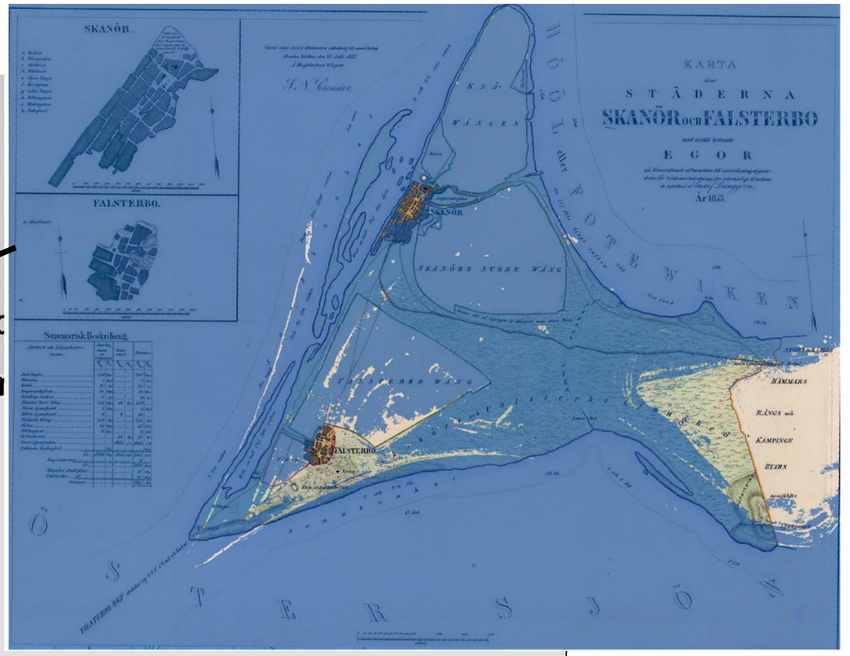
LUNDS UNIVERSITET

LTH
LUNDS TEKNISKA HÖGSKOLA

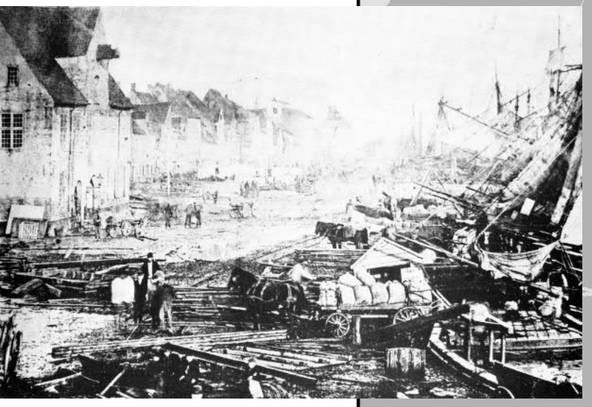
# Stormflod på tvären

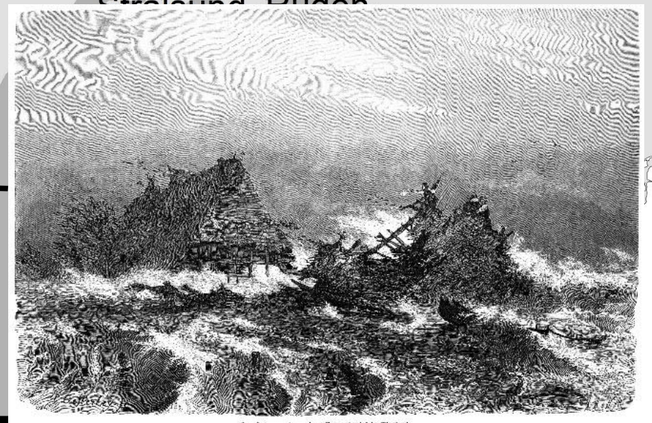
CAROLINE HALLIN OCH HELENA ALEXANDERSON

# Backafloden 13 november 1872



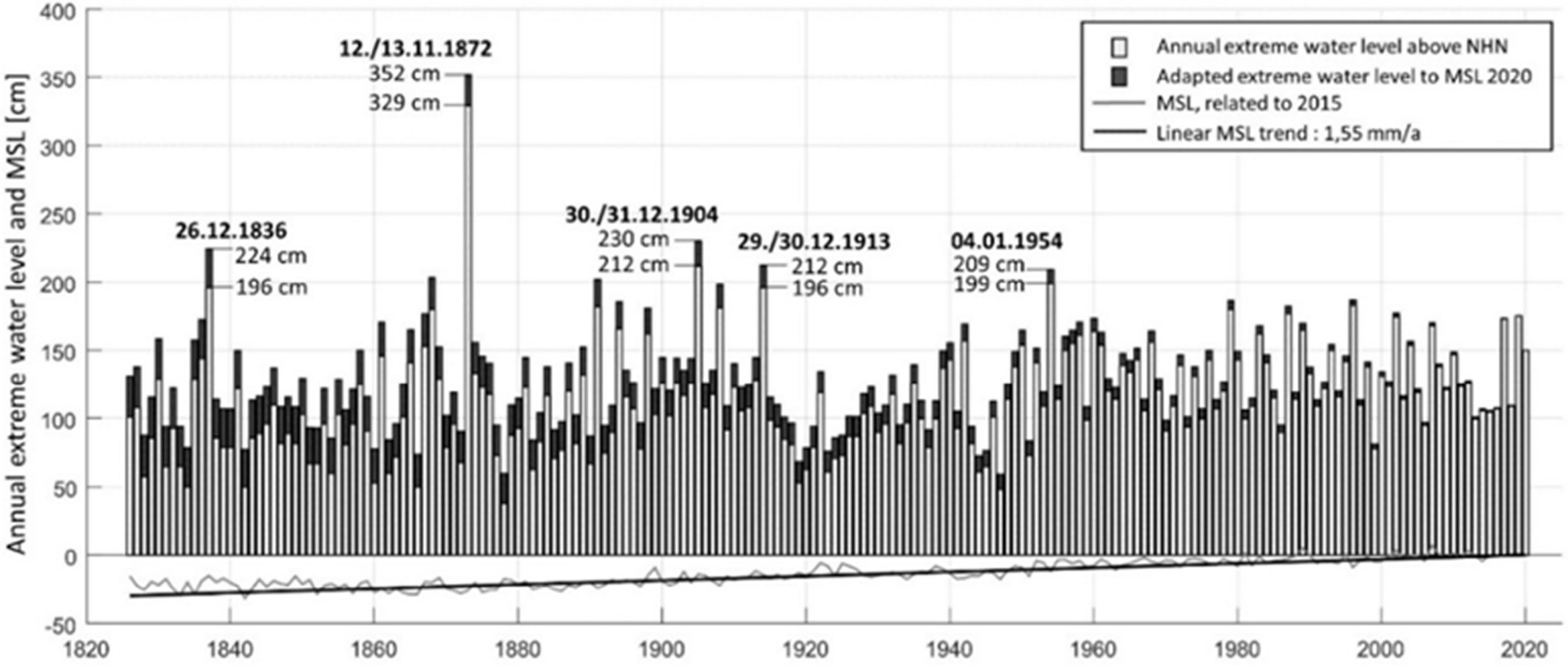

Zealand
Køge
+3.0 m
+2.4 m
Abbekås Ystad
+2.0 m
Falsterbo Peninsula
Omø
Vordingborg
Als
Flensborg
+3.2 m
+3.3 m
Lolland
+2.0 m
Falster
+3.0 m
Schleswig
+3.5 m
Eckernförde
+3.4 m
Kiel
+3.3 m
Ummanz
Dahme
Niendorf
+3.3 m
Lübeck
+3.4 m
Travemünde
0 25 50



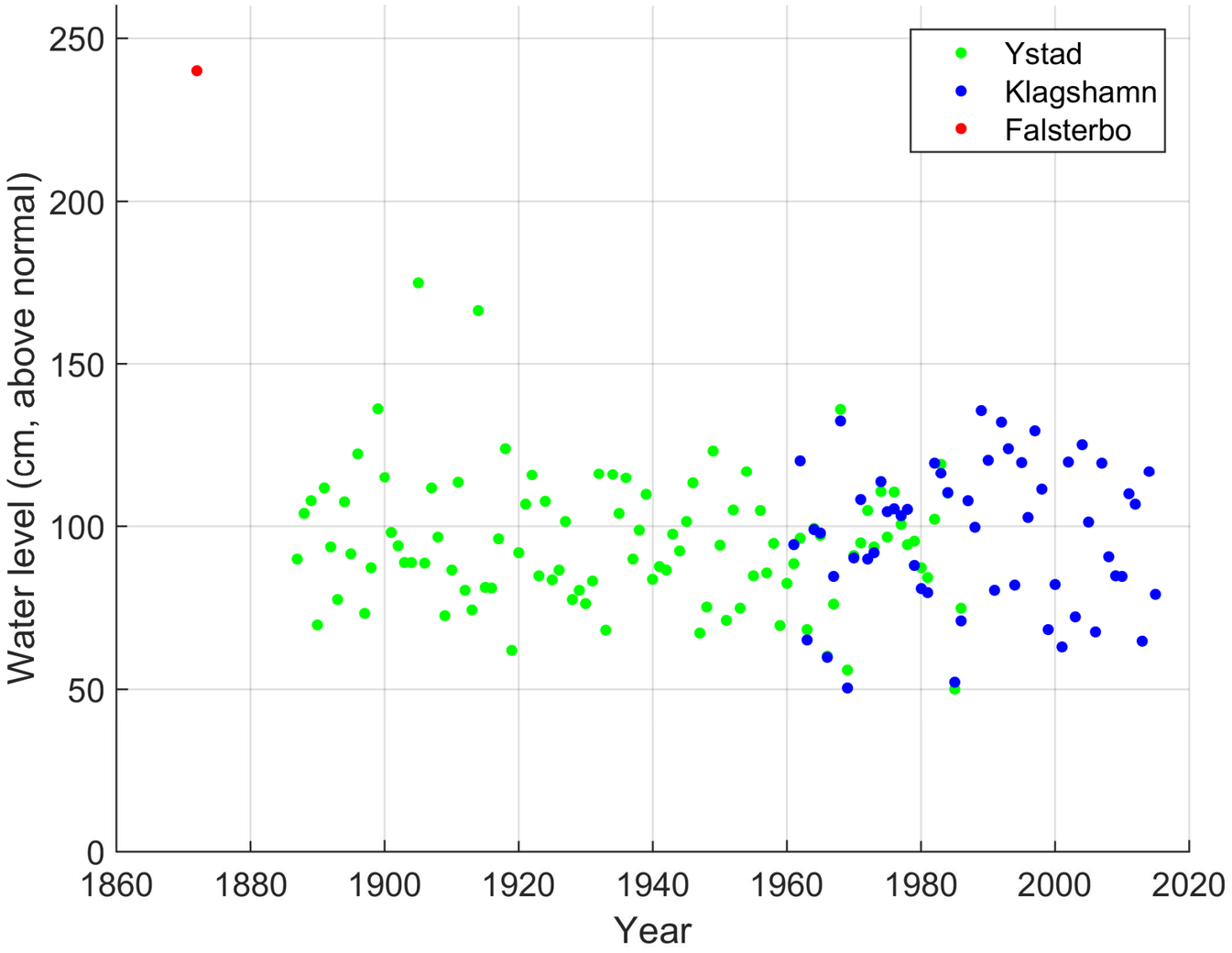


Countries
Sweden
Denmark
Germany
Poland

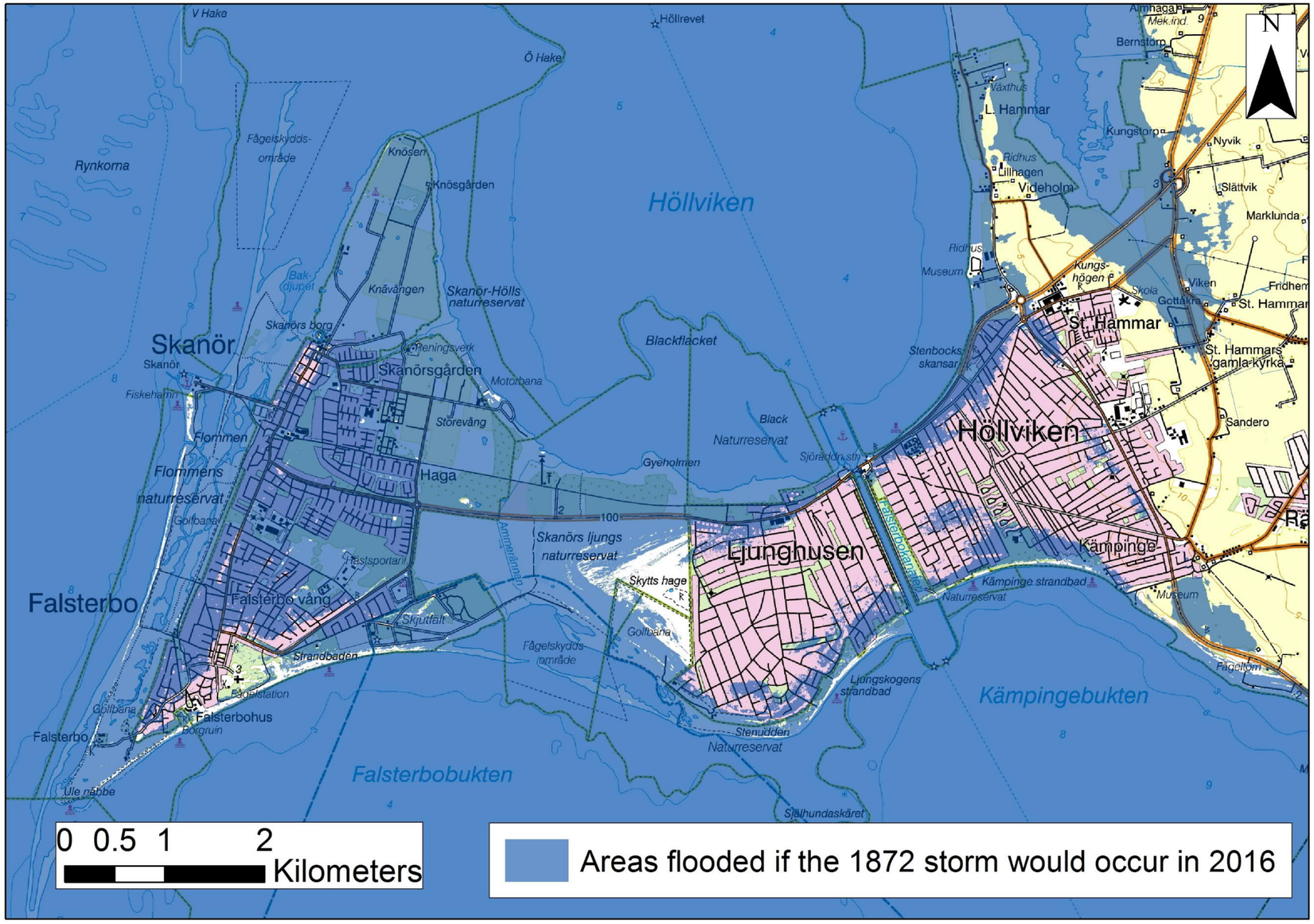
# Årshögsta vattenstånd Travemünde

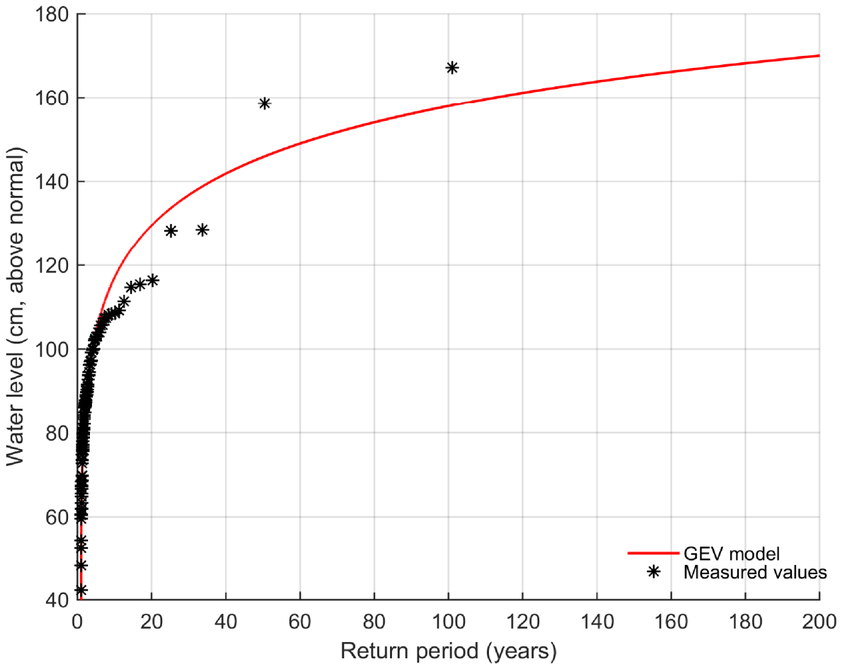


# Årshögsta vattenstånd Falsterbonäset




# Vad är sannolikheten att Backafloden händer igen?




**Beräknad återkomsttid 7000 år**

**Historiska observationer**

Travemünde (m över normal) :

1320: + 3.1 – 3.2 m

1625: + 2.84 m

1694: + 2.86 m

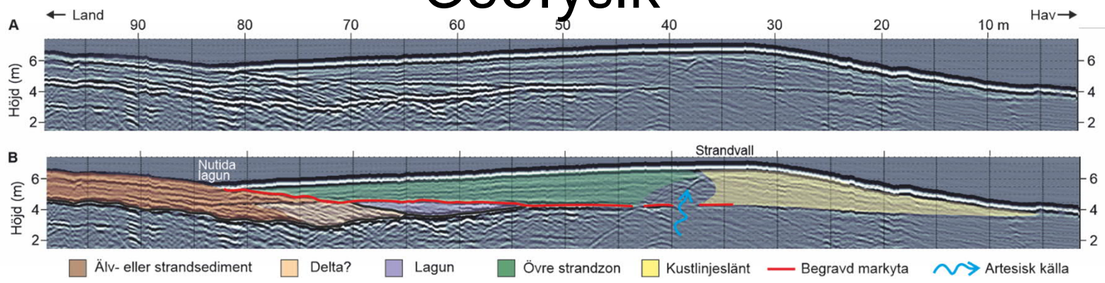
# Hur kan vi göra mer robusta skattningar av stormfloder?

- Stormfloder i Sverige
- Internationell utblick
- Påverkan av klimatvariationer och långsiktiga förändringar
- Historiska metoder
- Geologiska metoder
- Hydrodynamisk modellering
- Extremvärdesanalys
- Rekommendationer för framtida studier

# Geologiska metoder och arkiv

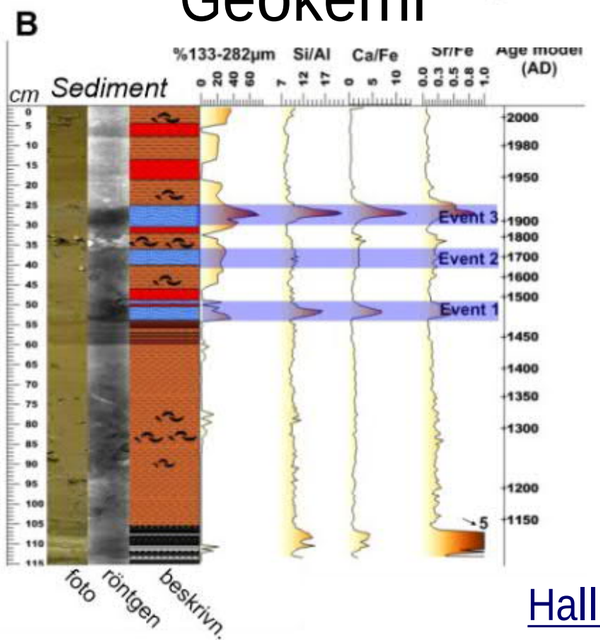
## Geomorfologi


## Geofysik



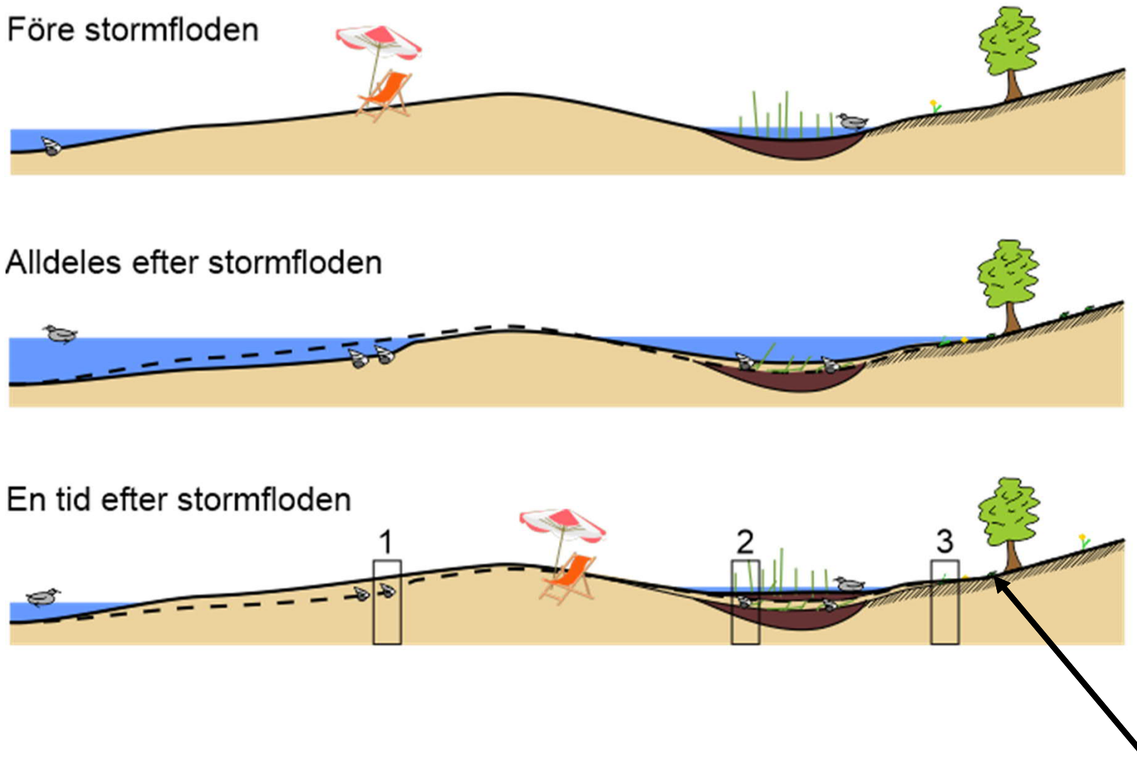

## Sedimentologi


## Geokemi

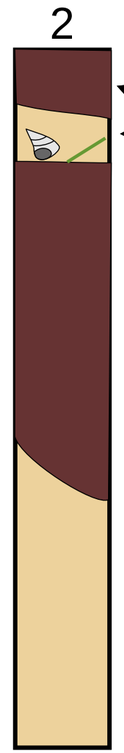



Hallin et al. 2022

# Rekonstruktion av stormflod – exempel



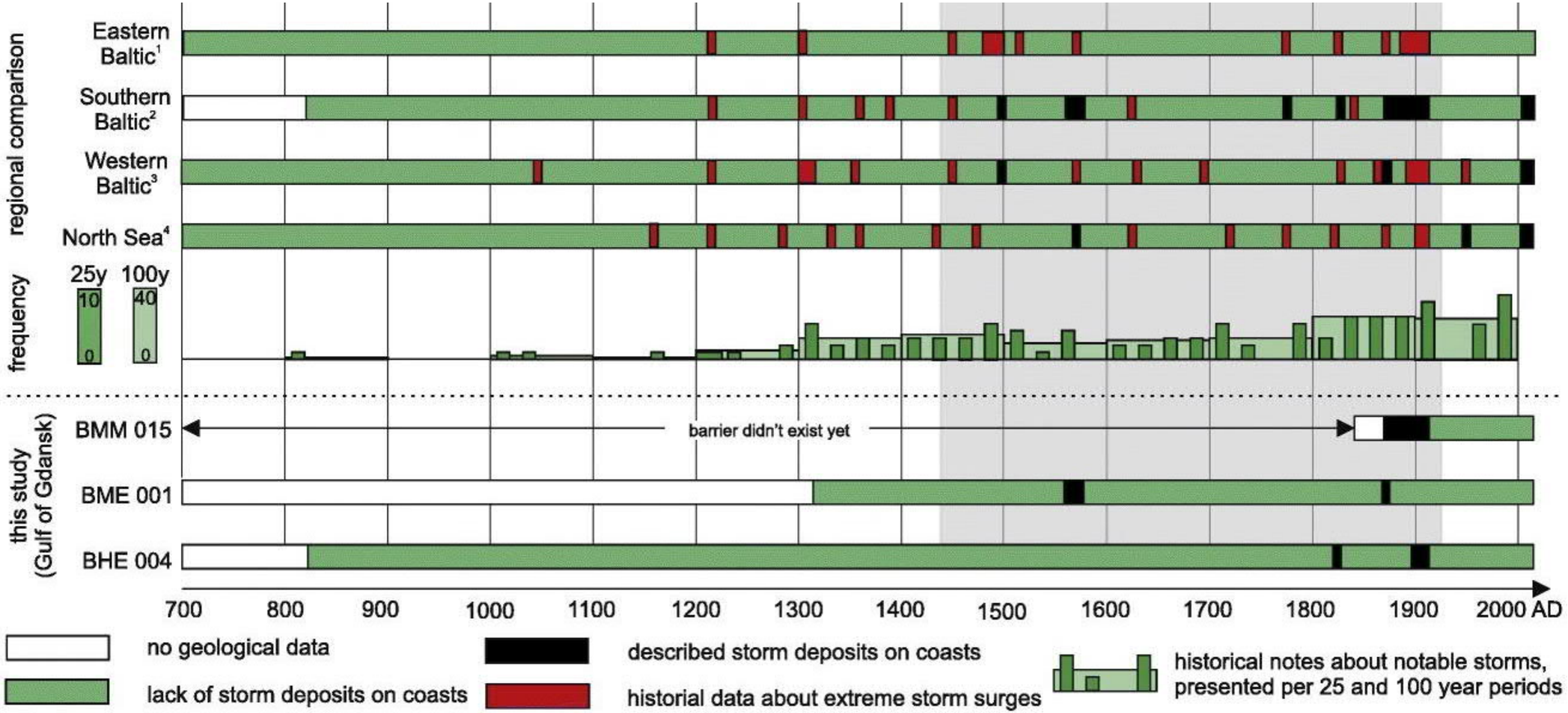

Mät in höjd – åtminstone så högt nådde vattnet


Åldersbestäm lager för min-, max- eller exakt ålder

Hallin et al. 2022

# Stormfloder i södra Östersjön




Moskalewicz et al. 2020

# Publikationer

LUNDQUA REPORT 44

## Stormfloder – en kunskapsöversikt av metoder för att identifiera och kvantifiera extrema havs-vattenstånd

CAROLINE HALLIN, HELENA ALEXANDERSON, MAGNUS LARSON & TIMOTHY LEY
LUNDS UNIVERSITET

water

MDPI

*Article*

## A Comparative Study of the Effects of the 1872 Storm and Coastal Flood Risk Management in Denmark, Germany, and Sweden

Caroline Hallin [1,2,*], Jacobus L. A. Hofstede [3], Grit Martinez [4], Jürgen Jensen [5], Nina Baron [6], Thorsten Heimann [7], Aart Kroon [8], Arne Arns [9], Björn Almström [1], Per Sørensen [10] and Magnus Larson [1]

1 Division of Water Resources Engineering, Lund University, John Ericssons väg 1, 223 63 Lund, Sweden; bjorn.almstrom@tvrl.lth.se (B.A.); magnus.larson@tvrl.lth.se (M.L.)
2 Department of Hydraulic Engineering, Delft University of Technology, Stevinweg 1, 2628 CN Delft, The Netherlands
3 Schleswig-Holstein Ministry of Energy Transition, Agriculture, Environment, Nature and Digitization, Mercatorstrasse 3-5, 24105 Kiel, Germany; Jacobus.Hofstede@melund.landsh.de
4 Ecologic Institute, Pfalzburgerstraße 43-44, 10717 Berlin, Germany; grit.martinez@ecologic.eu
5 Research Institute for Water and Environment, University of Siegen, Paul-Bonatz-Str. 9-11, 57076 Siegen, Germany; juergen.jensen@uni-siegen.de
6 The Emergency and Risk Management Program, University College Copenhagen, Sigurdsgade 26, 2200 Copenhagen, Denmark; NIBA@kp.dk
7 Environmental Policy Research Centre, Freie Universität Berlin, Ihnestraße 22, 14195 Berlin, Germany; t.heimann@fu-berlin.de
8 Department of Geosciences and Natural Resource Management, University of Copenhagen, Øster Voldgade 10, 1350 Copenhagen, Denmark; ak@ign.ku.dk
9 Faculty of Agricultural and Environmental Sciences, University of Rostock, Justus-von-Liebig-Weg 6, 18059 Rostock, Germany; arne.arns@uni-rostock.de
10 Kystdirektoratet, Højbovej 1, 7620 Lemvig, Denmark; pso@kyst.dk
* Correspondence: caroline.hallin@tvrl.lth.se

check for updates

**Citation:** Hallin, C.; Hofstede, J.L.A.; Martinez, G.; Jensen, J.; Baron, N.; Heimann, T.; Kroon, A.; Arns, A.; Almström, B.; Sørensen, P.; et al. A Comparative Study of the Effects of the 1872 Storm and Coastal Flood Risk Management in Denmark, Germany, and Sweden. *Water* **2021**, *13*, 1697. https://doi.org/10.3390/w13121697

Academic Editor: Luca Martinelli

Received: 4 May 2021
Accepted: 16 June 2021
Published: 18 June 2021

**Publisher's Note:** MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



**Abstract:** From November 12th to 13th in 1872, an extreme coastal flood event occurred in the south Baltic Sea. An unusual combination of winds created a storm surge reaching up to 3.5 m above mean sea level, which is more than a meter higher than all other observations over the past 200 years. On the Danish, German, and Swedish coasts, about 300 people lost their lives. The consequences of the storm in Denmark and Germany were more severe than in Sweden, with significantly larger destruction and higher numbers of casualties. In Denmark and Germany, the 1872 storm has been more extensively documented and remembered and still influences local and regional risk awareness. A comparative study indicates that the collective memory of the 1872 storm is related to the background knowledge about floods, the damage extent, and the response to the storm. Flood marks and dikes help to remember the events. In general, coastal flood defence is to the largest degree implemented in the affected areas in Germany, followed by Denmark, and is almost absent in Sweden, corresponding to the extent of the collective memory of the 1872 storm. Within the affected countries, there is local variability of flood risk awareness associated with the collective memory of the storm. Also, the economic dependency on flood-prone areas and conflicting interests with the tourism industry have influence on flood protection decisions. The processes of climate change adaptation and implementation of the EU Floods Directive are slowly removing these differences in flood risk management approaches.

**Keywords:** 1872 storm; collective memory; historical storms; flood risk management

### 1. Introduction

The sensitivity for coastal flooding is usually assessed by using statistical analyses of measured water levels and by applying hydrodynamic models. The flooding sensitivity is



## A Method for Evaluating and Mapping Terrestrial Deposition and Preservation Potential- for Palaeostorm Surge Traces.

### Remote Mapping of the Coast of Scania, Blekinge and Halland, in Southern Sweden, with a Field Study at Dalköpinge Ängar, Trelleborg.

***Lykke Lundgren Sassner***

**Dissertations in Geology at Lund University,**
**Master's thesis, no 614**
**(45 hp/ECTS credits)**

**Department of Geology**
**Lund University**
**2021**

[Hallin_etal_2022_Stormfloder.pdf (lu.se)]

[Water | Free Full-Text | A Comparative Study of the Effects of the 1872 Storm and Coastal Flood Risk Management in Denmark, Germany, and Sweden | HTML (mdpi.com)]

[Lundgren Sassner 2021 MSc-arbete i geologi]

# Vad gör vi näst?

- Simulering av vågförhållanden under stormarna 1872 och 1904
- Studier av historiska arkiv – Julstormen 1902
- Inventera möjliga platser
- Genomföra pilotprojekt på utvalda platser för att testa och utveckla geologisk metodik för svenska förhållanden


LUNDS UNIVERSITET

LTH

LUNDS TEKNISKA HÖGSKOLA