

Past & Future Climate Change in the German Bight & the Elbe Estuary

- Part: German Bight -

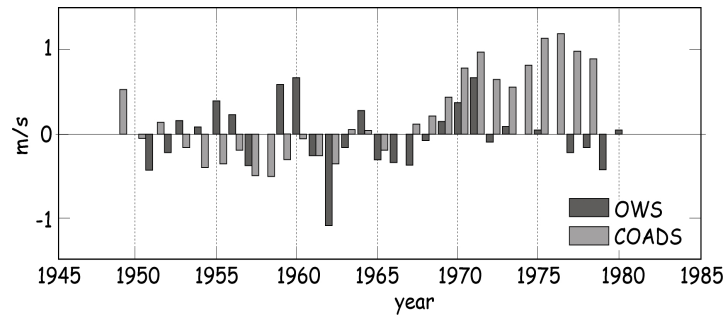
**Ralf Weisse, Iris Grabemann, Elke Meyer,
Frauke Albrecht, Hans von Storch**

GKSS Forschungszentrum Geesthacht

Structure of Presentation

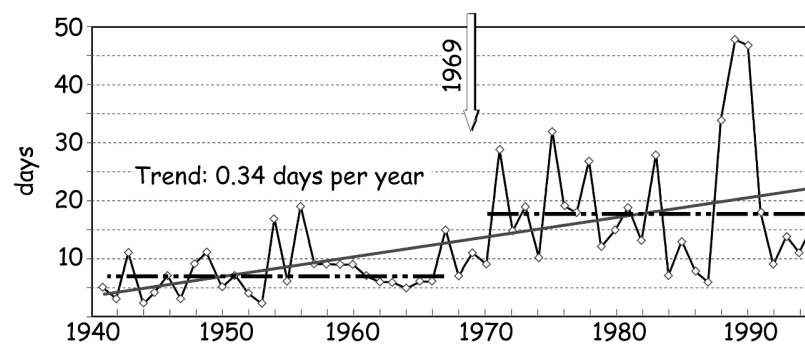
- The Homogeneity Problem
- Approach
- Past Changes & Potential Future Developments
(Summary of relevant chapters from "Klimabericht für die
Metropolregion Hamburg")

The Homogeneity Problem



Estimated changes in mean wind speed in the North Pacific in the area of ocean weather station OWS P. Data from the ocean weather station are marked as "OWS" (ocean weather ship), and those from the ships of opportunity in the vicinity of OWS as "COADS". (After Isemer, pers. communication)

The Homogeneity Problem



Number of days per year where wind speeds of 21 ms^{-1} and more (storm days) have been observed in Kullaberg, southwest Sweden (bottom); The solid line represents the annual values, the straight solid line the linear trend over the time interval shown, and the two horizontal lines are the 1941-1969 and the 1970-1995 averages respectively.

Approach

1. Proxy Data

Variables that carry the same physical information but are less affected by homogeneity problems; e.g. pressure based storm indices

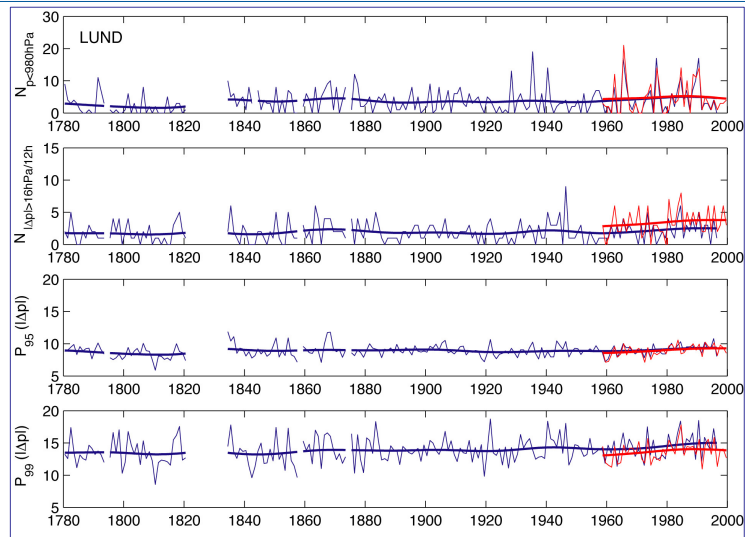
2. Model Hindcast (Reconstruction) & Scenarios

Use models in combination with existing measurements to reconstruct past changes & to produce scenarios for the future

Approach

Pressure-based storm indicators derived from pressure readings in Lund. From top to bottom: The number of deep pressure readings, number of absolute 12h pressure differences exceeding 16 hPa., Intra-annual 95-percentile and 99-percentile of the 12h pressure differences. In red statistics simulated by the regional model REMO for 1958-2000 are added.

(After Barring and von Storch 2004)



Past & Potential Future Changes (Klimabericht Metropolregion Hamburg)



	Past	Future
SST	<ul style="list-style-type: none"> - Approx. +1.1 K since 1962 - Decadal Trends particularly pronounced since about 1980 	<ul style="list-style-type: none"> - Approx. +1-2K until 2100 depending on model & scenario - Warming strongest in summer
SSS	<ul style="list-style-type: none"> - No significant change (trend) since about 1900 	<ul style="list-style-type: none"> - No consolidated (consistent) statements so far
Water Levels	<ul style="list-style-type: none"> - MTHW approx. 2-3 mm/year along the German coastline - No significant change in meteorologically caused variations (surge) 	<ul style="list-style-type: none"> - IPCC globally approx. 18-59 cm till 2100 - Regional effects uncertain - Surge: Tendency towards an increase
Sea State	<ul style="list-style-type: none"> - No significant change (trend) - Variability closely linked to that of storm activity 	<ul style="list-style-type: none"> - Tendency towards an increase - Considerable uncertainties
Sea Ice	<ul style="list-style-type: none"> - Tendency towards less severe ice winters 	<ul style="list-style-type: none"> - No explicit study



PAGE 7

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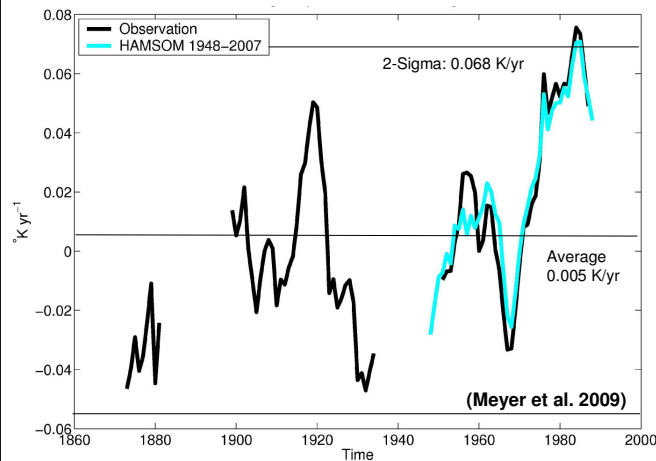


PAGE 8

Past & Potential Future Changes (Klimabericht Metropolregion Hamburg)



20-year running averages SST Helgoland



- No significant Trend until approx. 1985
- Decadal trend emerging approx. 1980-85 highest on record
- Corresponds to an increase of about 1.13 K (Helgoland) since 1962



PAGE 9

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PAGE 10

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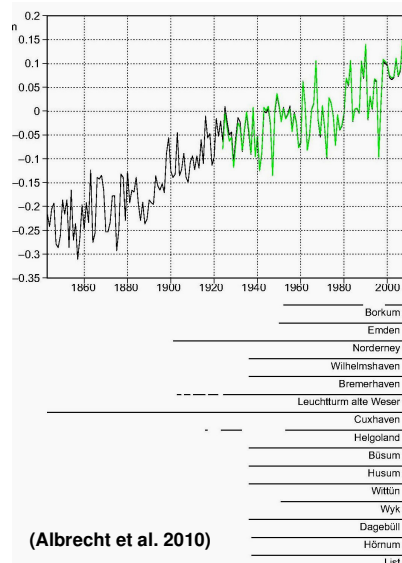


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PAGE 11

Past & Potential Future Changes (Klimabericht Metropolregion Hamburg)



Regional Mean Sea Level Changes
1936-2008

German Bight: ~ 1.95 mm/yr

Lower Saxony: ~ 1.7 mm/yr

Schleswig-Holstein: ~ 2.0 mm/yr



PAGE 12

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PAGE 13

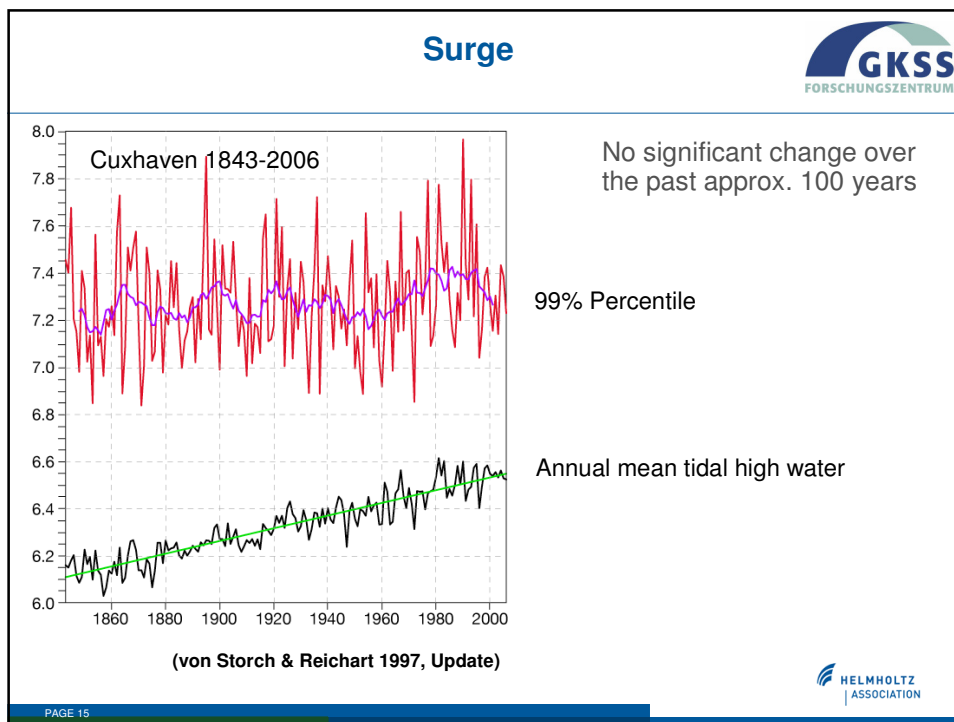
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PAGE 14



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PAGE 16

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