THE PROBLEM OF LIMIT VALUES EXCEEDANCES DETECTION IN COMPLEX TERRAIN USING MEASUREMENT AND MODELS

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Why should we care for very complex terrain areas?

We live on complex terrain

Air pollution, weather prediction, climate data collection.....

Needed at least everywhere where there are settlements

URBAN ? : RURAL ?

URBAN : RURAL

Slovenia: more than 1/2 of people living in rural areas

Accurate air pollution control is needed in rural areas as well

Rural and also urban

== complex terrain in Slovenia

=> non-homogenuous air pollution

Protection of population ?

average values are important

but

we have to correctly detect the occurence of peak values – episodes of high concentrations

when limit values are exceeded

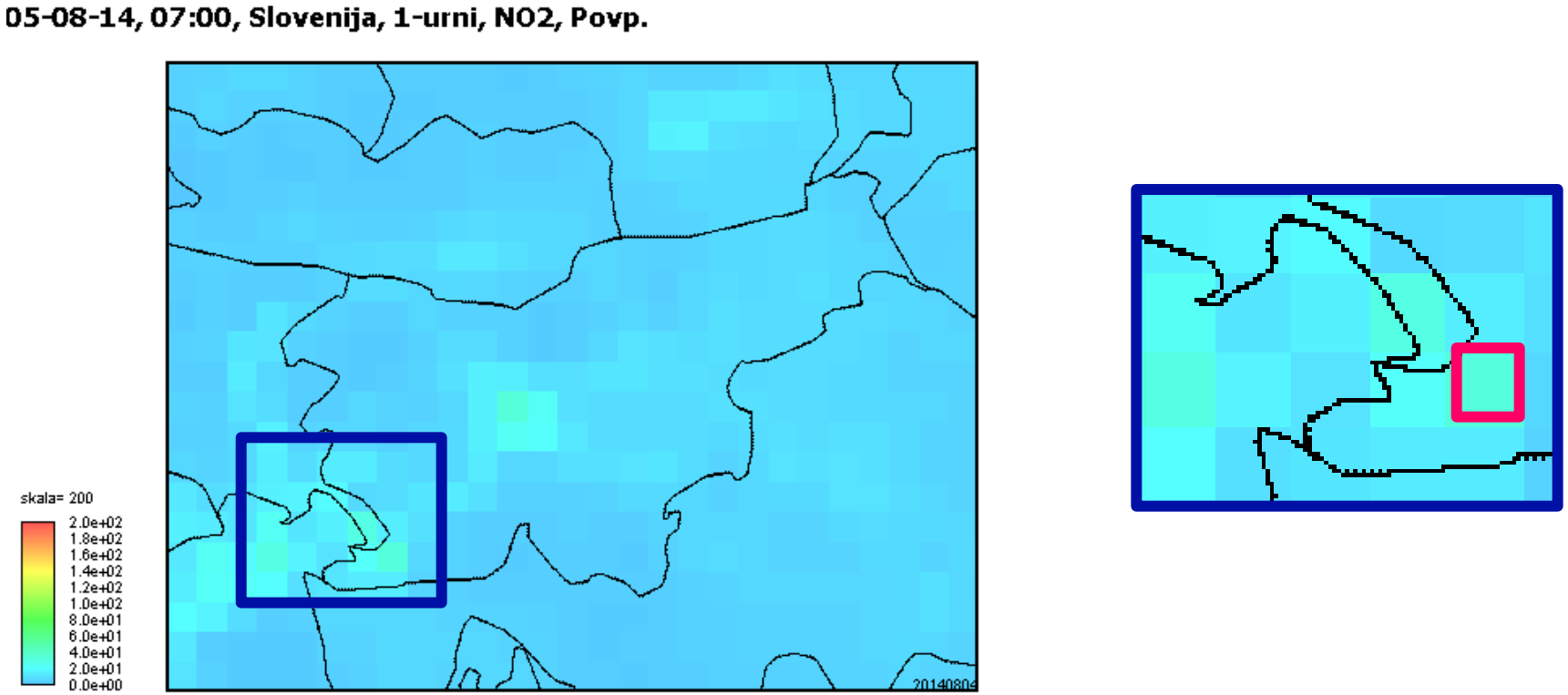
how ?

THE DETERMINATION OF EXCEEDANCES OF THE LIMIT VALUES OF POLLUTANTS IN AMBIENT AIR

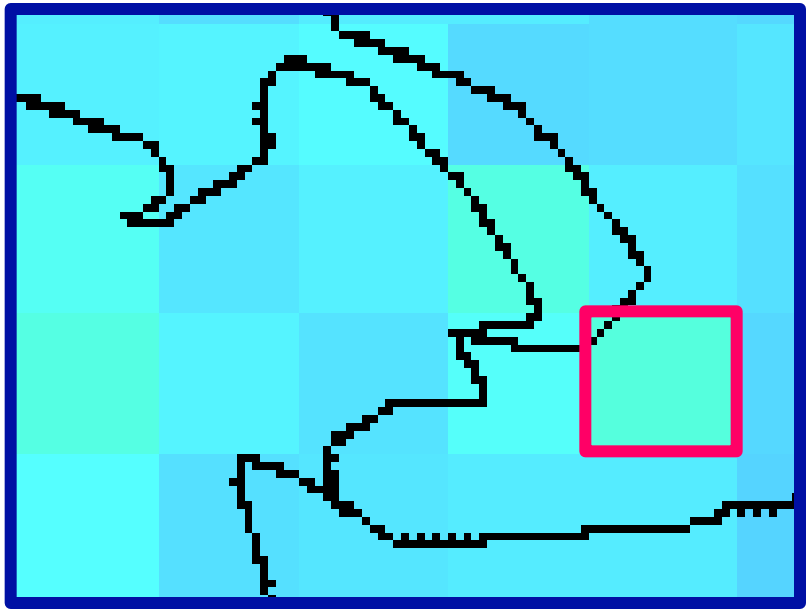
air pollution measurements

THE DETERMINATION OF EXCEEDANCES OF THE LIMIT VALUES OF POLLUTANTS IN AMBIENT AIR

air pollution modelling



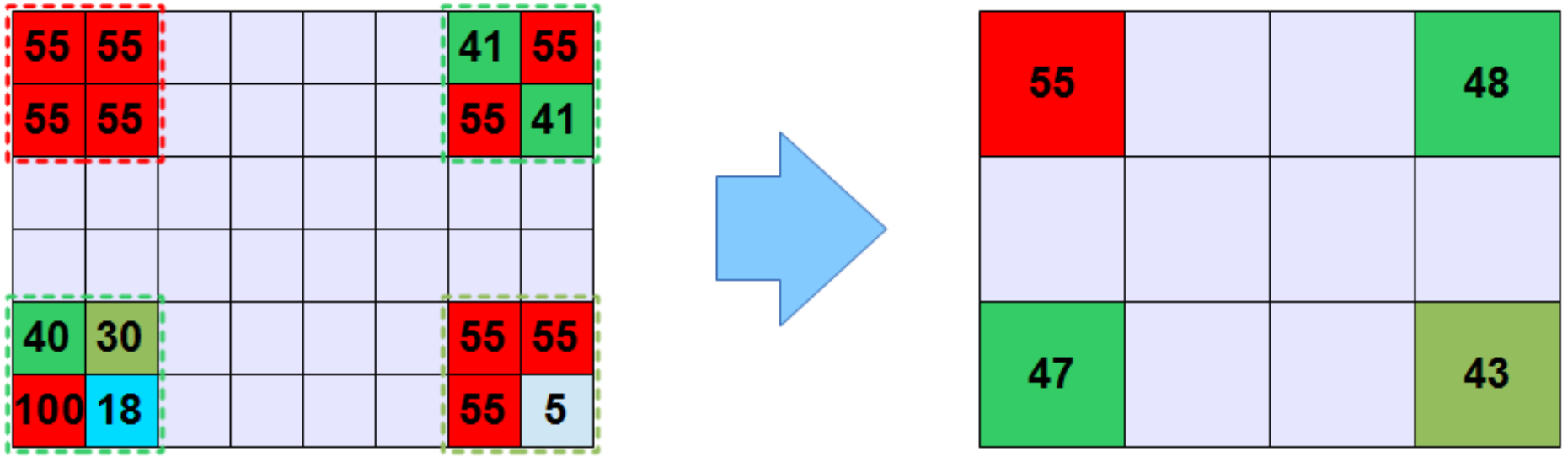
DETECTING HIGH CONCENTRATION EVENTS USING MODELS



Are concentrations realy homogeneous in the cell ?

Are concentrations really homogeneous in the cell ?

smoothing can hide exceedances



Three valeys of Zasavje region
example of PM10 pollution

http://www.slo-flute-festival.org/img_zagorje/origin/01.jpg
Roman Rozina

http://sftp.slovenka.net/rr/h/it/hrastnik/hrastnik.jpg

http://projekti.gess.si/unite/images/anim/IMGP1165.jpg
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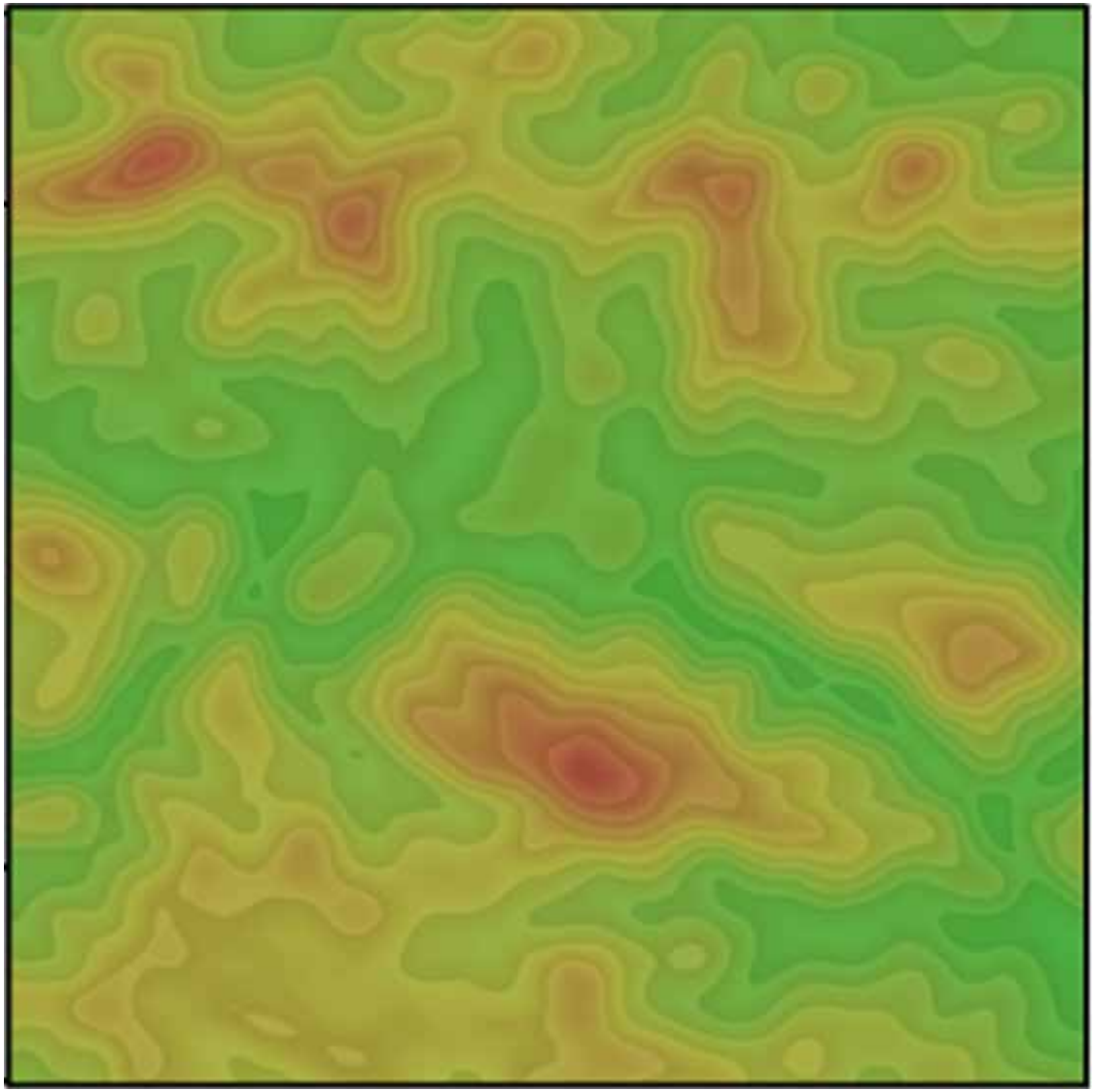
Zasavje - industrial area

(lime, cement, glass factory, TPP)

over very complex terrain

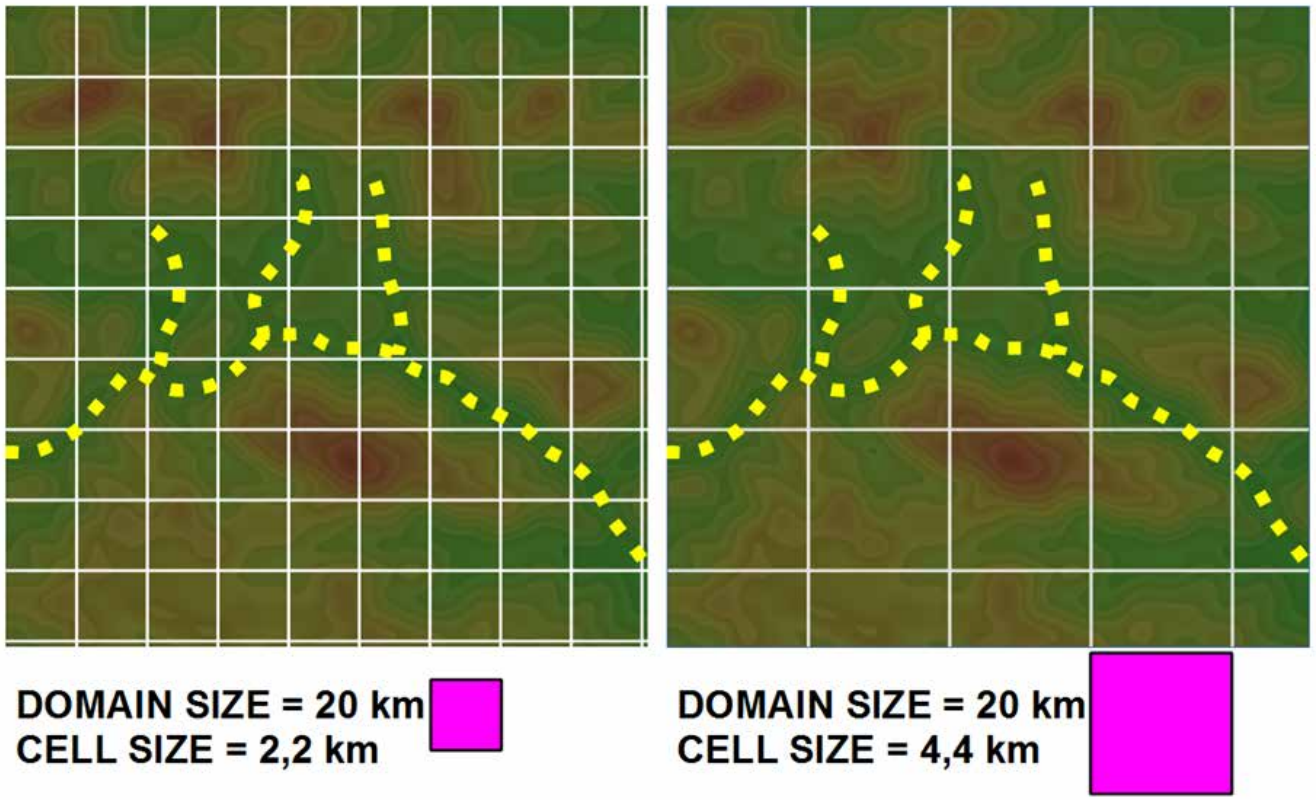
Air pollution from domestic heating in villages

Example of Zasavje region (complex terrain in Slovenia)



20 km x 20 km

Ssmoothing can hide exceedances
Example of Zasavje region (complex terrain in Slovenia)



...but even one smaller cell is not fine enough!

< --- >

cca 3km

http://www.slo-flute-festival.org/img_zagorje/origin/01.jpg
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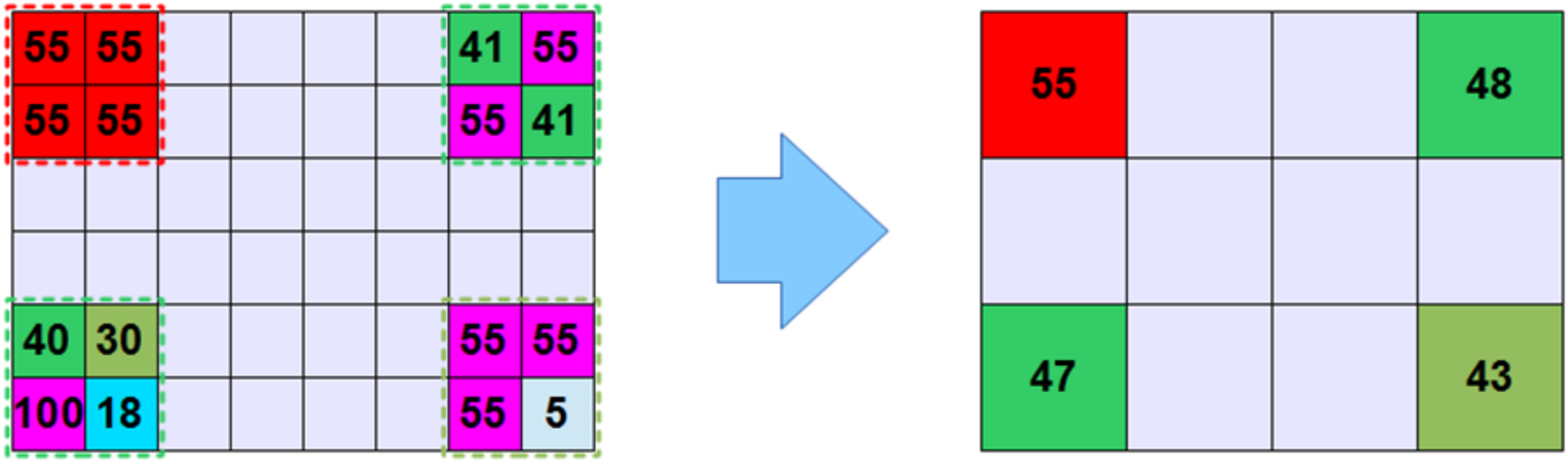
Smoothing hides exceedances!



SOLUTIONS ??

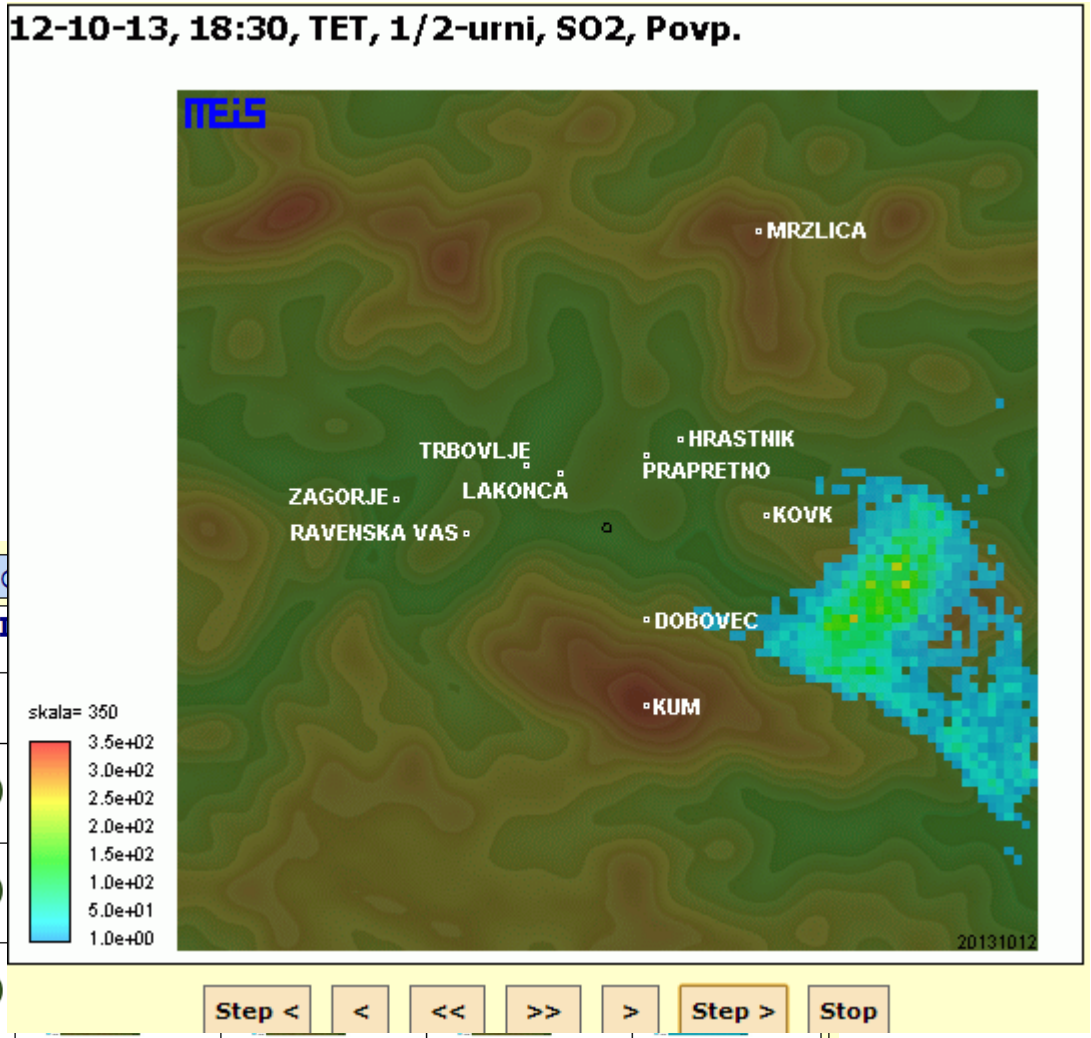
Fine resolution air pollution modelling == solution only for small domains

Area:

20 km x 20 km

Horiz. resolution:

200 m x 200 m



POLLUTION | AIR QUALITY FORECAST | MODEL VALIDATIC

ZASAVJE: ½ HOUR AVG. CONCENTRATION of AI

Source considered nominal emissions at full capacity	Termoelektrarna Trbovlje	Lafarge Cement				
SULFUR DIOXIDE SO_2 [µg/m³]						
NITROGEN DIOXIDE NO_2 [µg/m³]						
DUST PM10 [µg/m³]						
Emission data	emission	emission	emission	emission	emission	emission

A lot of air quality stations
... too expencive









Summary of problems in complex terrain

- **Air quality stations in complex terrain:**
  - **Not representative for wider areas,**
  - **Never enough of stations**

- **Models:**
  - **Bad emission inventories...**
  - **are uncertain ...**
  - **Fine resolution impossible for huge areas**

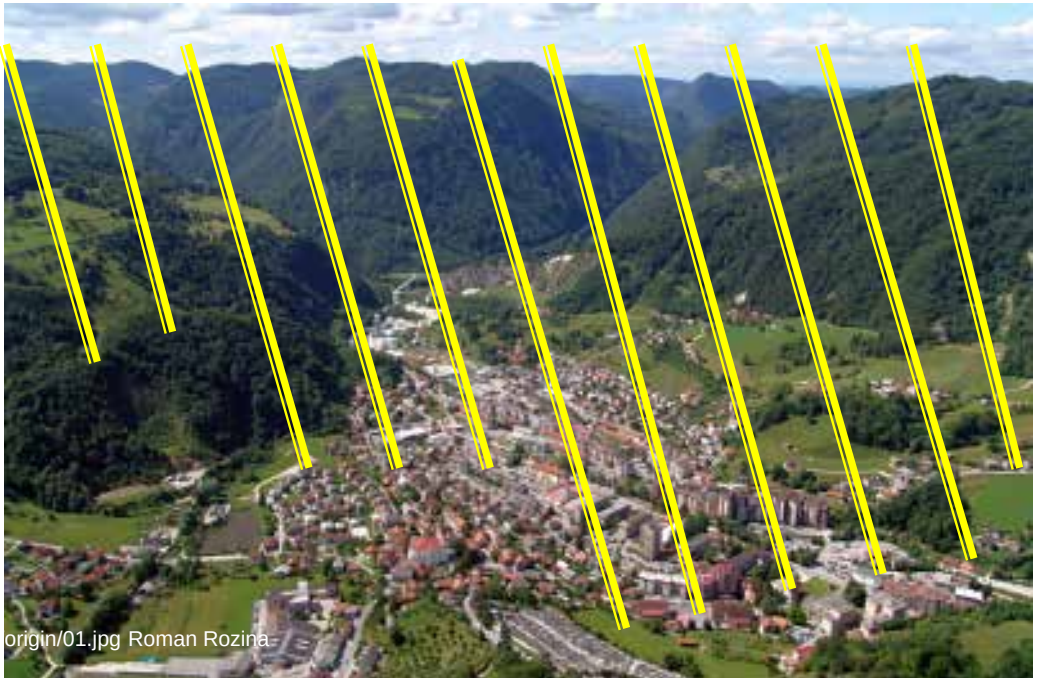
http://www.slo-flute-festival.org/img_zagorje/origin/01.jpg
Roman Rozina

SATELLITE MEASUREMENTS + / -

+ to some degree can replace in-situ measurement

+ enable spatial coverage with representative data for areas where in-situ measurements will never be feasible

- The same resolution problems as the models have



origin/01.jpg Roman Rozina

PROPOSAL FOR AREAS WITH HIGHLY NON-HOMOGENEOUS CONCENTRATIONS

corrective factor that would downscale the limit values in inverse proportion to the size of the model cell or resolution of satellite observation

The factor would be equal one only when adequately small ground-level model cells are used so that concentrations are actually homogeneous within individual ground-level cells in reality

Thank you!

From complex terrain J