# FAIRMODE WG 5 „Bias Correction“

# The
# Delta-Method

## (Note: no connection to the FAIRMODE Delta-Tool)

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# Method to assimilate modelled data for scenarios

„Delta-Method“

- developed by Rainer Stern
  Stern, R.: Großräumige PM10-Ausbreitungsmodellierung: Abschätzung der gegenwärtigen Immissionsbelastung in Europa und Prognose bis 2010; in: “Feinstaub und Stickstoffdioxid. Wirkung – Quellen – Luftreinhaltepläne – Minderungsmaßnahmen”, Hrsg.: DIN Deutsches Institut für Normung e.V., KRdL Kommission Reinhaltung der Luft im VDI und DIN; Beuth Verlag GmbH Berlin Wien Zürich; 85-102, 2006.
- often used in Germany
- rather simple approach
- idea:
  - do not create a complicated method to assimilate scenario data, but …
  - … create virtual future „measurement“ data and then use standard assimilation methods, e. g. OI

# Input information

- Model results for reference case, based on meteorology for year *Y*
- Measurement data for year *Y*
- Model results for scenario case, based on meteorology for year *Y*
- (Assimilated model results for year *Y*)

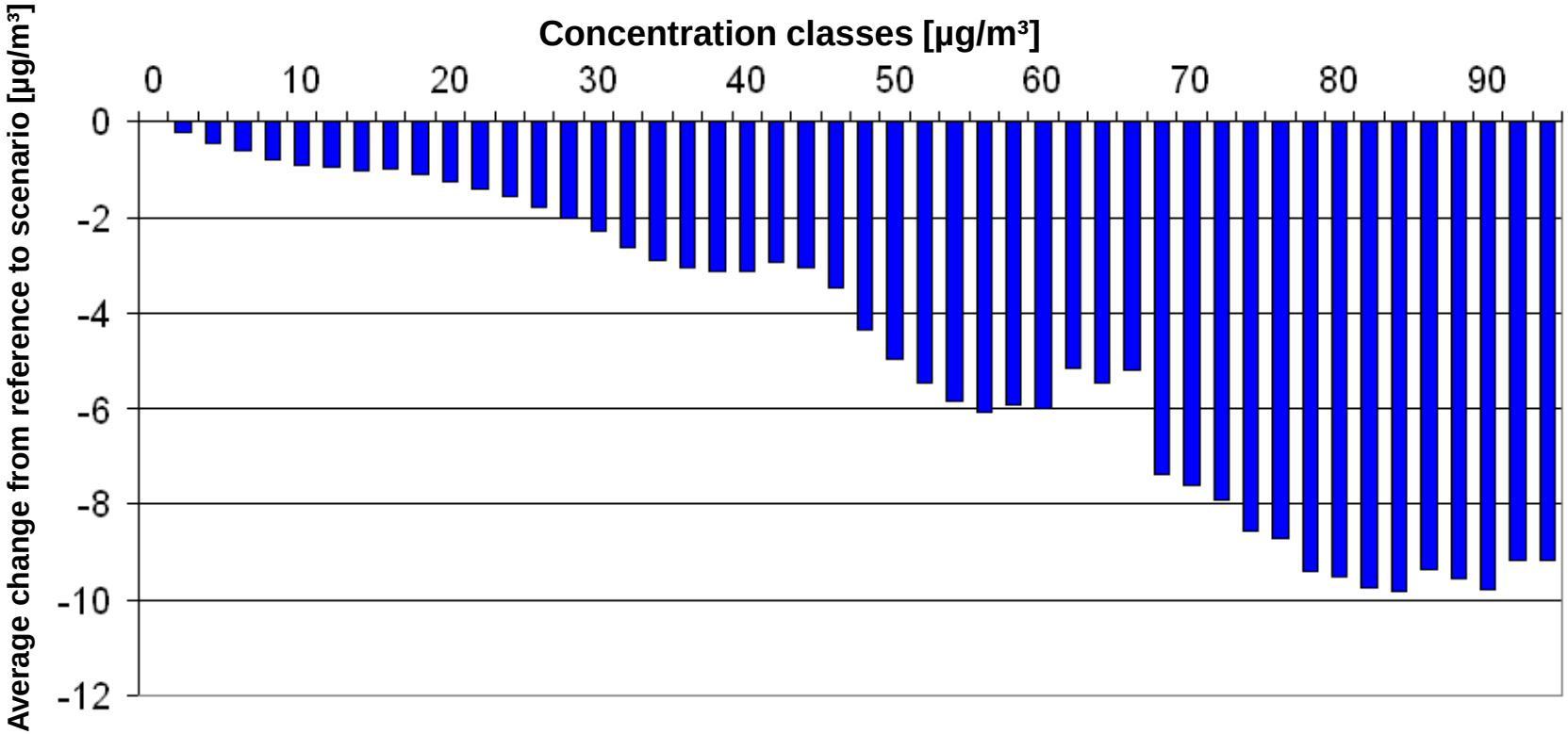
**Assumption**

- modelled concentration change between reference case and scenario case can be used to estimate average changes in measurements between both cases

  (⇐ relevant physical and chemical processes are sufficiently well modelled to capture concentration changes between reference and scenario case)

# Method

- generate histogram of modelled values, e. g. for classes of 2 µg/m³
  (use all hourly values of entire model domain)
- for each class, determine average change in modelled values for this class: *scenario - reference*




- generate virtual measurements in scenario case by changing each (hourly) measurement value by the average modelled change for the class of the measurement value

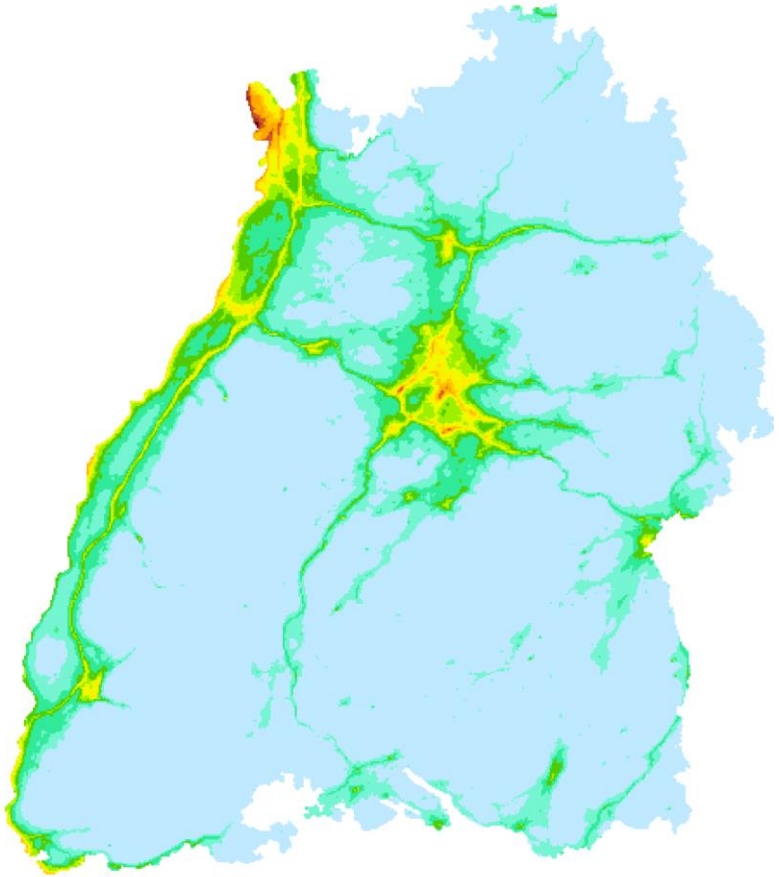
# Notes

- for classes with < 5 entries, change of neighboring higher class is used
- for measurements > highest class, change of highest class is used

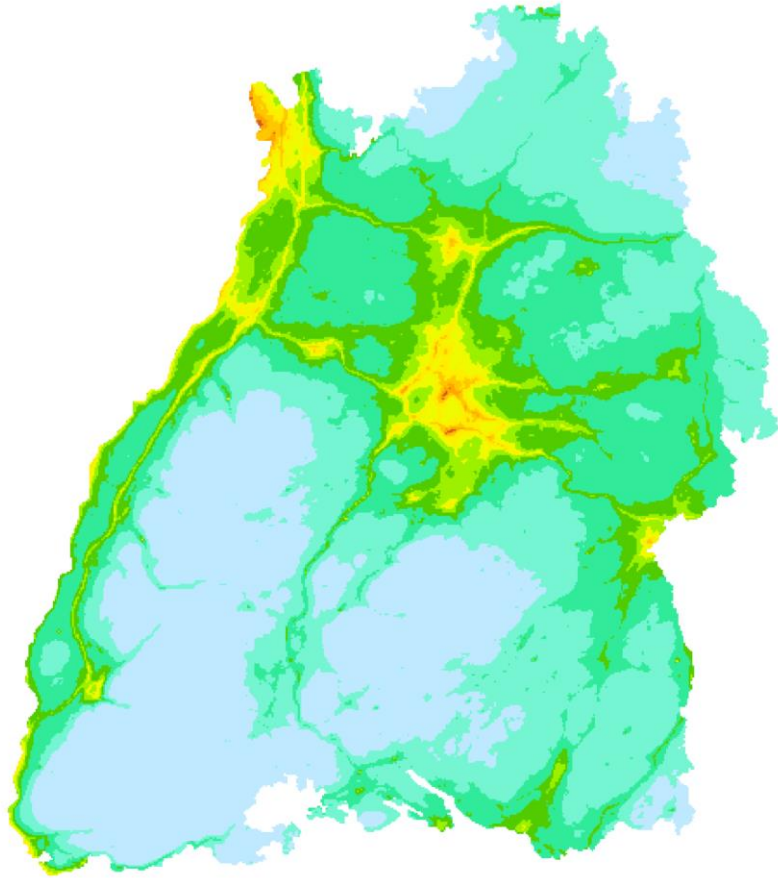
- representativeness of modelled values and measurements should correspond
- time and space dimensions of individual values are “dissolved”
- temporal and spatial distribution of virtual measurements for scenario is the same as for the reference
- so far, only applied for identical meteorology for both cases

# Example

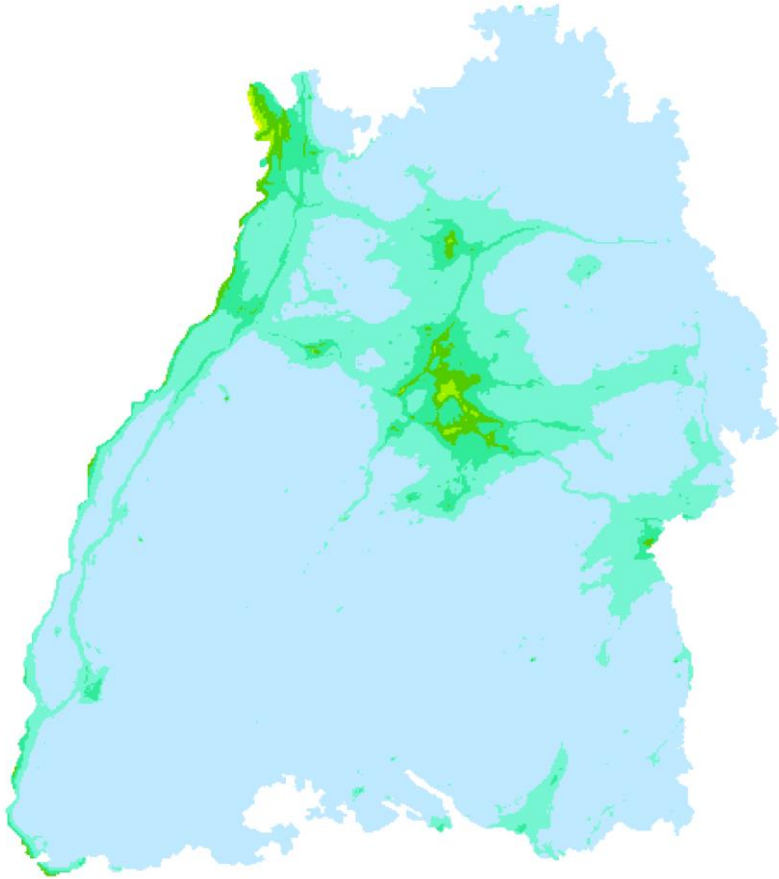
RCG model results - reference case



Data assimilation with OI - reference case

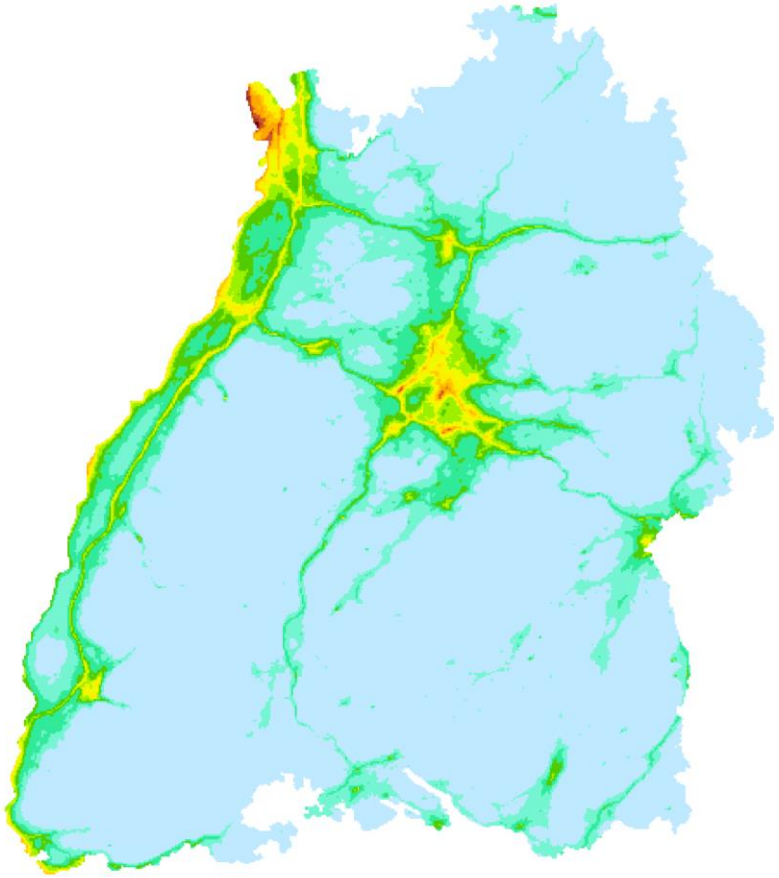


Data assimilation with OI - scenario

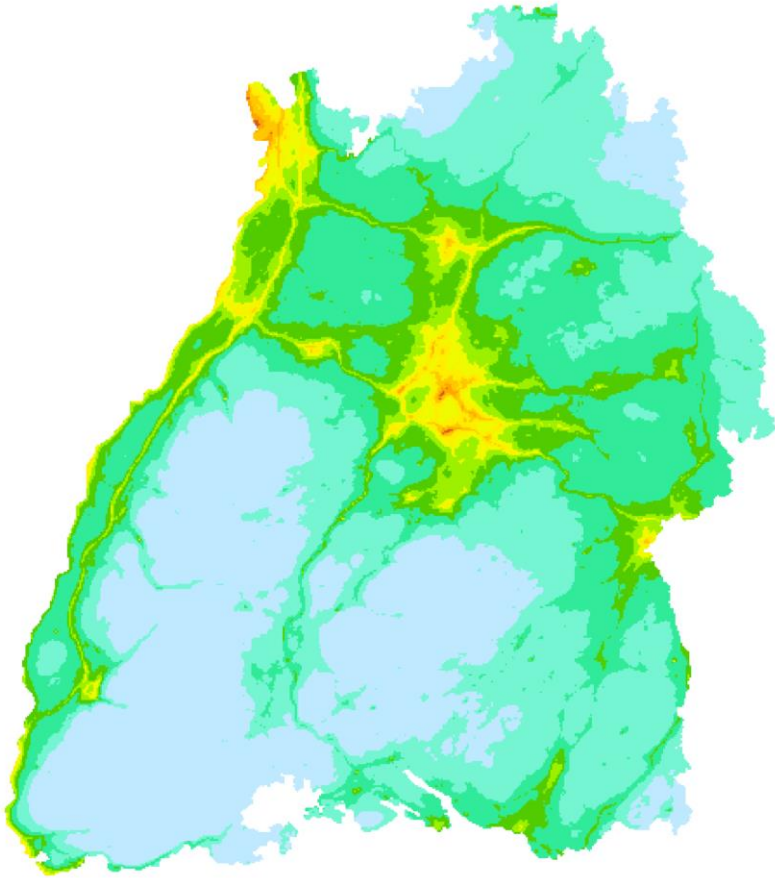


# Example

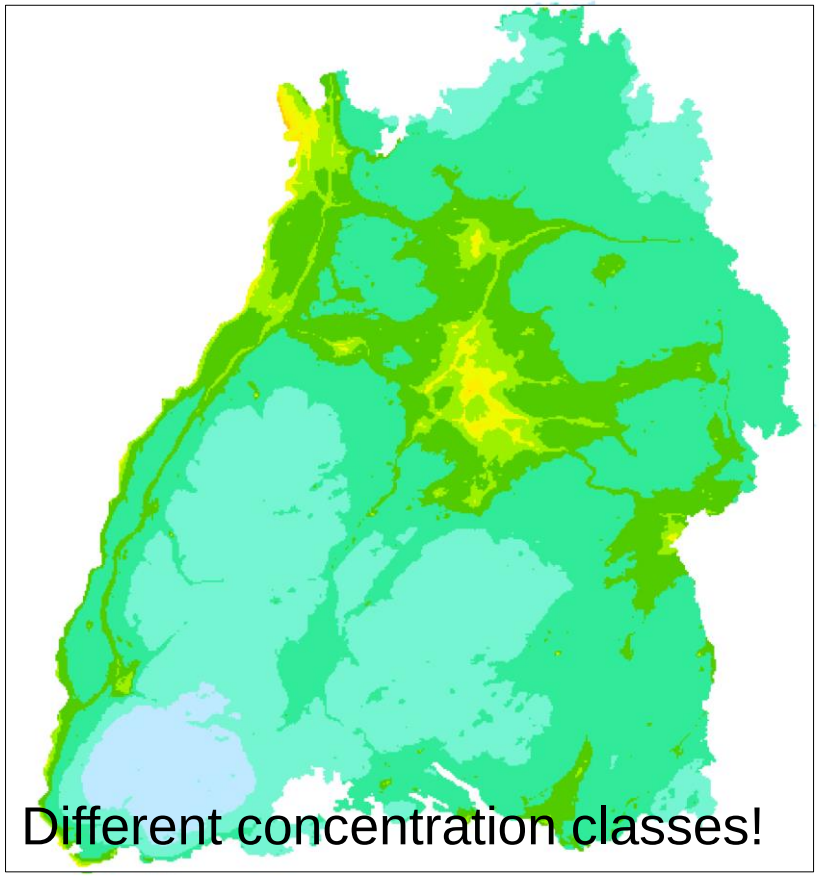
RCG model results - reference case



Data assimilation with OI - reference case



Data assimilation with OI - scenario



# Possible improvements

- keep some of the spatial dimension when determining average changes, e. g. “regions”,
- keep some of the temporal dimension, e. g. “seasons”, “day/night”
- possibly think about extending to specific emission scenarios, e. g. for some sectors based on changes determined from modelled source apportionment?
- …

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# Questions?

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