

# The sedimentary architecture of abandoned channel fills

Willem H.J. Toonen, M.G. Kleinhans, K.M. Cohen



**Universiteit Utrecht**  
Faculty of Geosciences

w.toonen@geo.uu.nl, tel: 030-2534014  
Dept. Physical Geography, P.O. box 80.115, 3508 TC Utrecht



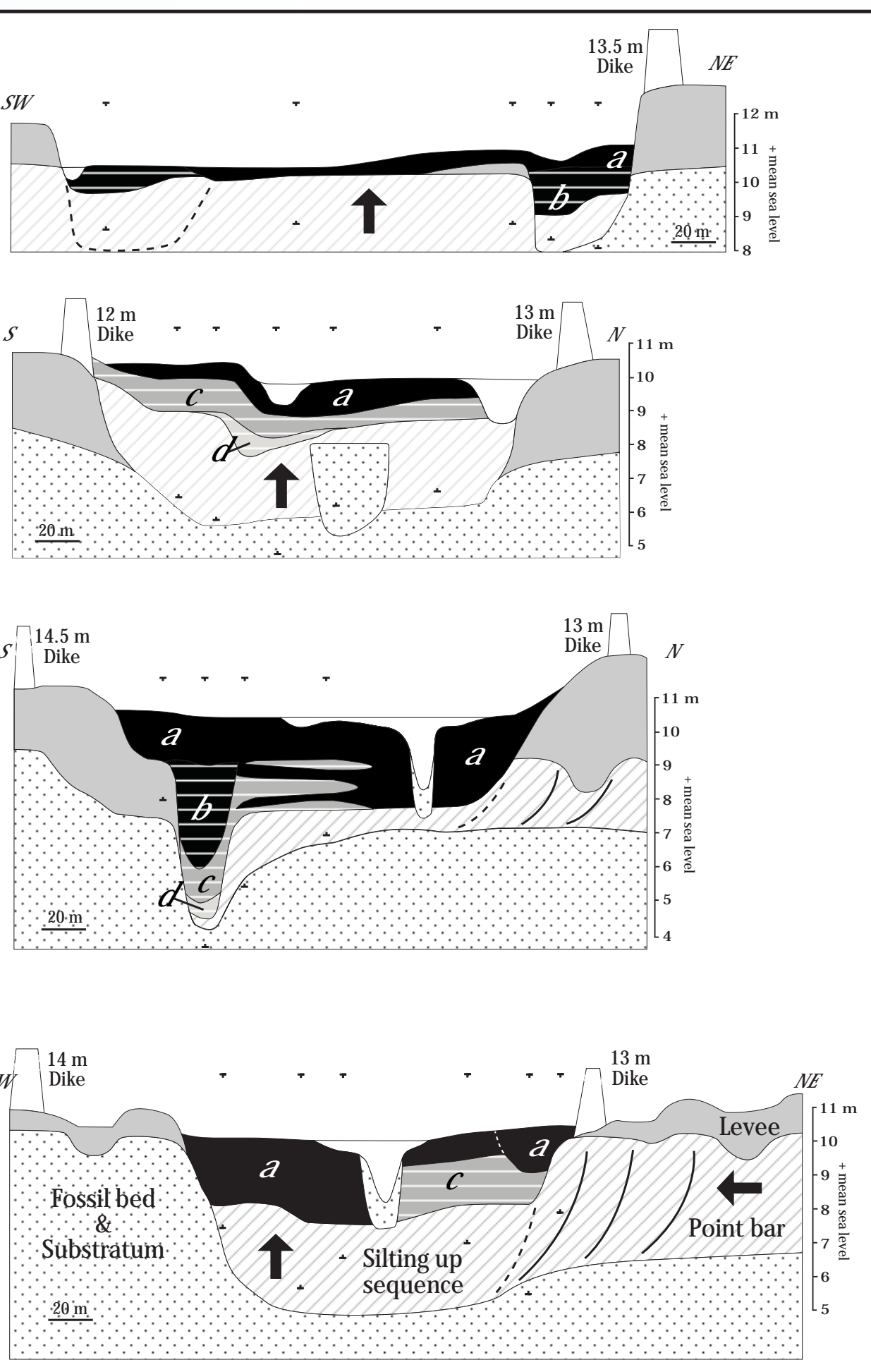
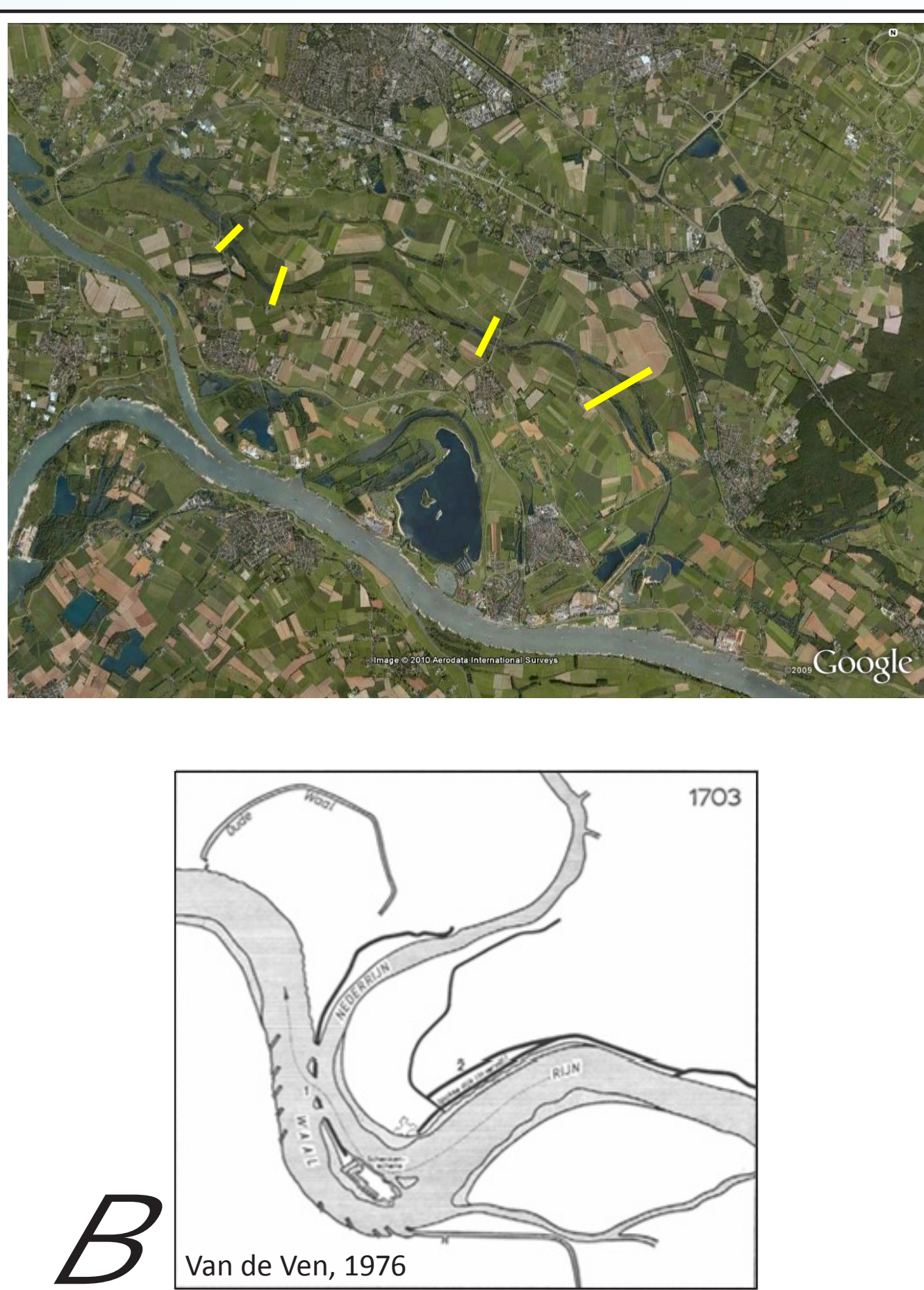
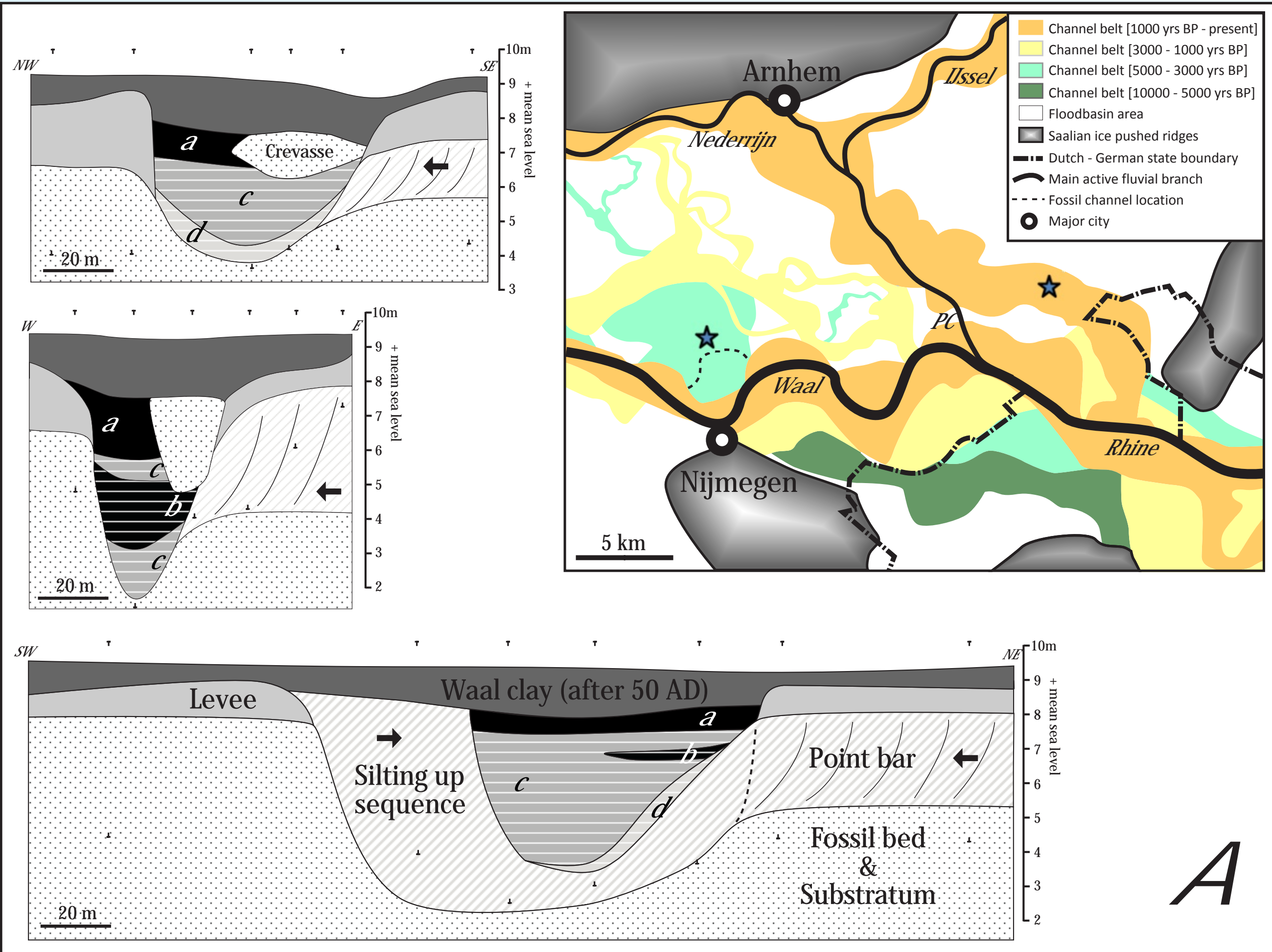
## Meander bend cutoff



## INTRODUCTION

Oxbow lakes and avulsed former channels are common examples of abandoned channels. Since their abandonment, these depressions functioned as sediment traps during floods. Their laminated fill is extremely interesting for palaeo-reconstructions, such as extreme floods of the river Rhine during the last 5000 years. However, filling mechanisms and deposit stratigraphy are poorly understood. This troubles interpretation of individual cored sites and makes correlating site records difficult. We created an integrated facies model that covers both oxbow- and avulsed-channel infilling, to improve their usability as flood registering records.

## Avulsion

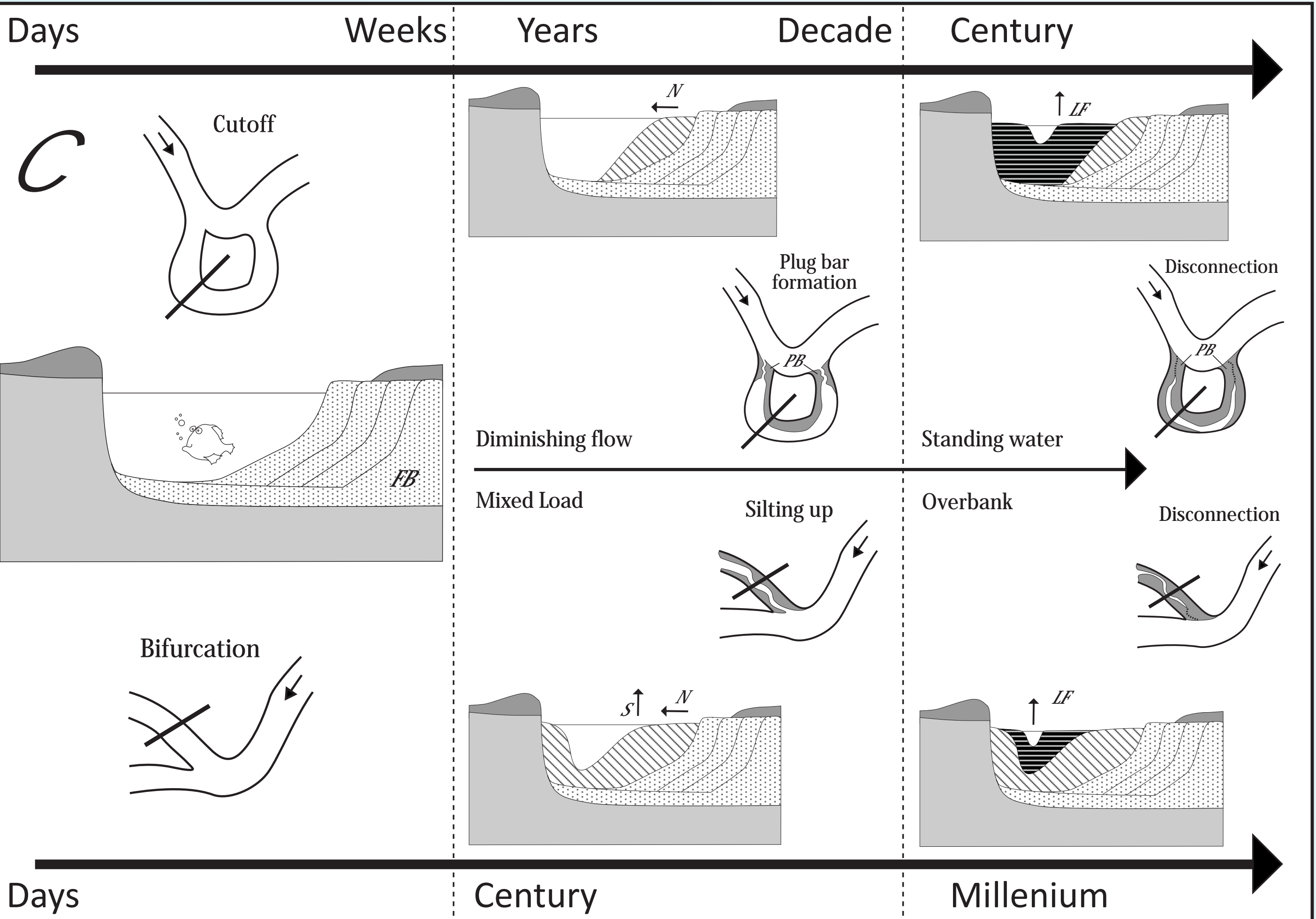


## METHODS

To construct a practical facies model for oxbow *and* avulsed-channel fills, we first built a theoretical framework based on literature on oxbows. Literature that zooms in on the fills of avulsion-abandoned channels hardly exists.

Then lithological data was collected from a filled oxbow (*A*: Waalsprong, Nijmegen) and an avulsed channel (*B*: Rijnstrangen, Lobith) in the upper delta, to validate the framework and to compare the fill-stratigraphies.

Based on numerical modelling of flow and sedimentation at the bifurcation point feeding the Rijnstrangen and differences between the fills, we created the more complete facies model presented on this poster (*C*).



## CAUSAL FACTORS

- Gradient advantage
- Sediment load
- Migration rates
- Entrance angle
- Bend configuration
- Plug bar maturity
- Tie channels
- Crevasse splays
- Proximity
- Connectivity

## CONCLUSION

Oxbows are in general abandoned within a decade, as a result of plug bar formation at the channel entrance. The remaining lake is then gradually filled during successive flooding events. The resulting laminated fill consists of overbank deposits, is located directly on top of the fossil bed, is in both longitudinal and lateral directions very homogeneous and may contain a palaeo-archive of up to 500 years.

Avulsed channels abandon very slowly: their plugging can easily take up to a millennium and all this time diminishing flow through the channel continues. Initially, the channel silts up with relative coarse sediments. After disconnection, a laminated fill can form, typically increasing in thickness in a downstream direction. Avulsed channel fills contain a heterogeneous stratigraphy in both longitudinal and lateral directions, which complicates the use of proxy data from these sites.



### References

Kleinhans, M.G., Cohen, K.M., Hoekstra, J., Umker, J.M., in prep. Effects of channel narrowing and meandering at a bifurcation on sedimentary style and duration of a nodal avulsion of the Rhine, The Netherlands.

Van de Ven, G., 1976. Aan de wieg van Rijkswaterstaat – wordingsgeschiedenis van het Pannerdens Kanaal. De Walburg Pers, Zutphen, 438 pp.

### Acknowledgements

We acknowledge Janneke Umker MSc and Jantien Hoekstra MSc for their preliminary work in the Rijnstrangen.

We acknowledge Tiuri Konijnendijk BSc for this support during the Waalsprong field campaign.