CHR Spring Seminar - 25/26th March 2015

Floodplain Sedimentation

at the German part of the River Rhine

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Scientific Question

- Deposition on the floodplains
  of the German part of the River Rhine
- How much sediment is deposited?
- What is deposited? Sand, clay, …

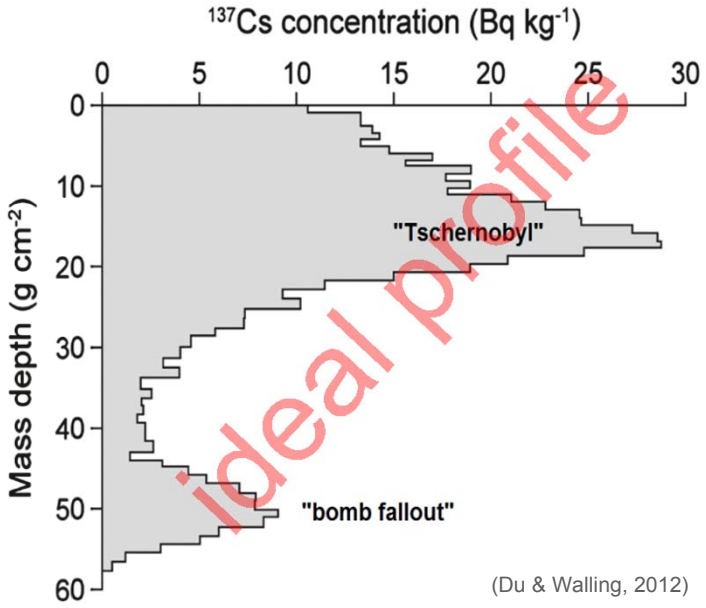

Fresh sand deposition near Koblenz, June 2013

➢ Objective: annual sedimentation rate

Method

- Analysis of cores → age dating by ^{137}Cs
- ^{137}Cs = radioactive isotope, origin in nuclear fission

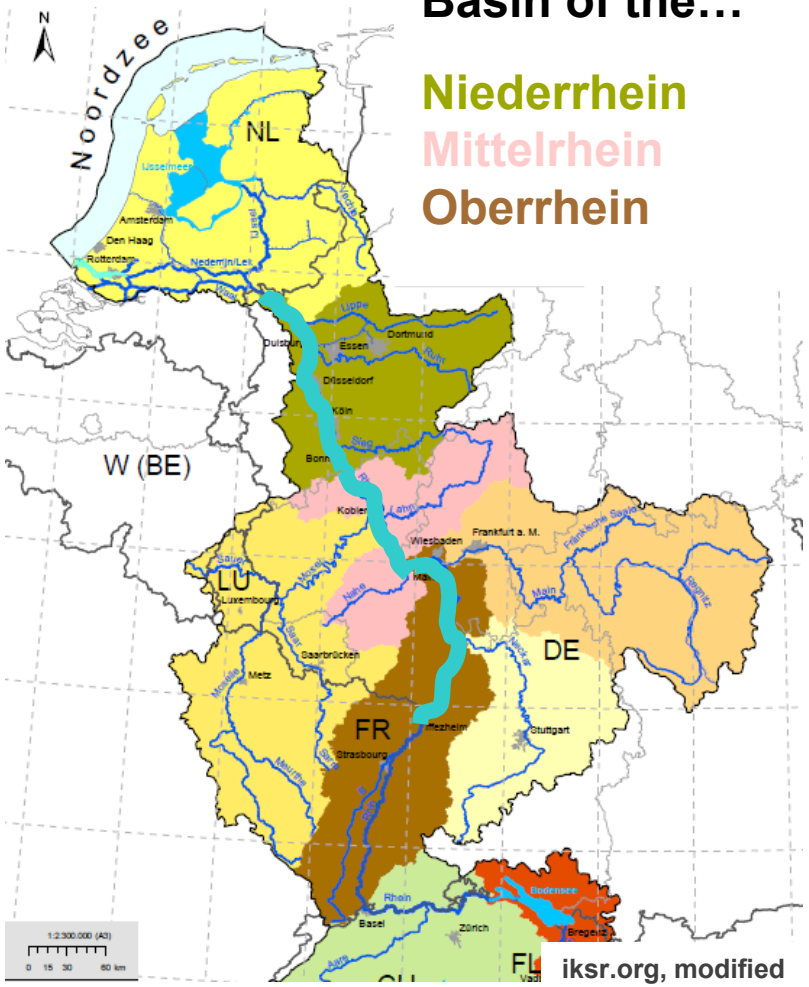
- High concentration in Rhine basin caused by
  - 1963 worldwide atomic bomb testing
  - 1986 Chernobyl



(Du & Walling, 2012)

Method

- Investigation area:
  - Free flowing Oberrhein, 197 km graben structure
  - Mittelrhein, 115 km mountainous
  - Niederrhein, 218 km lowland



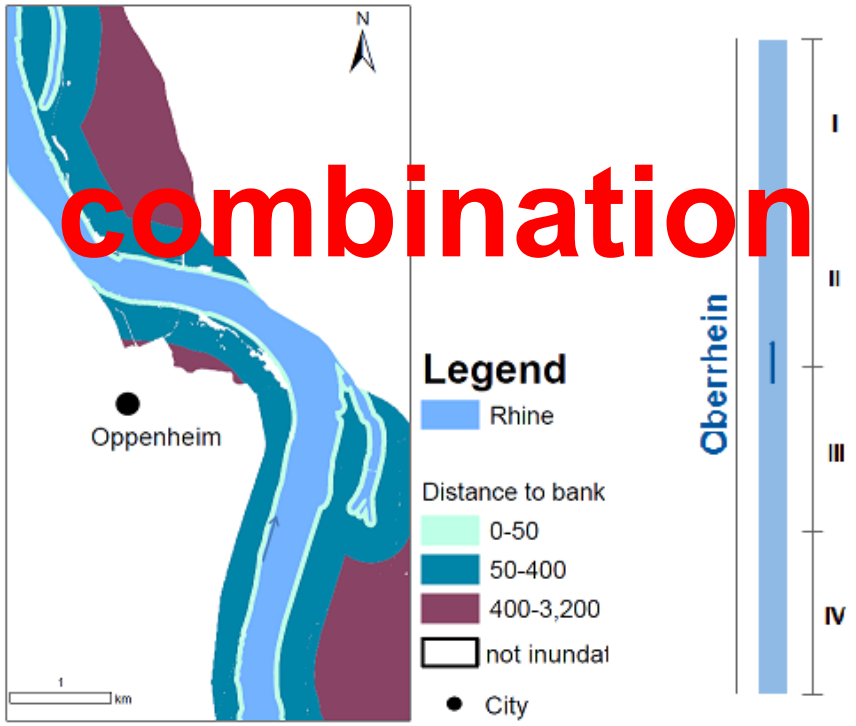
Method – Selection of Sites

- Inundated during HQ_5
- No anthropogenic operation

- Categories:
  - Ober-, Mittel-, Niederrhein
  - Distance to river bank
  - Subdivision of river parts

- Oberrhein (195 km²): 10 cores
- Mittelrhein (20 km²): 4 cores
- Niederrhein (142 km²): 9 cores

Σ = 23 cores



Method – Field

- Sampling of drill cores: PVC tube Ø 10 cm, length 65 cm

Sampling site

Sampling

Complete core

Method – Laboratory

- Preparation of the cores

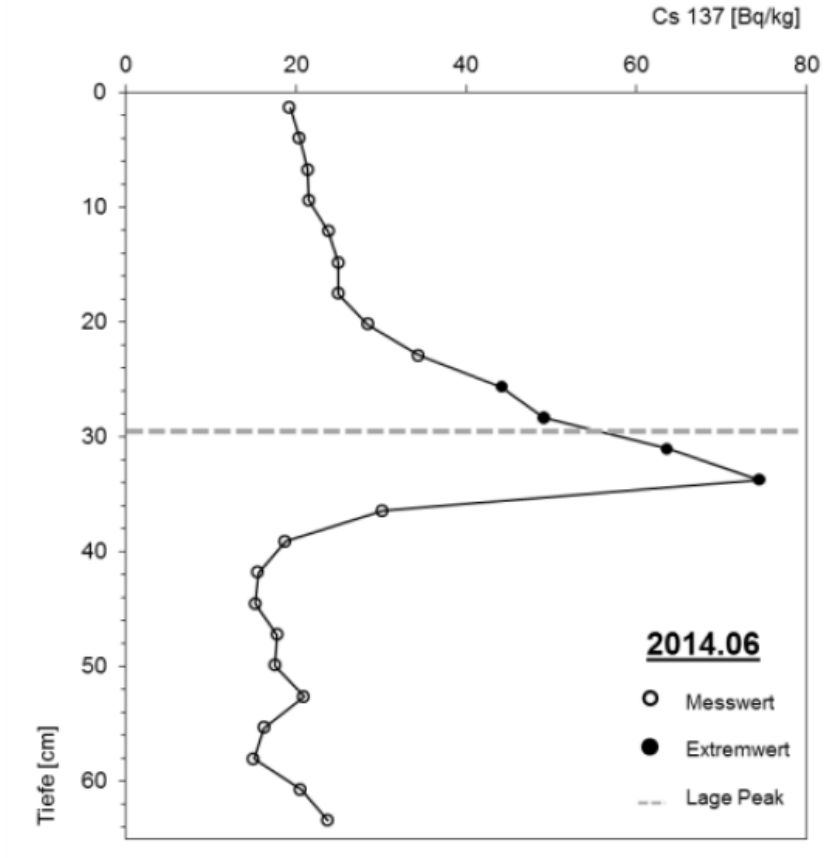
1. halve core

2. split in 1-cm-layers

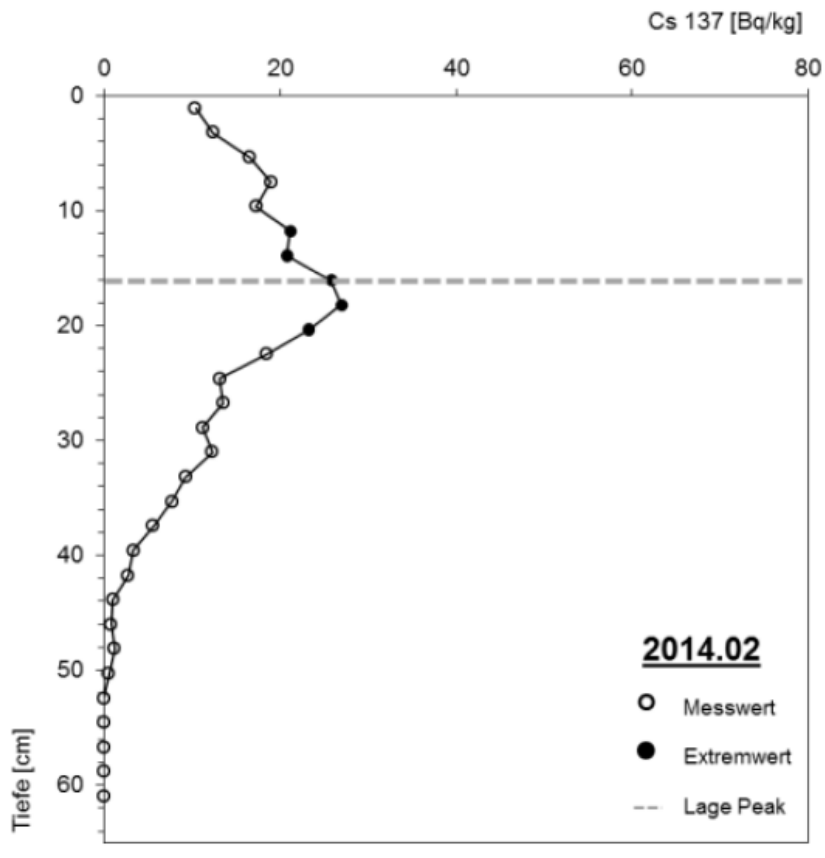
3. pack dry and homogenized layers

- Gamma ray spectroscopy of ^{137}Cs

Results – examples



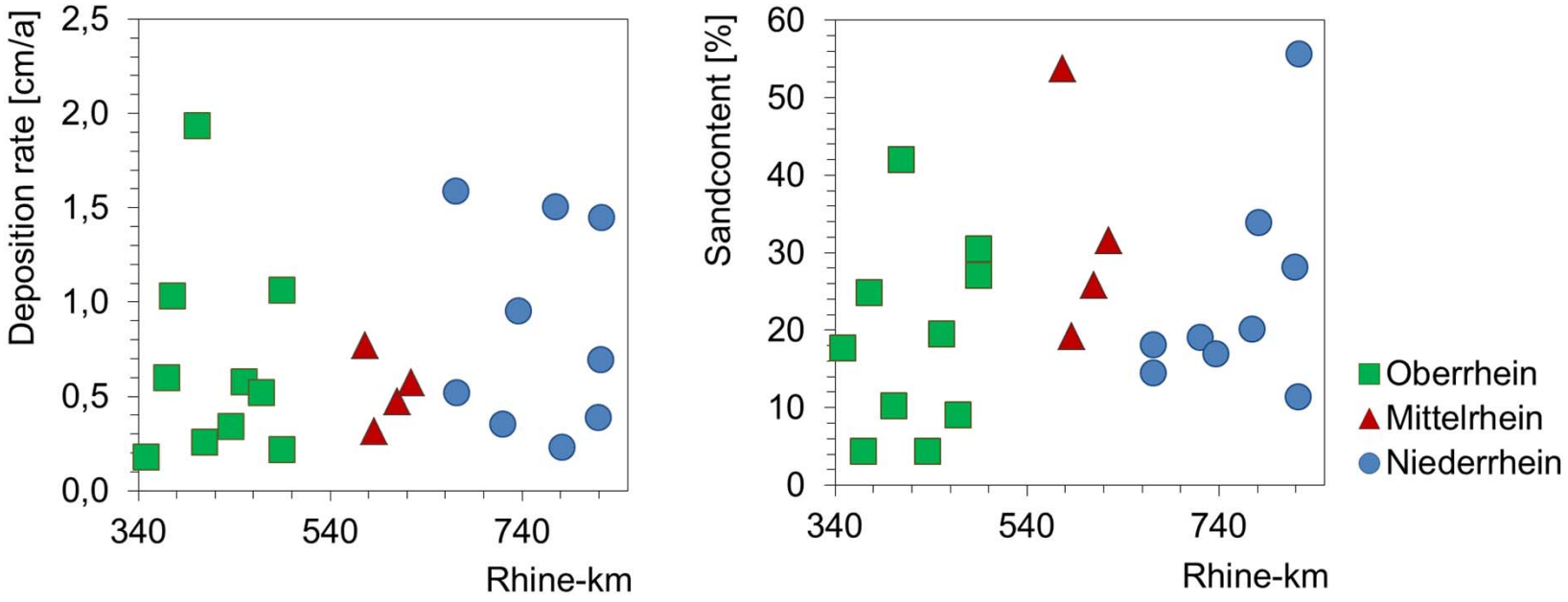
Oberrhein, km 490
0-50 m



Mittelrhein, km 623
0-50 m

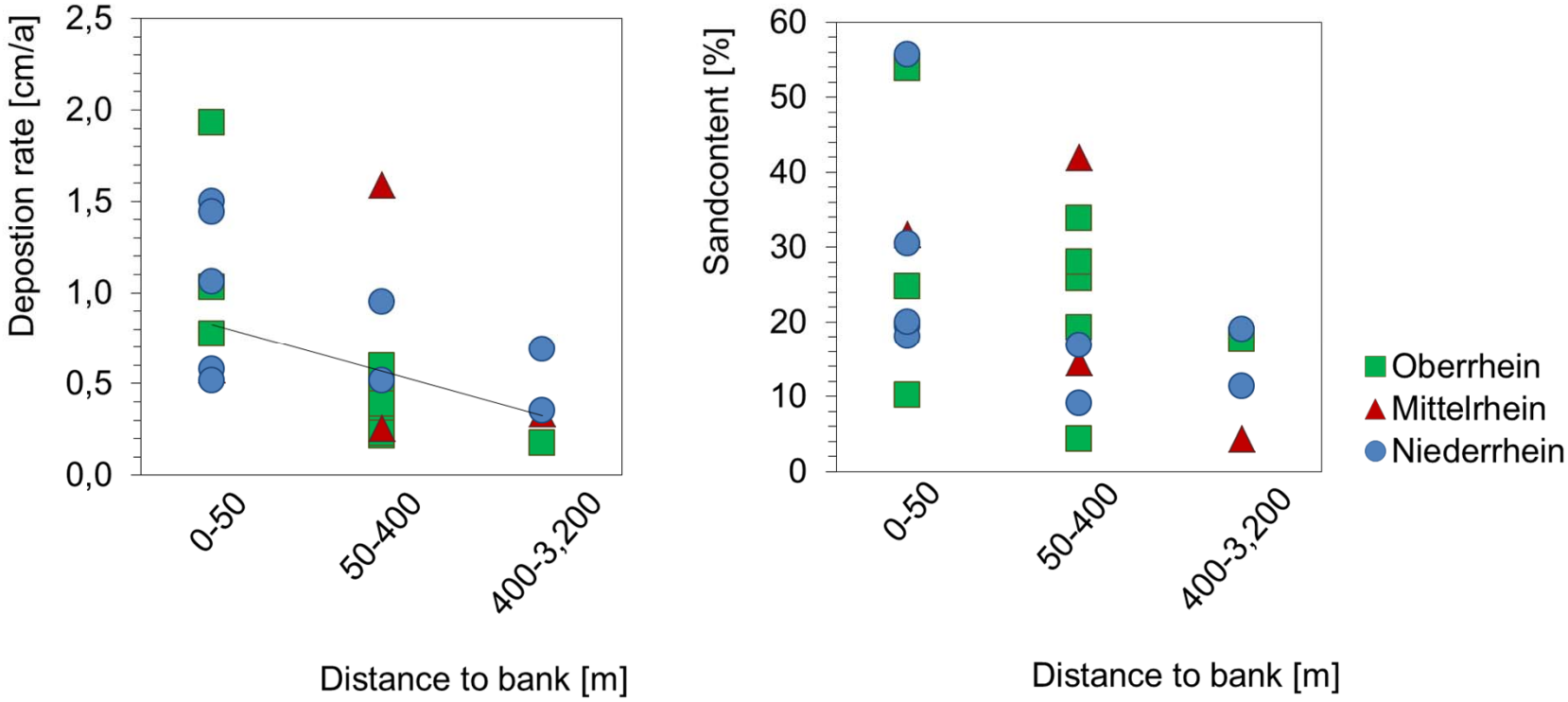
Results

- No significant variation of deposition or sand content in streamwise direction



Results

- Deposition rate and its sand content against the distance to the bank
  - ➢ decrease with increasing distance to bank (sign.)



Results

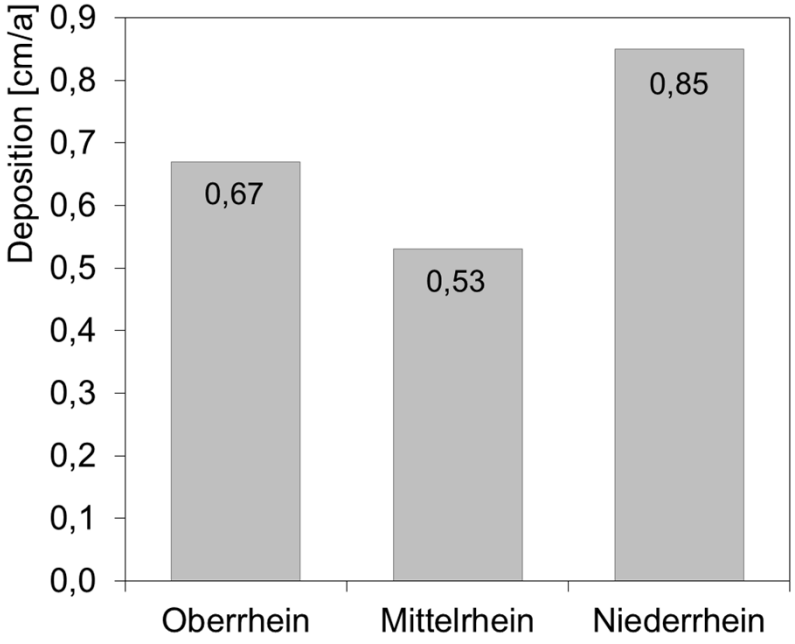
- Average annual deposition:

  thickness [cm/a]

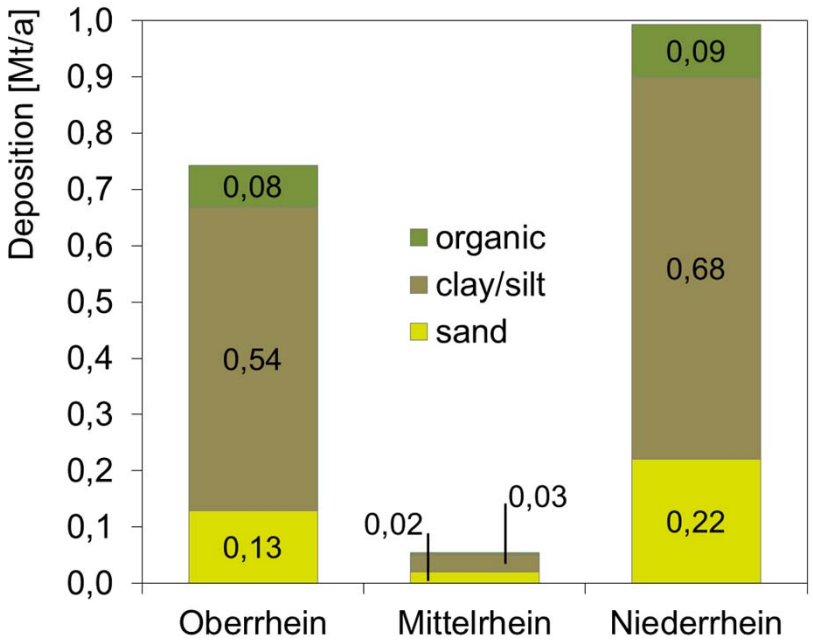
- Average annual deposition:

  • area [m²] →
  • density [t/m³] →

  mass [Mt/a]



n = 10 n = 4 n = 9



Discussion

- Deposition is not regularly → effects:
  - topography
  - land use
  - sediment supply …
- Errors by…
  - bioturbation (mules, worms, roots, …)
  - misinterpret cause of peak (bomb test – Chernobyl)

Thank you …

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… for your attention