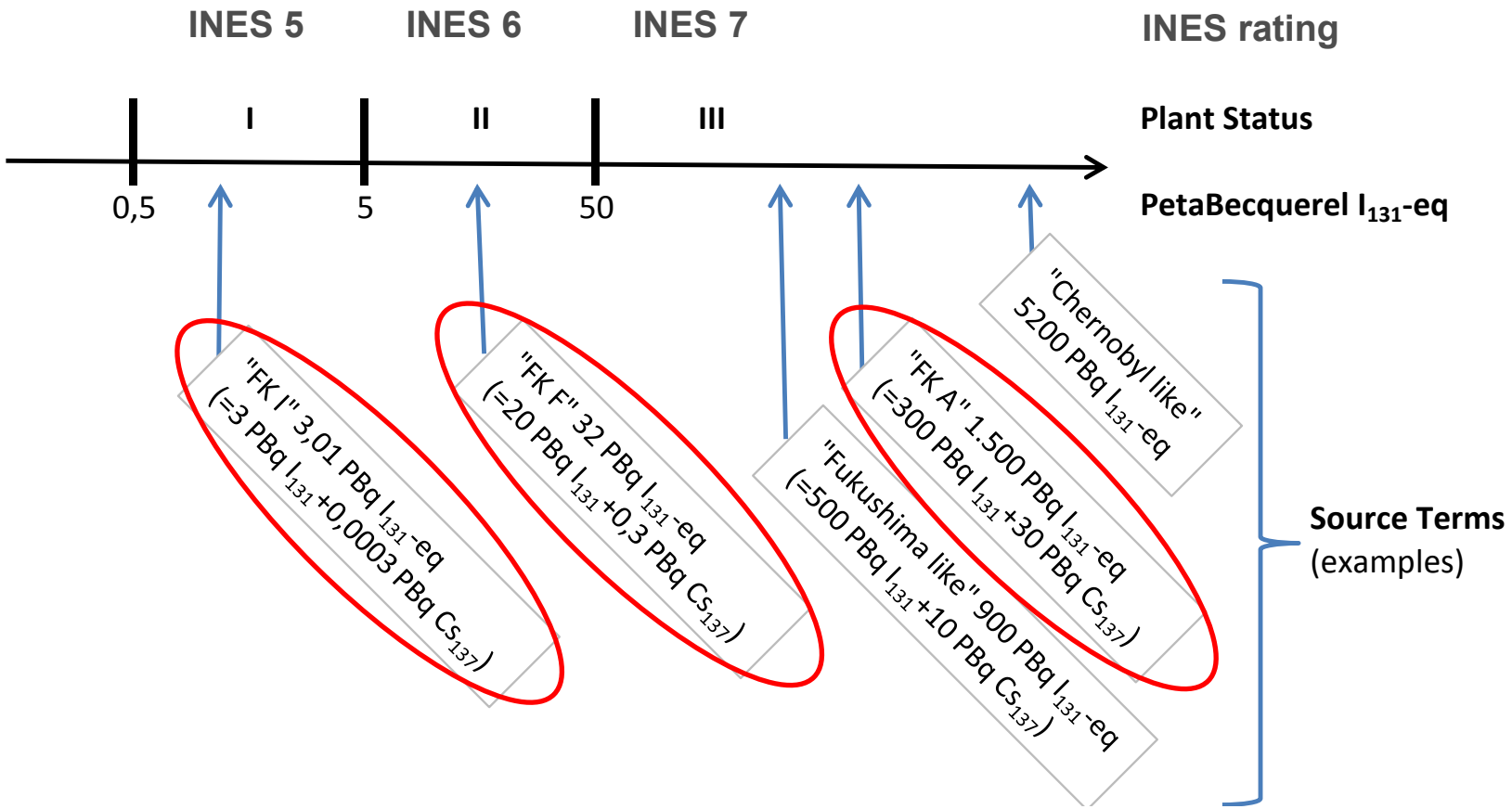
Hazard assessment – source terms (for severe NPP accidents)



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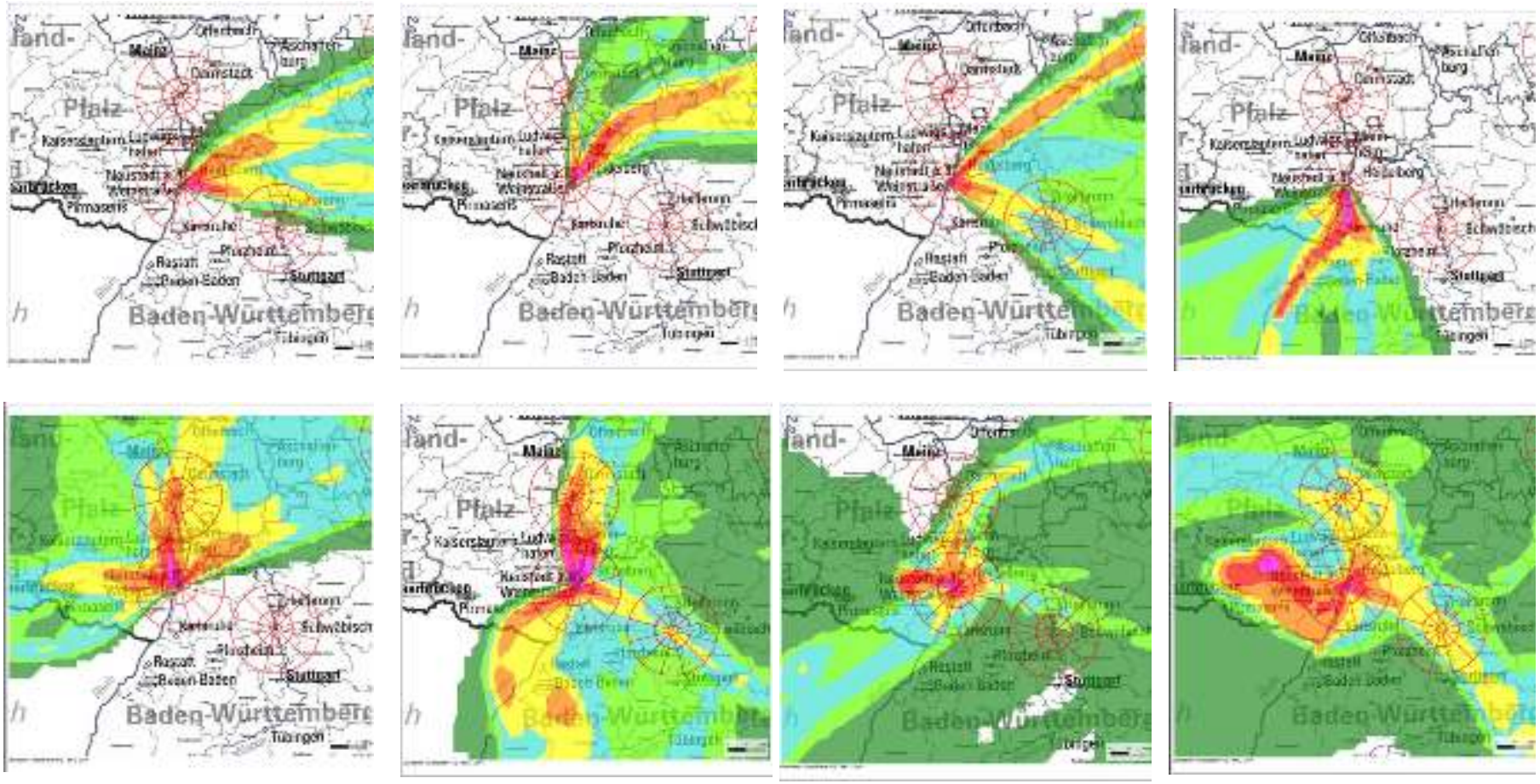
Hazard assessment – weather data / RODOS simulations

For 365 days of a year:



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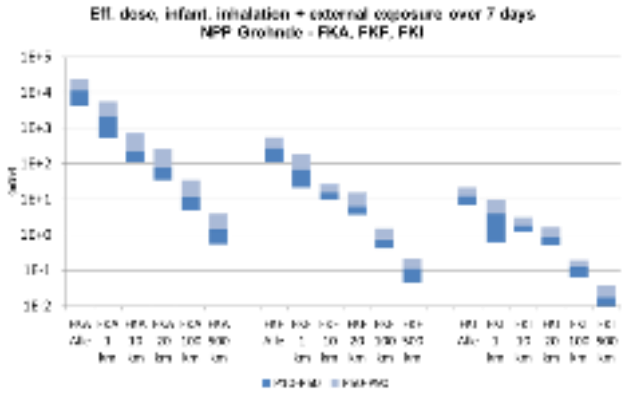
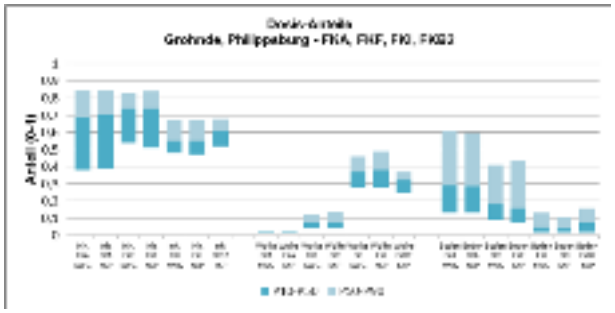
Hazard assessment – analysis of results

Resulting doses:



Exposure pathways:



Monitoring data:

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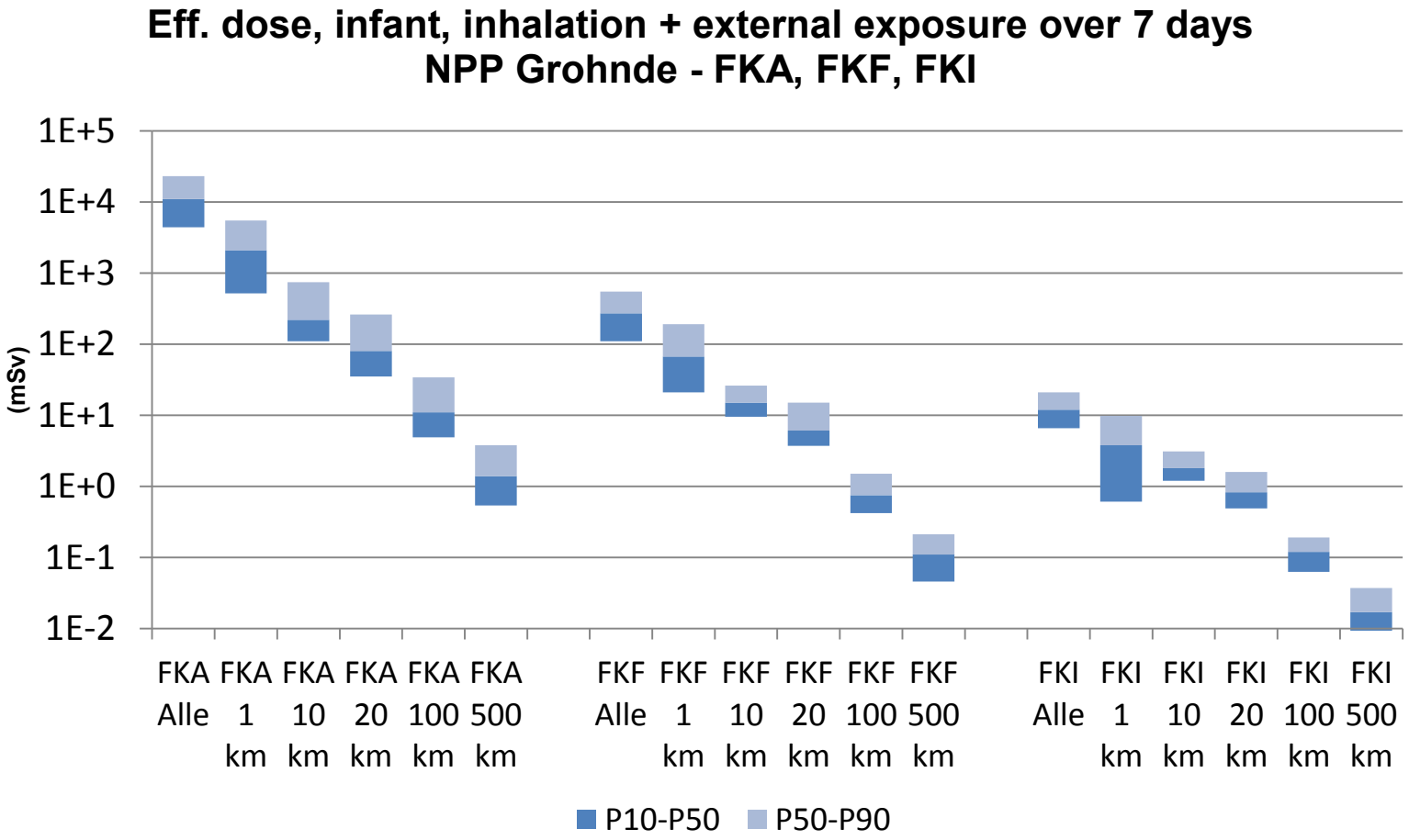
Results of hazard assessment: doses to the public

0. ~~Unclear situation~~
1. NPP accident in Germany
2. …



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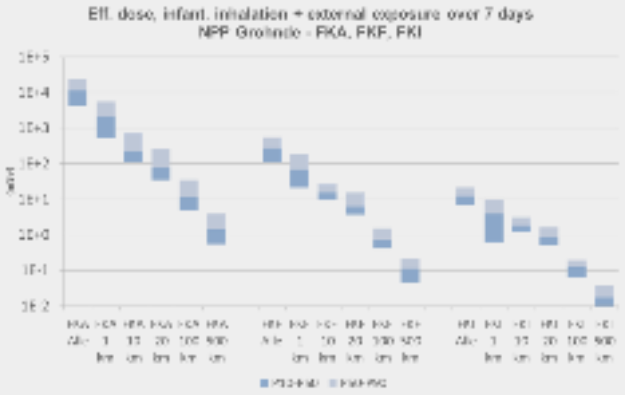
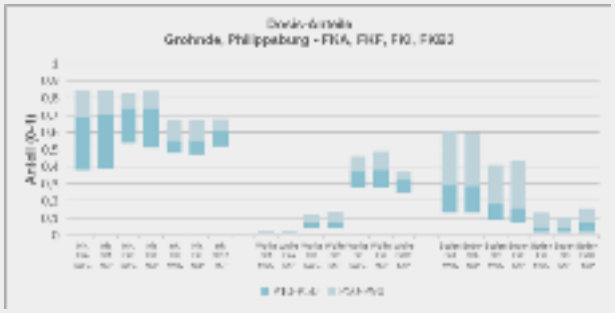
Hazard assessment – analysis of results

Resulting doses:

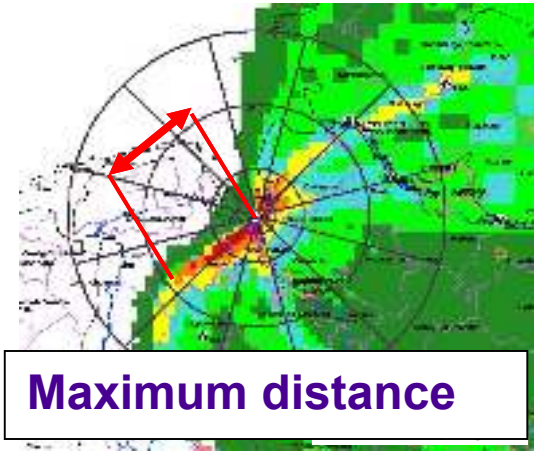


Exposure pathways:

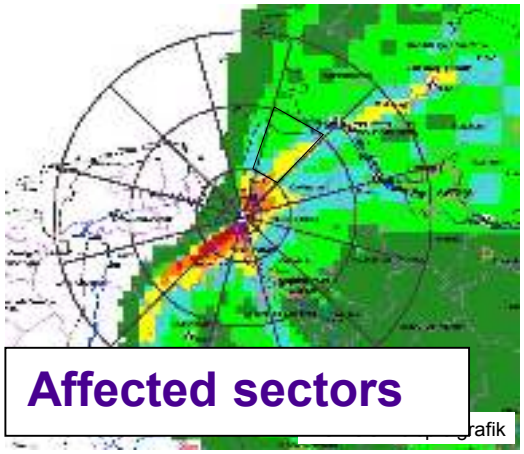


Monitoring data:

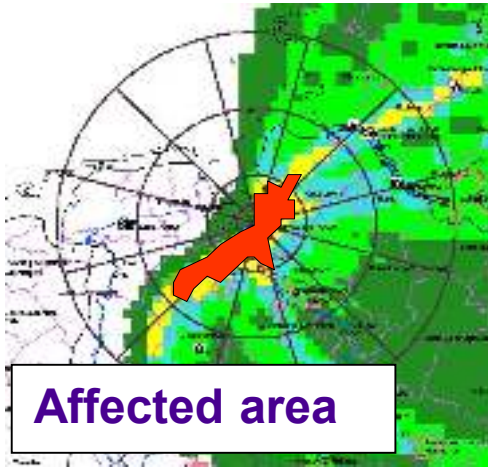
Exceedance of dose criteria for protective actions:



Maximum distance



Affected sectors



Affected area

Affected persons

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Results of hazard assessment: protective actions

0. Unclear situation
1. NPP accident in Germany
2. …

Maximum distance for protective actions, source term FKA

Dose / contamination criteria	Protective action	Maximum distance (km) in which intervention level is exceeded (median)
1000 mSv bone marow dose (infants)	(Priority evacuation)	0.8
100 mSv eff. dose in 7d (infants)	Evacuation	15
10 mSv eff. dose in 7d (infants)	Sheltering	100
50 mSv thyroid dose in 7 d (infants)	ITB (children)	180
2000 Bq/kg iodine in leafy vegetables	Food ban	>800
…	…	…

Results of hazard assessment: protective actions

…

5. Accident in a nuclear facility

…

Maximum distance for protective actions, Research reactor

Dose / contamination criteria	Protective action	Maximum distance (km) in which intervention level is exceeded (median)
1000 mSv bone marow dose (infants)	(Priority evacuation)	0
100 mSv eff. dose in 7d (infants)	Evacuation	0.7
10 mSv eff. dose in 7d (infants)	Sheltering	4
50 mSv thyroid dose in 7 d (infants)	ITB (children)	9
2000 Bq/kg iodine in leafy vegetables	Food ban	600
…	…	…

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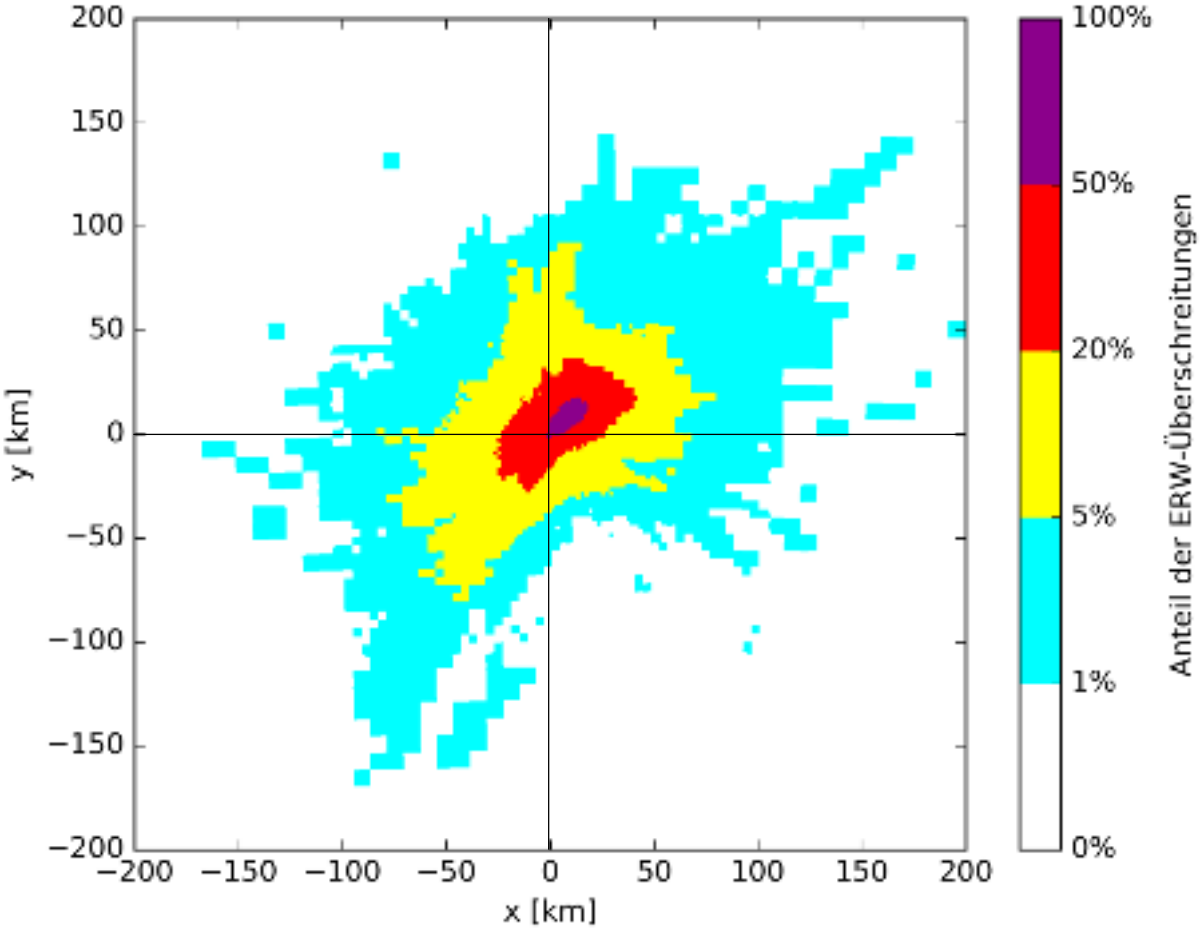
Visualization and further analysis of data



Relative frequency of exceedance of dose criteria
(cartesian coordinates, site KKP,
source term FKA, protective action „sheltering“)

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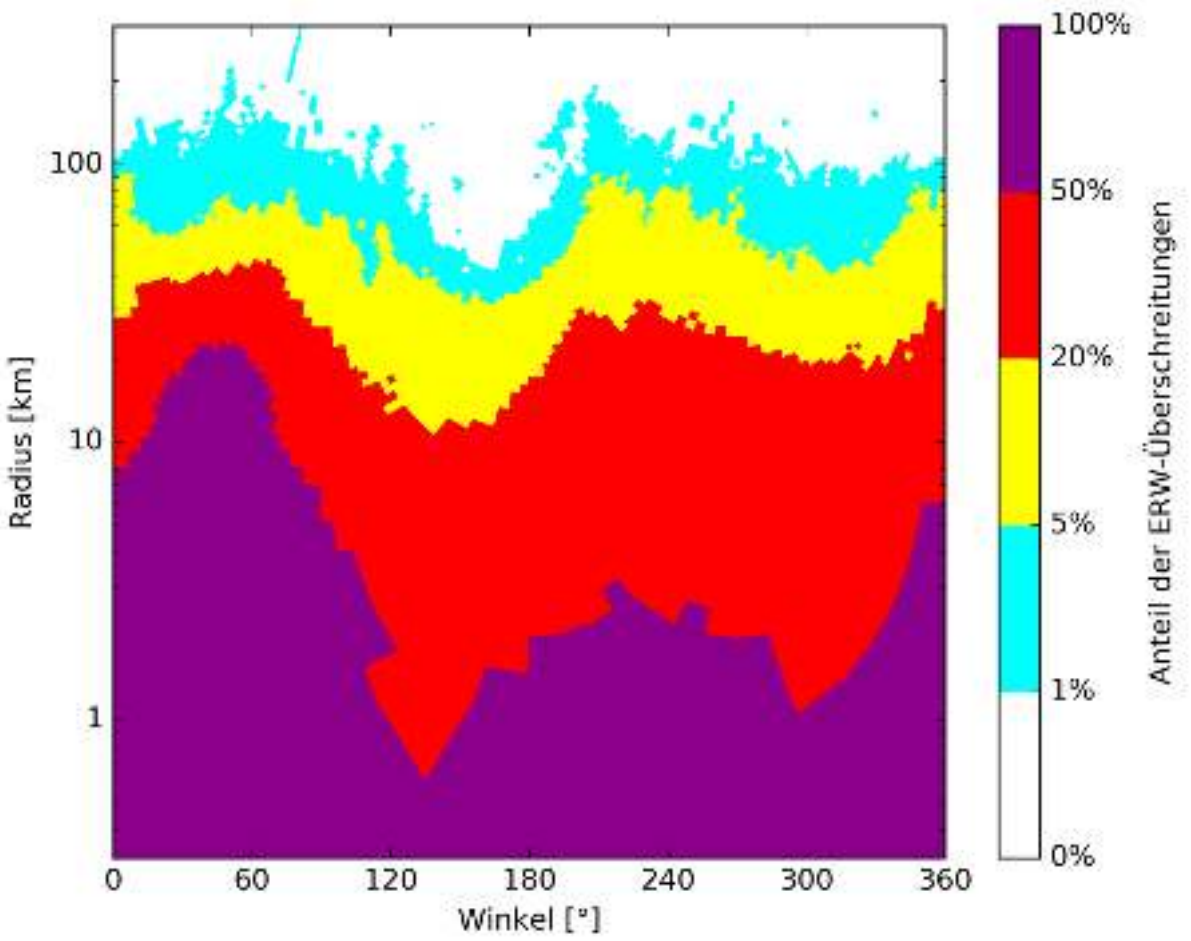
Visualization and further analysis of data



Relative frequency of exceedance of dose criteria
(polar coordinates (log scale), site KKP,
source term FKA, protective action „sheltering“)

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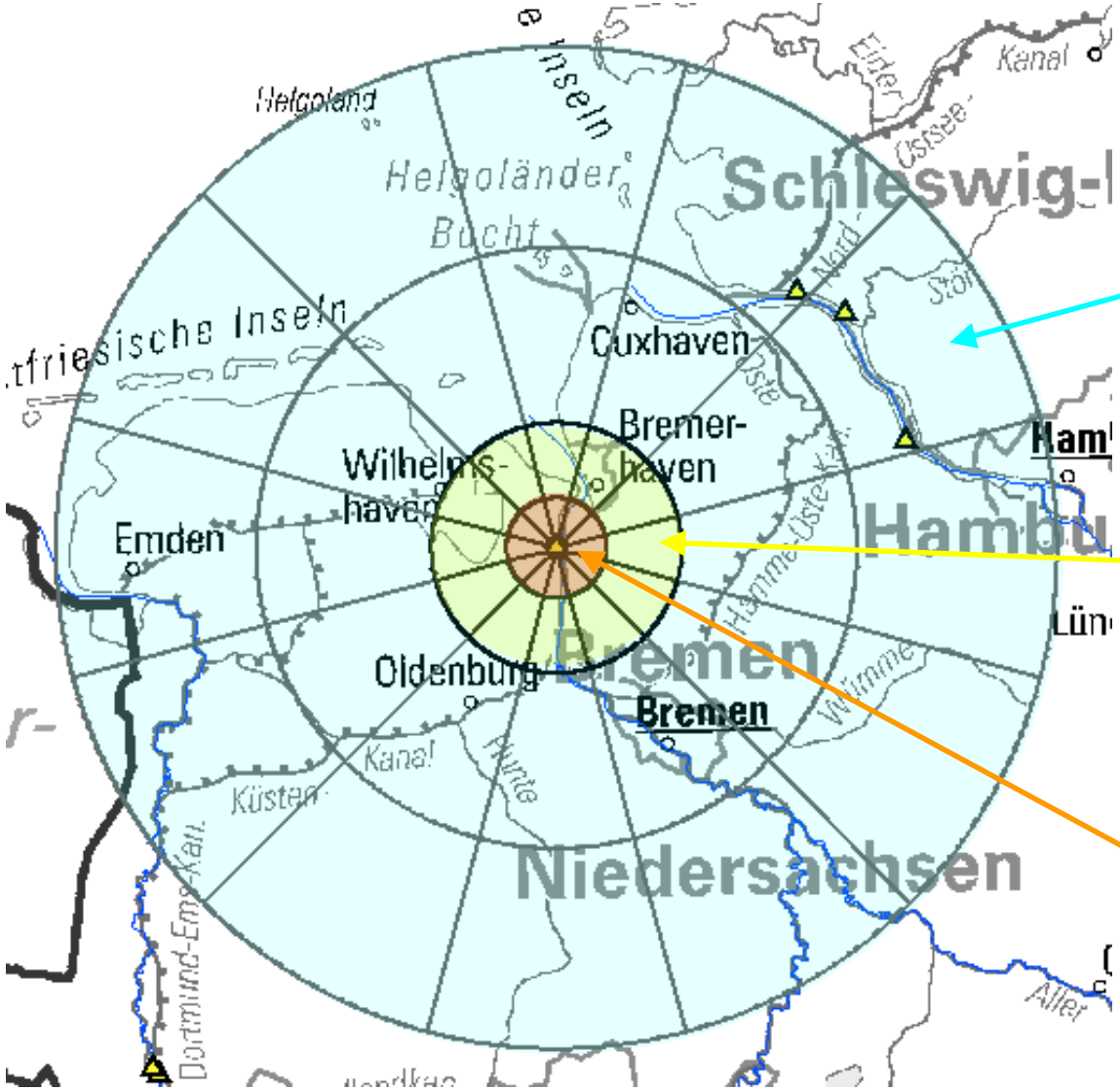
Support countermeasure strategies: Emergency planning zones for NPPs (before 2014)



Emergency planning zones:

<100 km:
ITB for children and pregnant women

<25 km:
ITB for all persons < 45 years

<10 km:
Evacuation, Sheltering

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Emergency planning zones for NPPs (since 2014)

Emergency planning zones:

<100 km:
ITB for all persons < 45 years, sheltering

<20 km:
Evacuation, Sheltering

<5 km:
Evacuation (priority), Sheltering

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Results of hazard assessment (2016)

0. Unclear situation
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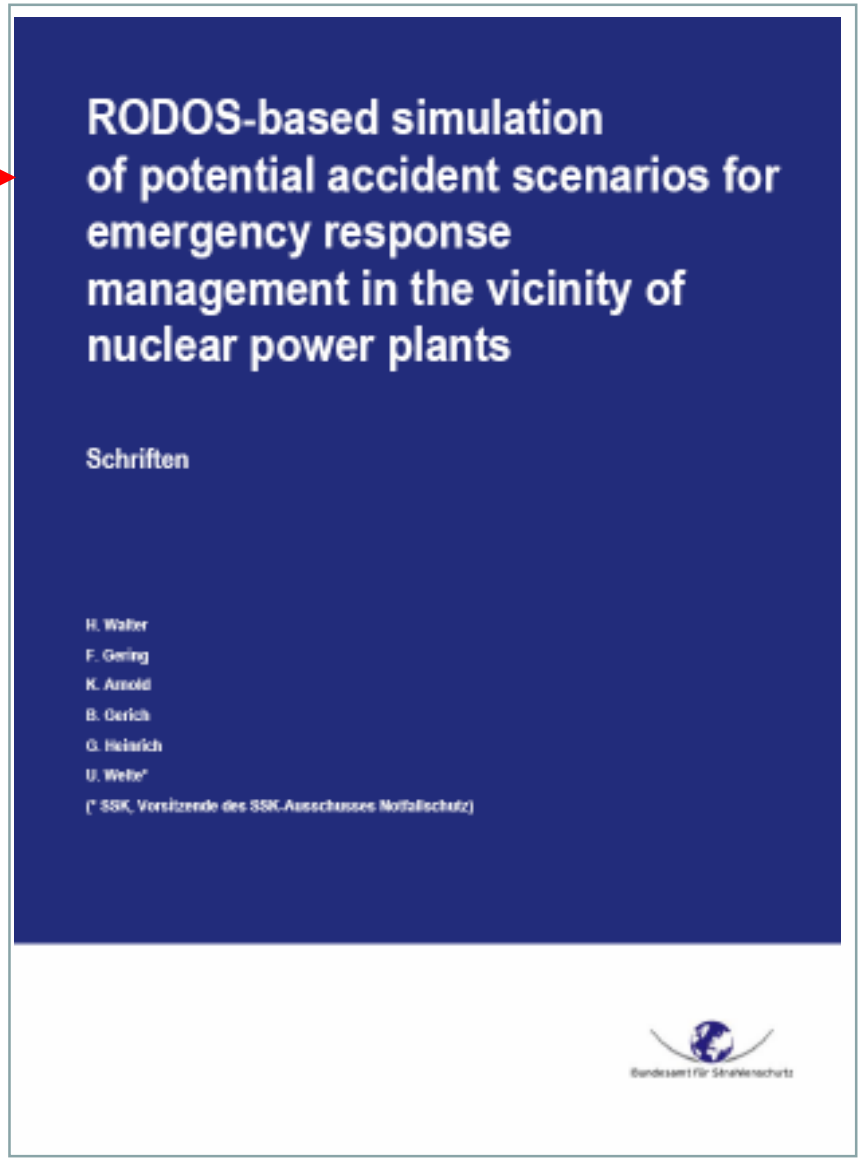

http://nbn-resolving.de/urn:nbn:de:0221-2016091214084

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Thank you

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