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Parameter Study with the Atmospheric Dispersion Model ADPIC

HARMO15, 6th May 2013

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Motivation

- ADPIC no longer up to date, specifically with respect to visualisation of results
- ADPIC is an “island solution”
- Knowledge rests on few shoulders

⇒ Project “RADUK” to replace ADPIC (see poster by Giuseppe Testa)

Motivation

Some parameters have to be fixed for all runs,

but (may) have strong effect on duration of run:

- horizontal spatial grid resolution
- time resolution of input meteo wind fields
- number of particles emitted

$\Rightarrow$ parameter study

Boundary conditions

Source term: 3.0E18 Bq noble gases

1.0E16 Bq iodine

1.0E15 Bq aerosols

8 scenarios:

Scenario	A	B	C	D	E	F	G	H
Release duration [h]	1	1	4	4	6	6	5	5
Simulation duration [h]	2	2	6	6	8	8	7	7
Start time for meteorology	11.1.2011, 17:30	11.1.2011, 17:30	9.1.2011, 22:00	9.1.2011, 22:00	9.1.2011, 00:00	9.1.2011, 00:00	8.2.2011, 16:30	8.2. 2011, 16:30
Activity release time dependence (first half and second half of release duration time)	2/3 1/3	1/5 4/5	2/3 1/3	1/5 4/5	2/3 1/3	1/5 4/5	1/4 3/4	1/5 4/5
Release height [m] (first half and second half of release duration time, if different)	70	20 50	70	20 50	70	20 50	70	20 50
Thermal release energy [MW]	0	0.01	0	0.01	0	0.01	0	0.01

Parameters varied

- Horizontal spatial grid resolution:

  250 m, 500 m, and 1’000 m.
- Time resolution of input wind fields:

  10 min, 30 min, and 60 min.
- Number of particles emitted per time:

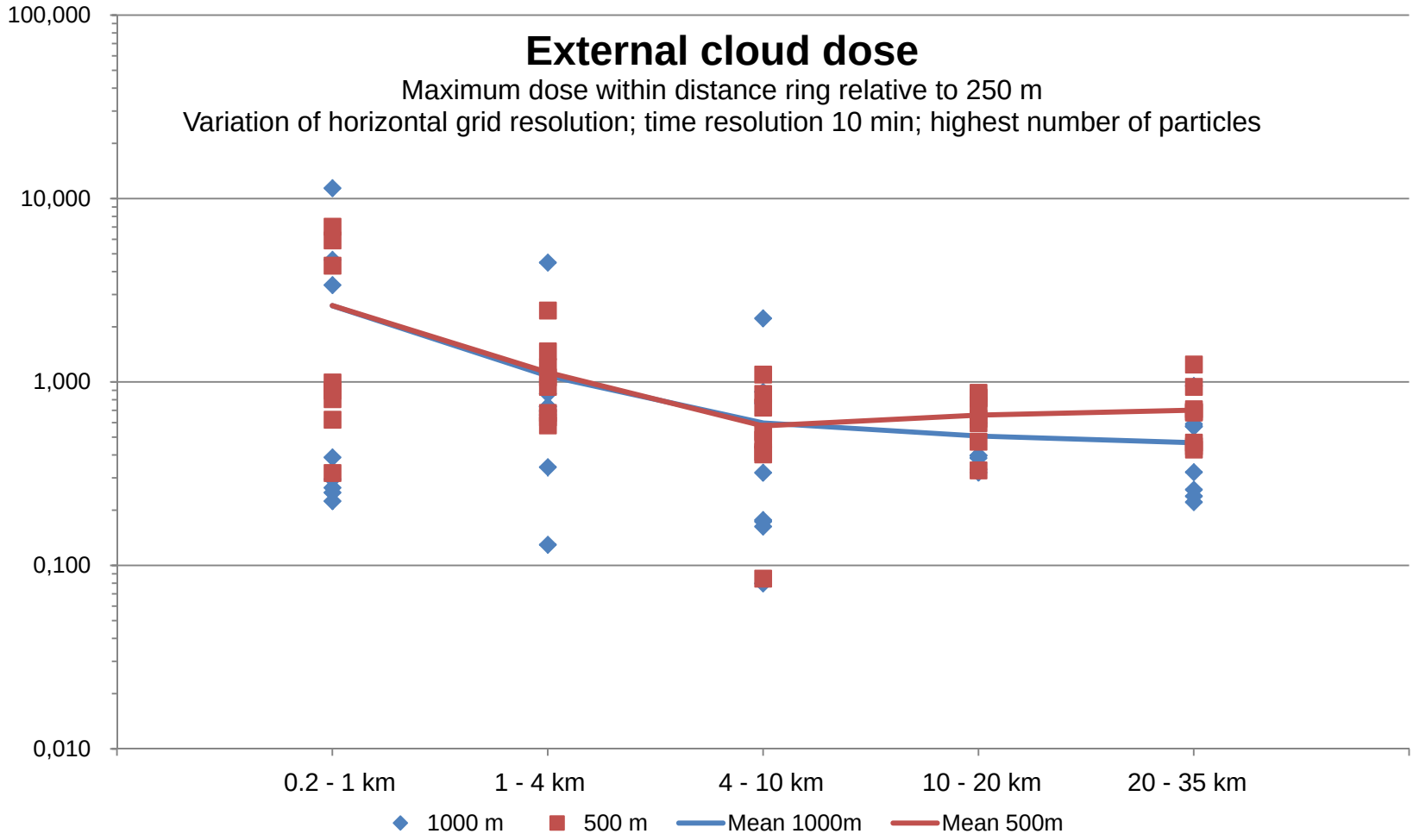
  1’024’000/h, 256’000/h, 64’000/h, 16’000/h, and 4’000/h.

Analysis methods

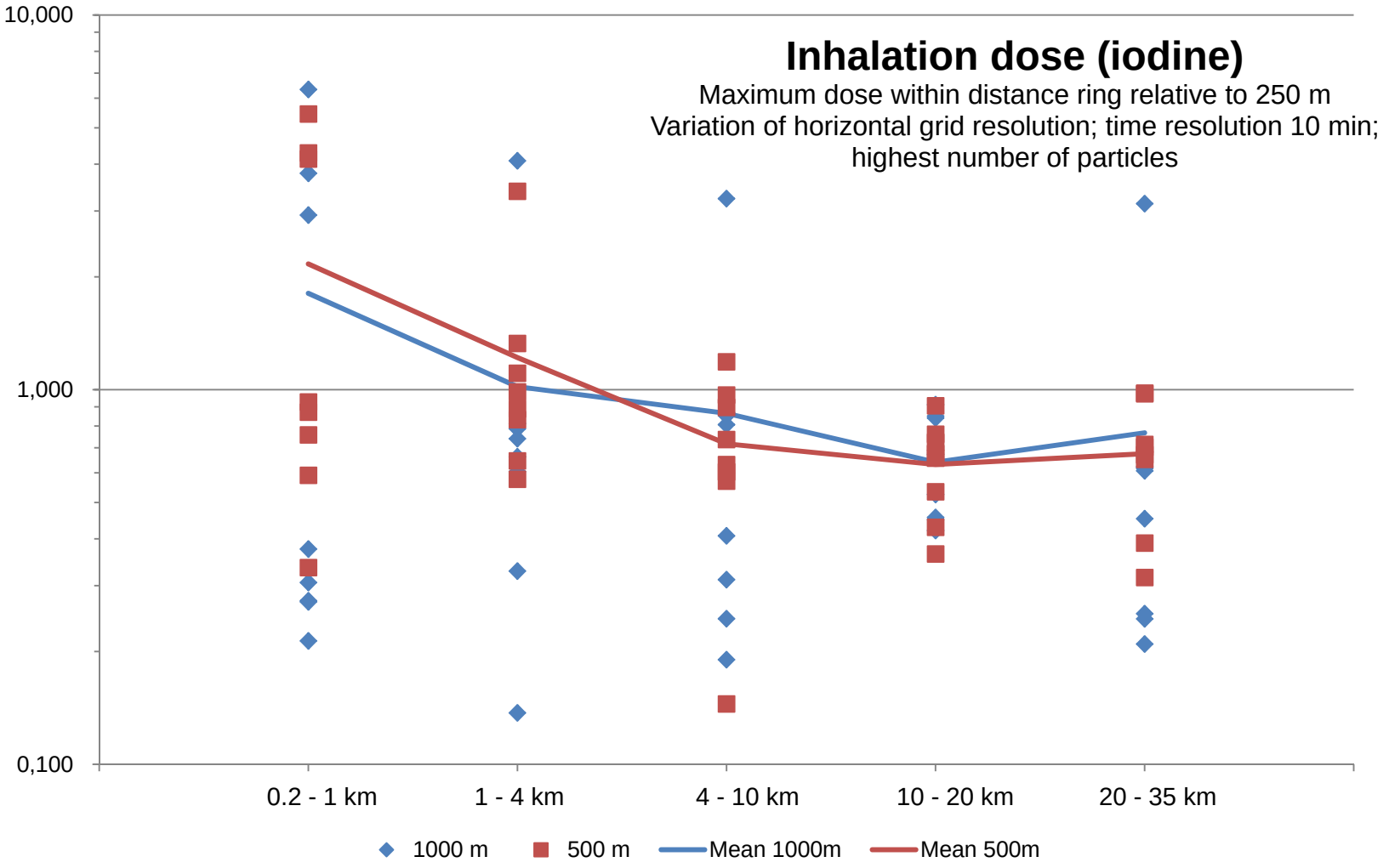
a) Maximum resulting dose within a specific distance ring (relative to “highest quality” run)

b) Dose map plot

Results: horizontal grid resolution



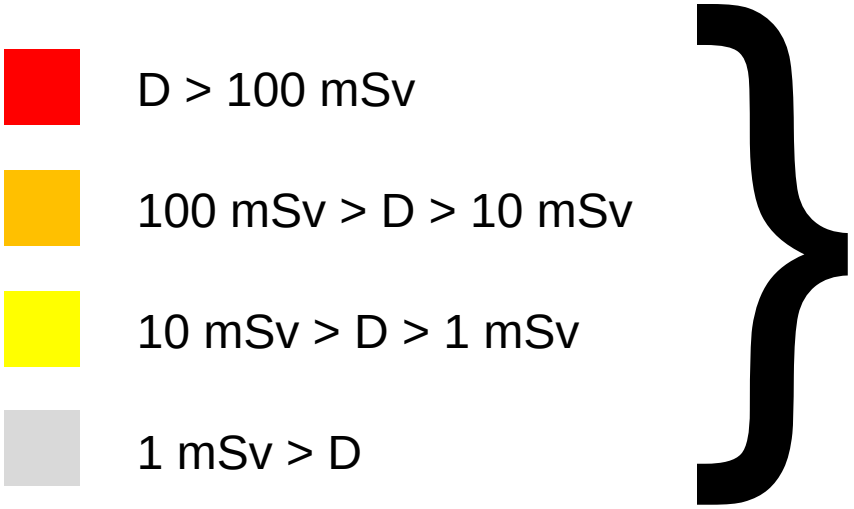
Results: horizontal grid resolution



Results: horizontal grid resolution

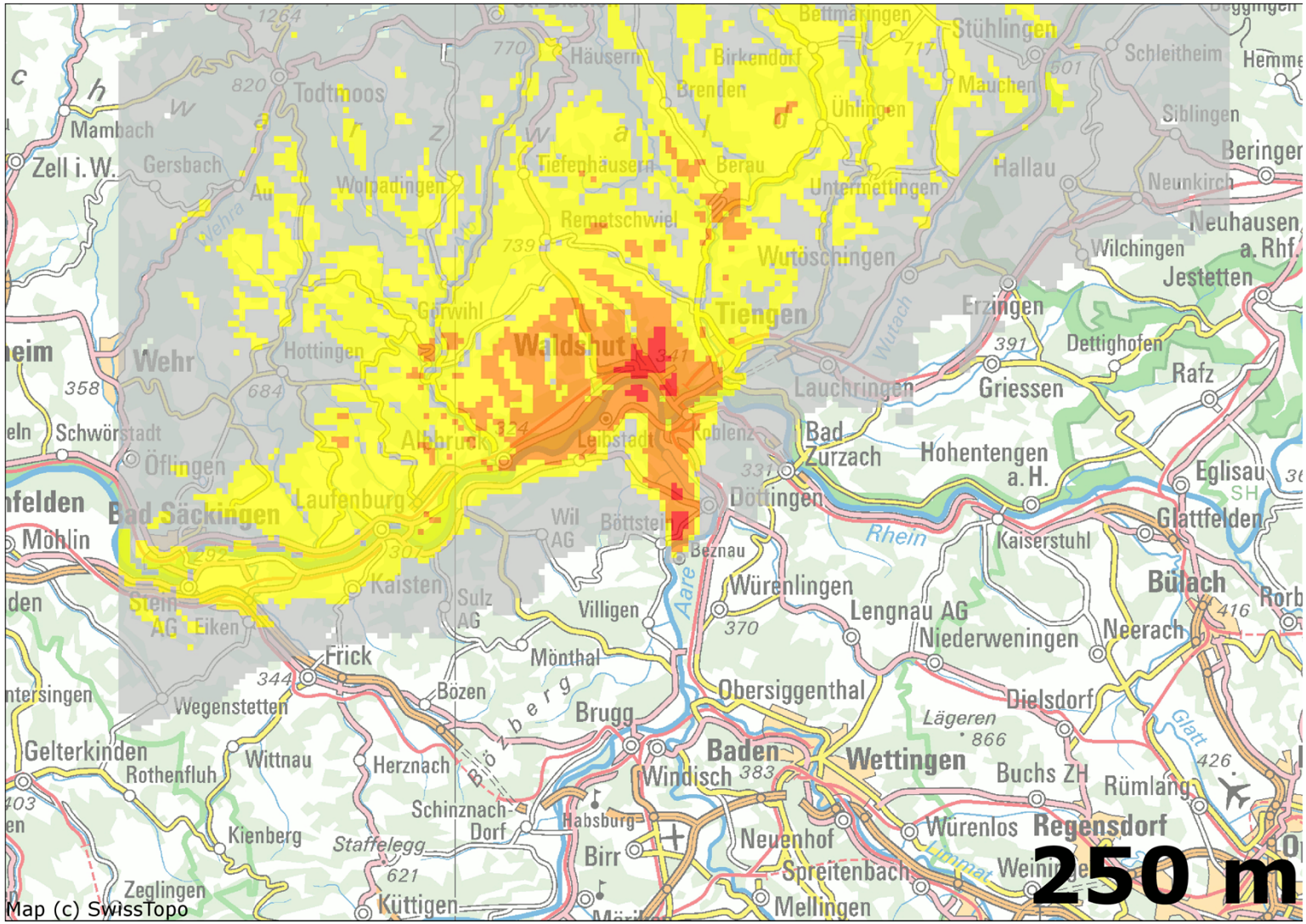
Dose map plot (next slide):

external cumulative cloud & ground dose at end of simulation

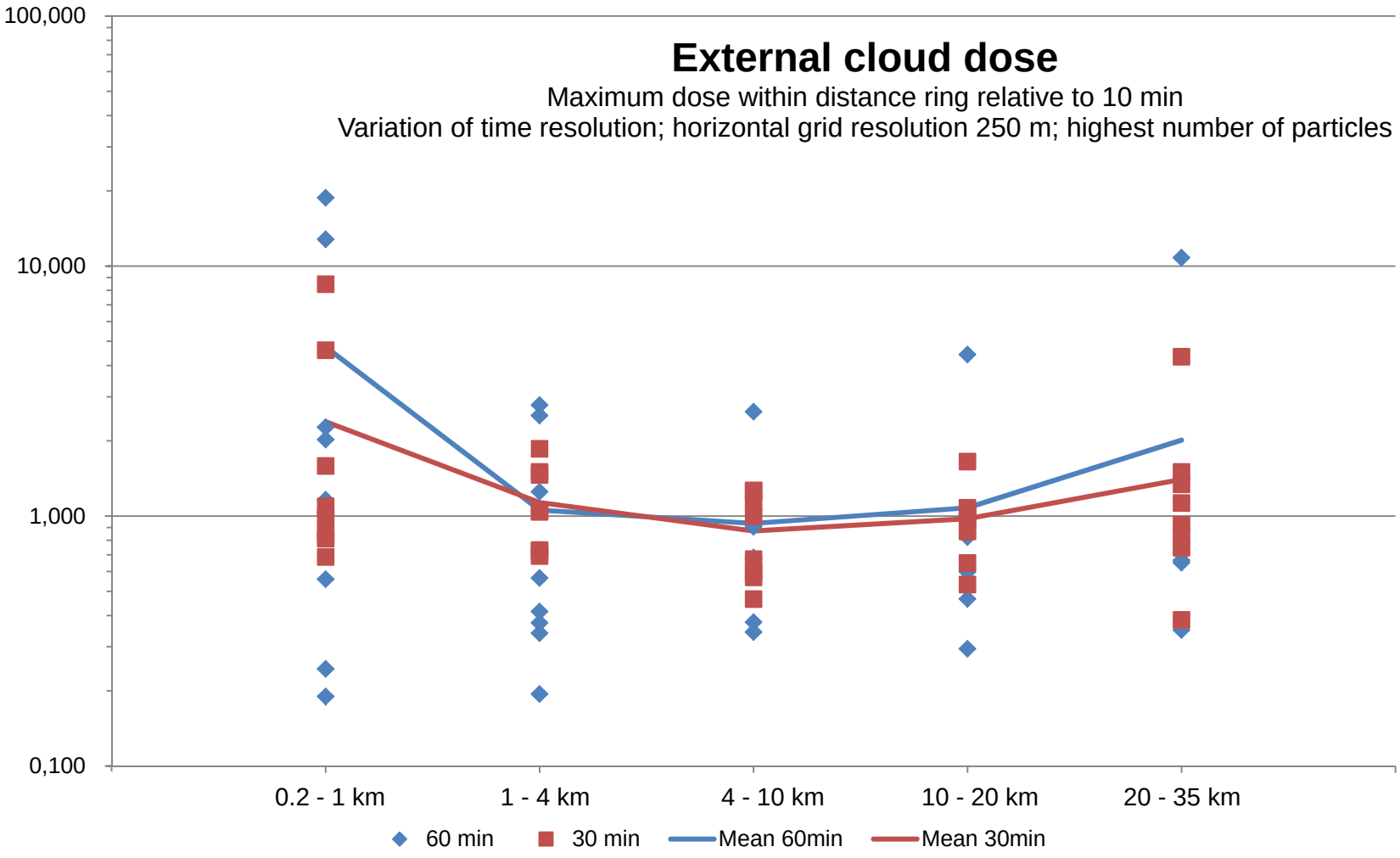


Colouring according to Swiss concept for visualisation

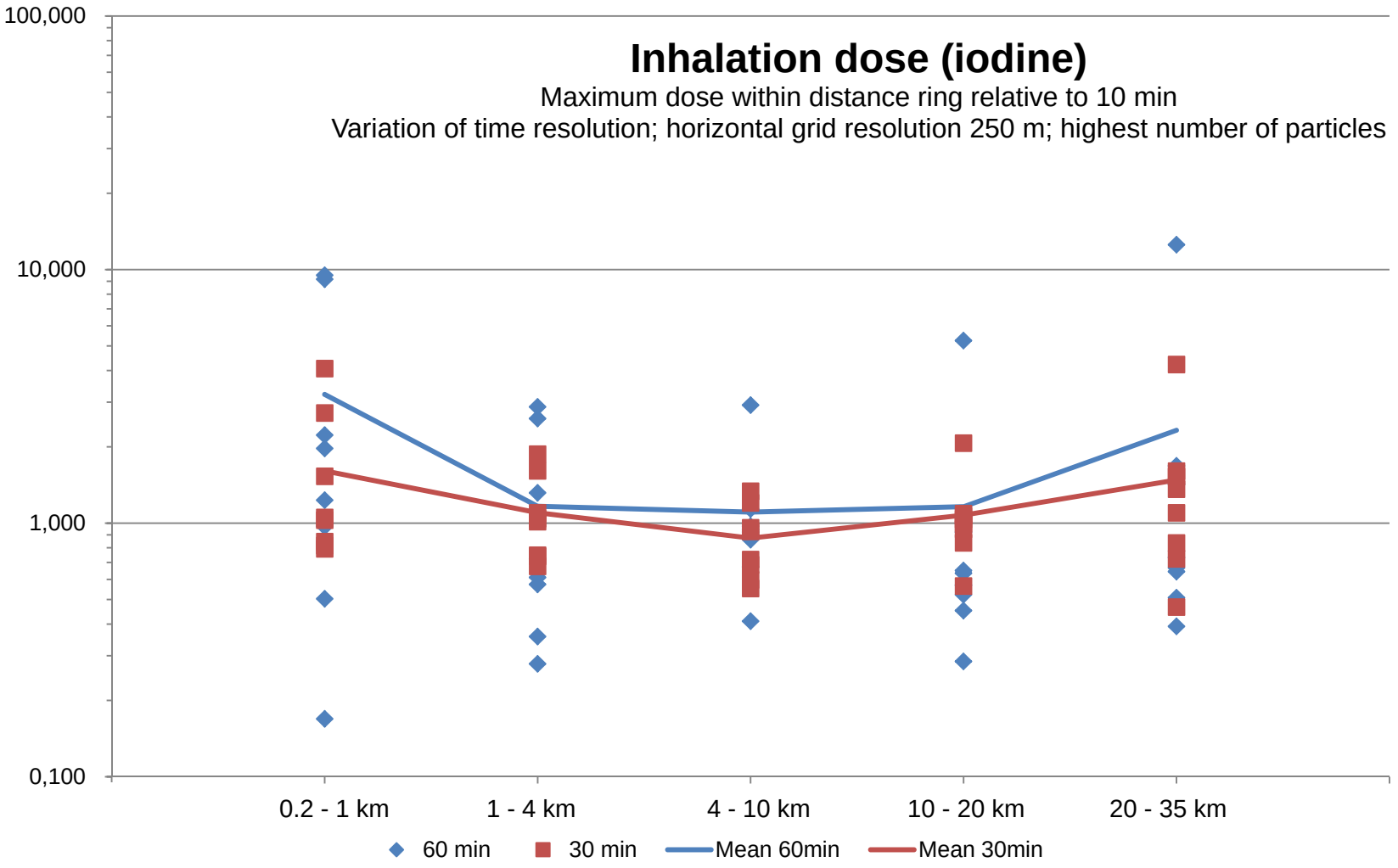
Results: horizontal grid resolution



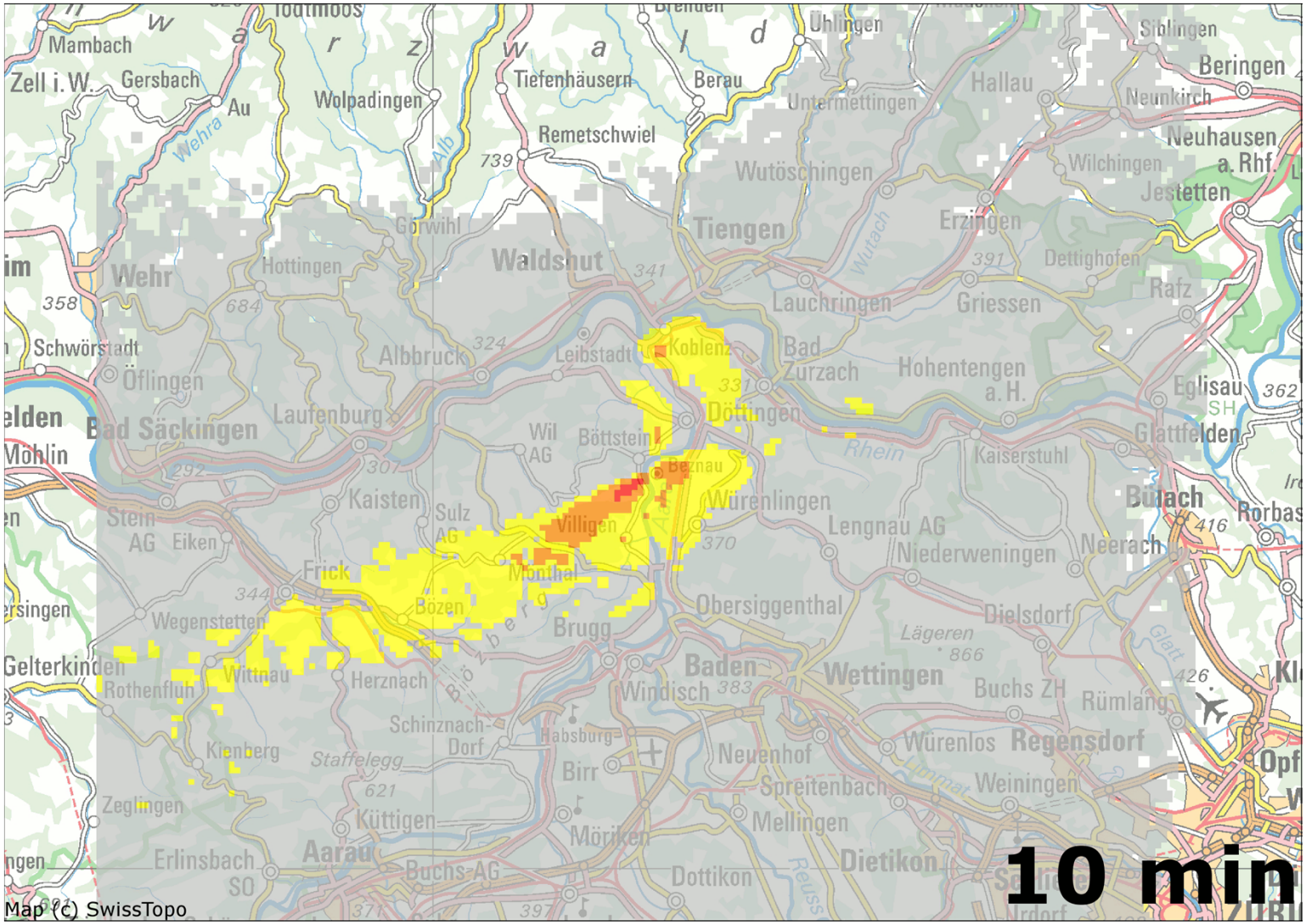
Results: time resolution of wind fields



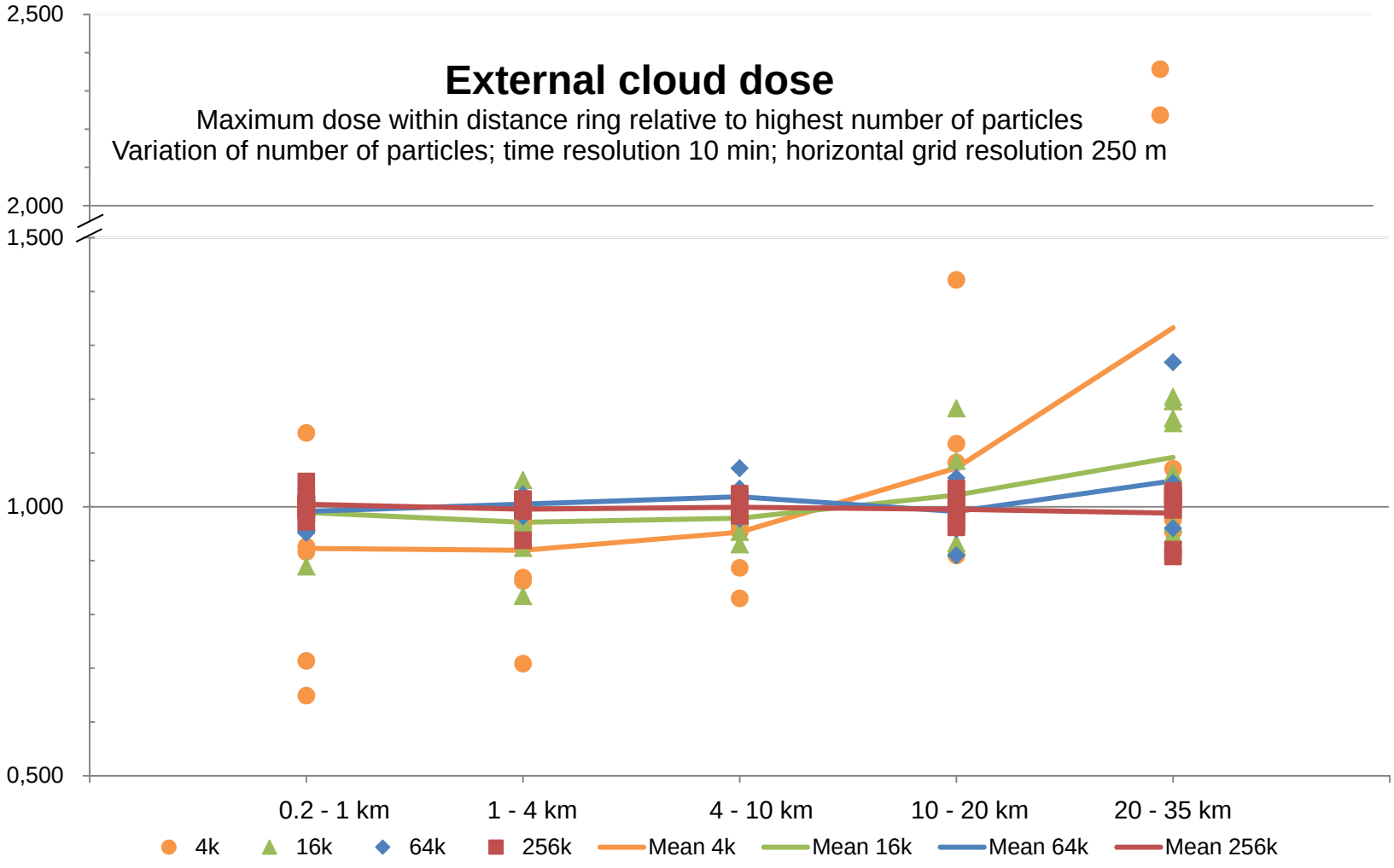
Results: time resolution of wind fields



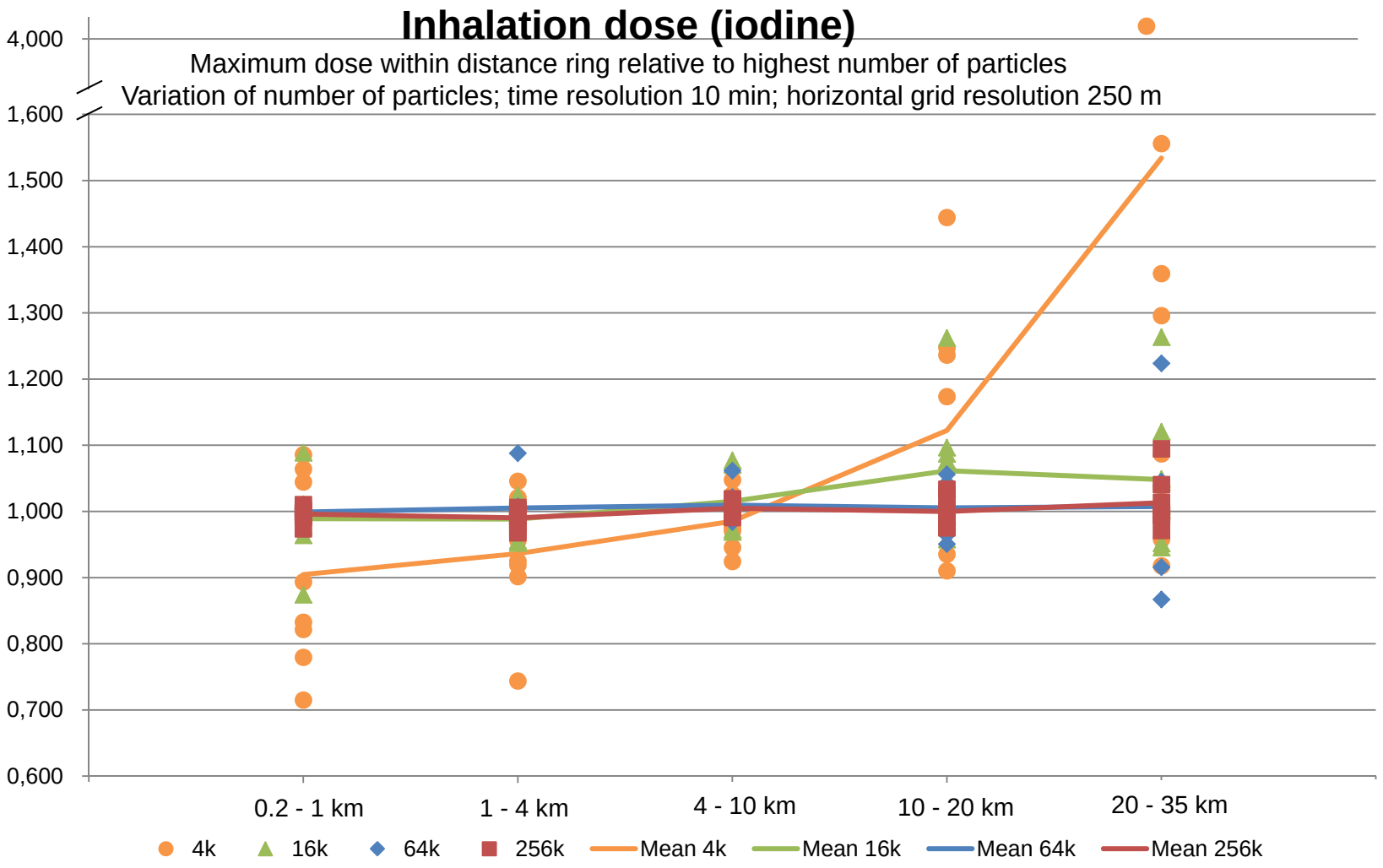
Results: time resolution of wind fields



Results: number of particles emitted



Results: number of particles emitted



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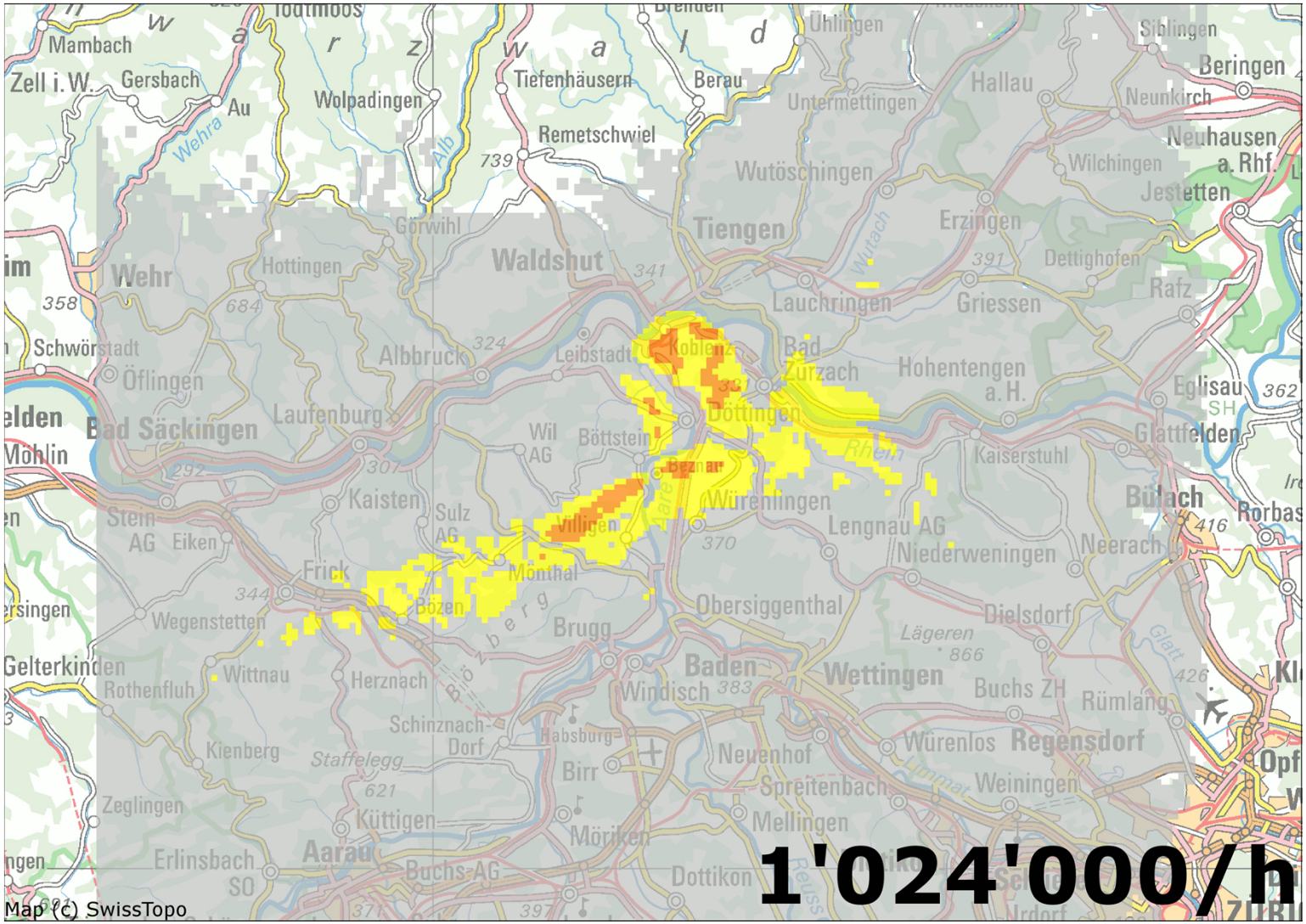

Conclusions

- horizontal spatial resolution critical in small-scale orography
- time resolution of wind fields important in small-scale orography
- number of particles relevant but not critical

Conclusions

For RADUK, we therefore stipulate:

- 250 m spatial grid resolution with nested grid for larger distances
- 10 min time resolution of wind fields
- appropriate number of particles to ensure sufficient statistics; at least 16’000/h

Questions

Collaborators: Hanspeter Isaak, Benno Bucher, and Giuseppe Testa