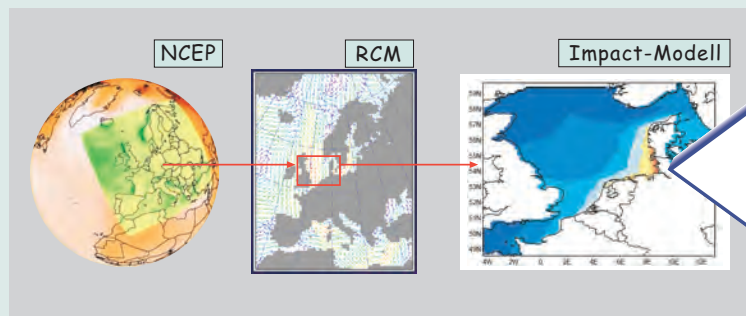


Hans von Storch, Ralf Weisse, Frauke Feser, Jörg Winterfeldt, Andreas Plüss and Lidia Gaslikova
Institute for Coastal Research, GKSS Research Centre, Geesthacht, Germany

Detailed description and assessment of coastal climate change since 1958 in N Europe

In a concerted effort of a series of quasi-realistic models of the regional atmosphere, the hydrodynamics of the North Sea and of the wave conditions, the global re-analyses of NCEP are downscaled to a high-resolution grid presentation of storminess, currents, water levels and wave heights in Northern Europe and particularly the North Sea area. In this way, the past development is described with an hourly time increment for more than 40 years (1958-2004).



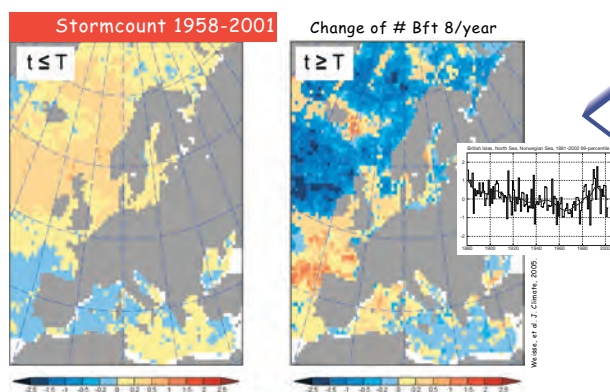
strategy

Even if not all events are reproduced in detail, the statistics as conditioned by the large scale atmospheric state compare favorably with the limited instrumental evidence, in particular with respect to all aspects related to marine windiness.

performance

Years	Wind [m/s]					
	coastDat			Observed		
	χ_{γ}^{90}	χ_{γ}	χ_{γ}^{90}	χ_{γ}^{90}	χ_{γ}	χ_{γ}^{90}
2	24.38	25.17	25.96	24.05	25.21	26.37
5	25.86	27.28	28.70	25.75	27.64	29.53
25	28.44	31.33	34.22	28.09	32.77	37.45

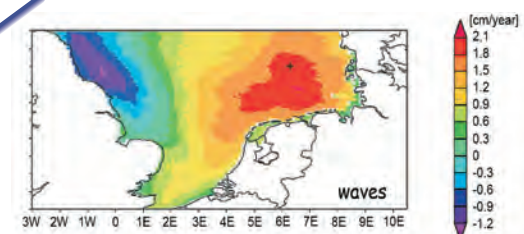
The analysis of the changing conditions indicates that for most parts of Northern Europe, storminess was on the rise until the early 1990s, after which a decline took place with the notable exception of the southern North Sea.



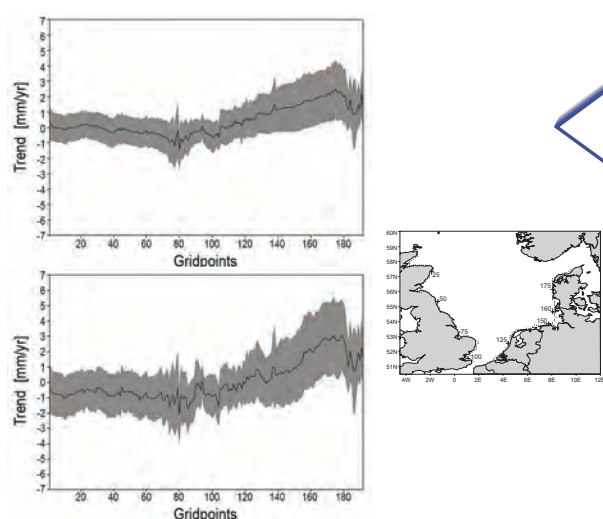
storminess

The characteristics of storm surge heights and wave heights followed this trend in marine windiness, with an increase of only a few centimeters in terms of storm surge heights but up to 80 cm in high waves during the past four decades in the German Bight.

waves



linear trend of annual 99 %ile, 1998-2002



Linear trend 1958-2002 in mm year-1 (solid) of winter (Nov-Mar) mean (upper) and 90 %ile (lower) high water. The 95% confidence interval indicated in grey. The x-axis represents grid points along the North Sea coast. For the numbering of locations, see small map.

surges

von Storch, H., H. Langenberg and F. Feser, 2000: A spectral nudging technique for dynamical downscaling purposes. Mon. Wea. Rev. 128: 3664-3673
 Weisse, R., H. von Storch and F. Feser, 2005: Northeast Atlantic and North Sea storminess as simulated by a regional climate model 1958-2001 and comparison with observations. J. Climate 18, 465-479
 Weisse, R. and A. Plüss, 2005: Storm related sea level variations along the North Sea Coast as simulated by a high-resolution model 1958-2002, Ocean Dynamics, DOI: 10.1007/s10236-005-0037-y
 Gaslikova, L., 2006: High-resolution wave climate analysis in the Helgoland area. PhD thesis, U Hamburg, 102pp
 Feser, F., 2006. Enhanced detectability of added value in limited area model results separated into different spatial scales. Mon Wea. Rev. (in press)

The resulting hourly, high-resolution data set forms one of two major components of the data set **coastDat**, which is provided by the Institute for Coastal Research at GKSS to a variety of clients dealing with changing ecological conditions, coastal defense and offshore activity in the North Sea.