BMDV Network of Experts
Knowledge Ability Action

DAS Basisdienst
Klima und Wasser

CL4.9 Understanding sea level changes: global to local, from past to future - X5.180

Federal Ministry for Digital and Transport

Sea level projections for the German Coast

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Motivation

Our aim is to provide high-quality projections of relative sea level change for the German coastal areas, both in terms of spatial data as well as time series for specific stations. → *DAS core service "climate and water"*

Existing data from the IPCC projections are combined with a new and high-resolution land elevation model (instead of the coarse land elevation model for this region in the IPCC) → *BMDV „Network of Experts"*

Good to know - Land elevation?

Over Europe mostly post-glacial land uplift, caused by the missing weight of the ice sheet from the last ice age.

Sea level contributions

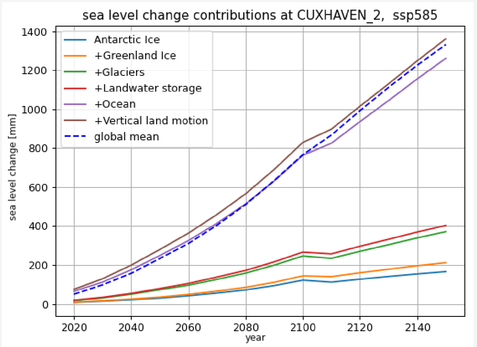

Fig. 1 Cummulative sum of sea level contributions according to IPCC AR6 ssp585 at station Cuxhaven and global mean for comparison

Literature

Garner, G., Hermans, T. H., Kopp, R., Slangen, A., Edwards, T., Levermann, A., ... & Pearson, B. (2022). IPCC AR6 WGI Sea Level Projections.

Kopp, R. E., Horton, R. M., Little, C. M., Mitrovica, J. X., Oppenheimer, M., Rasmussen, D. J., ... & Tebaldi, C. (2014). Probabilistic 21st and 22nd century sea-level projections at a global network of tide-gauge sites. Earth's future, 2(8), 383-406.

Vestøl, O., Ågren, J., Steffen, H., Kierulf, H., & Tarasov, L. (2019). NKG2016LU: a new land uplift model for Fennoscandia and the Baltic Region. *Journal of Geodesy*, *93*, 1759-1779.

Data

- **IPCC** AR6 sea level change (*Garner et. al 2022*), land motion from *Kopp (2014)*
- Regional land elevation model over the North and Baltic Sea (Fennoscandinavia) („**NKG**", NKG2016_LU_lev, *Vestøl et. al 2019*)

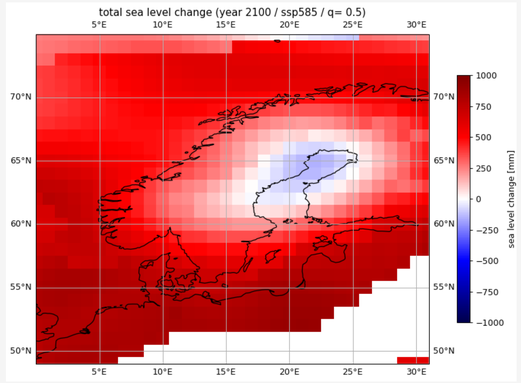

Fig. 2 Median of total sea level change relative to 1986–2005 from IPCC AR6 „ssp585" scenario for year 2100

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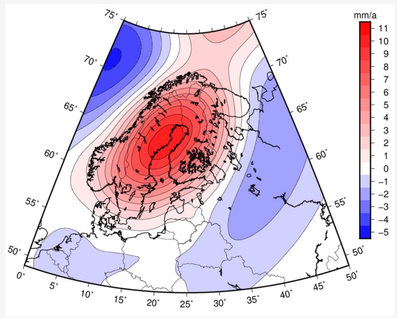
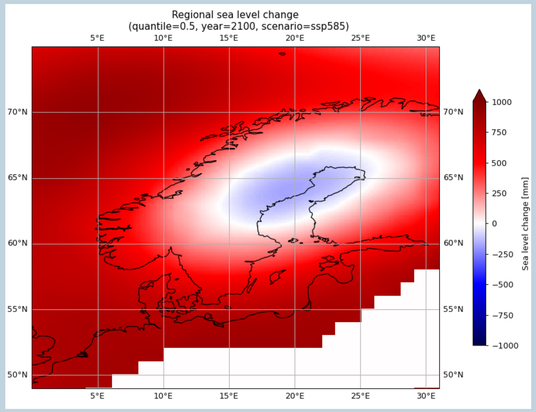


Fig. 3 Fig.9 from Vestøl et. al 2019, final NKG2016LU_abs land elevation model

Combination of IPCC sea level with different land elevation model „NKG"

Results - products



- Spatial data for the North and Baltic Sea
- Time series incl. uncertainties for stations along the German Coast

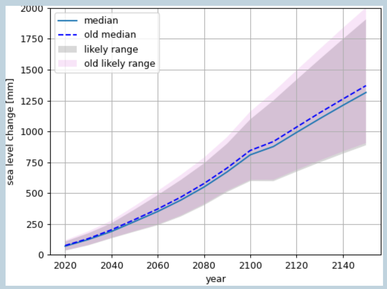


Fig. 4 Regional total sea level change IPCC AR6 „ssp585" scenario interpolated onto „NKG" grid using NKG2016_LU_lev land motion
Left: Median for 2100 , **Right:** Timeseries including uncertainties (16,7. und 83,3. percentile) for grid point close to Cuxhaven before and after combination with „NKG"

Results – different land uplift models

Land elevation models IPCC and NKG show different land uplifts, especially over the North Atlantic and Scandinavia.

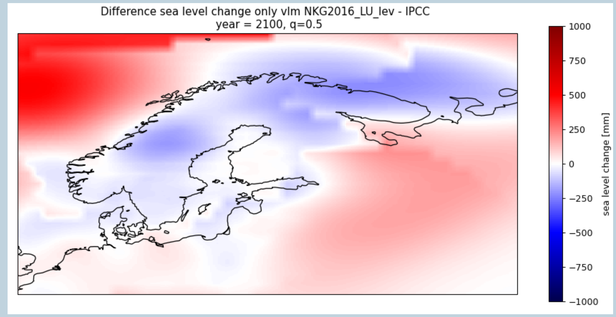


Fig 5 Sea level difference due to land elevation - NKG2016LU_lev minus IPCC AR6 median for scenario „ssp585" interpolated onto NKG grid

- **IPCC** shows sharper edges in land uplift over North Sea/Atlantic whereas
- **NKG** shows more land uplift over Scandinavia ~100 mm by 2100
- Validation: NKG land elevation model is more accurate (Federal Agency for Cartography and Geodesy - BKG - based on levelling measurements in Germany)

Future plans - info service & download

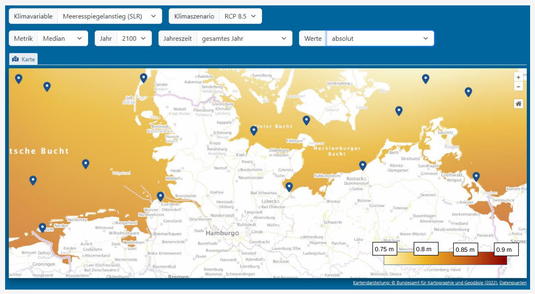


Fig. 6 Schematic example of DAS core service website at BSH. (https://das.bsh.de/)

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