Knowledge about climate change in the Baltic Sea Region assessed by EN CLIME

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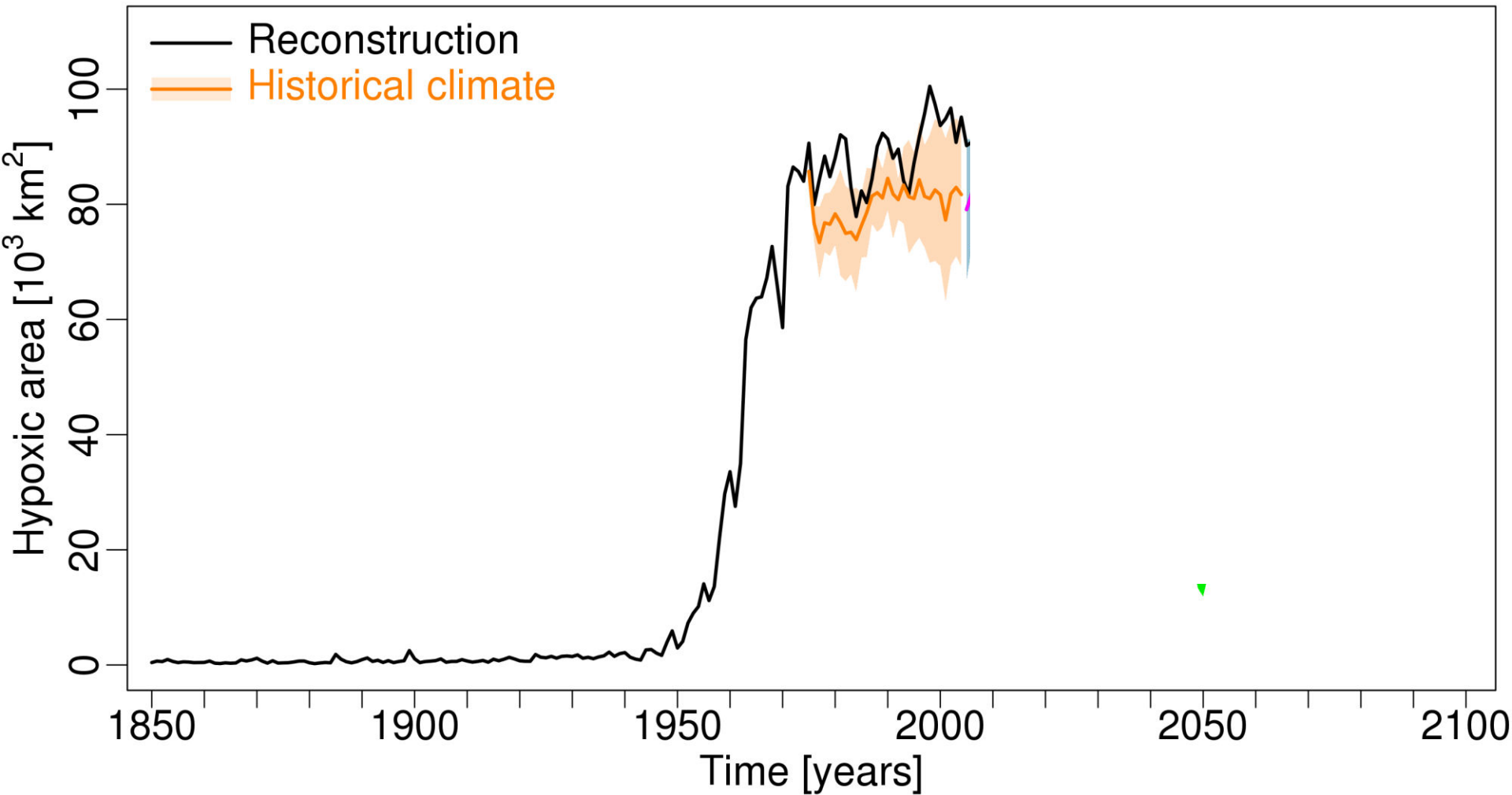
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Dead sea bottom without higher forms of life (Photo: J. Lokrantz/Azote)

Hypoxic area

(Source: modified after Meier et al., 2019)

HELCOM-Baltic Earth collaboration

BALTEX/Baltic Earth Assessments of Climate

Change for the Baltic Sea Basin (www.baltic.earth):

Consensus/dissensus

BACC Author Team (2008)   - book

BACC II Author Team (2015)   - book

BEARs (2021/2022)   - special issue in

Earth System Dynamics

EN CLIME

- Climate Change Fact Sheet: some background information, map showing regional future climate changes for selected parameters under RCP4.5

- 34 parameters (direct and indirect)

- For each parameter: description, past and future changes, knowledge gaps, policy relevance, references (BEARs)

- More than 110 scientists

- Publication September 2021

Table 1. Full list of EN CLIME parameters. The asterisk (*) indicates those parameters that include information on extreme events.

Direct parameters	Categorization
Air temperature*	Energy cycle
Water temperature*	Energy cycle
Large scale atmospheric circulation	Energy cycle
Sea ice*	Energy cycle
Solar radiation	Energy cycle
Salinity and saltwater inflows*	Water cycle
Stratification and ocean circulation	Water cycle
Precipitation*	Water cycle
River run-off*	Water cycle
Carbonate chemistry	Carbon and nutrient cycles
Riverine nutrient loads and atmospheric deposition	Carbon and nutrient cycles
Sea level*	Sea level and wind
Wind*	Sea level and wind
Waves*	Sea level and wind
Sediment transportation*	Sea level and wind

| Indirect parameters	Categorization
Oxygen	Carbon and nutrient cycles
Microbial community and processes	Biota and ecosystems
Benthic habitats	Biota and ecosystems
Coastal and migratory fish	Biota and ecosystems
Pelagic and demersal fish	Biota and ecosystems
Waterbirds	Biota and ecosystems
Marine mammals	Biota and ecosystems
Non-indigenous species	Biota and ecosystems
Marine protected areas (MPA's)	Biota and ecosystems
Ecosystem function	Biota and ecosystems
Nutrient concentrations and eutrophication	Biota and ecosystems
Coastal protection	Human activities
Offshore wind farms	Human activities
Shipping	Human activities
Tourism	Human activities
Fisheries	Human activities
Aquaculture	Human activities
Blue carbon storage capacity	Services
Marine and coastal ecosystem services	Services

warmer ➡

winter

summer
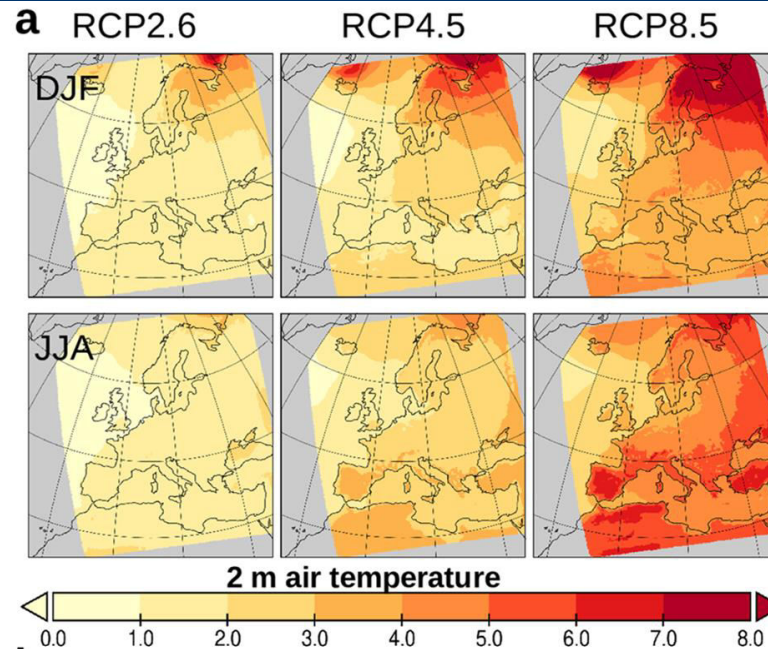
Air temperature changes

winter

summer
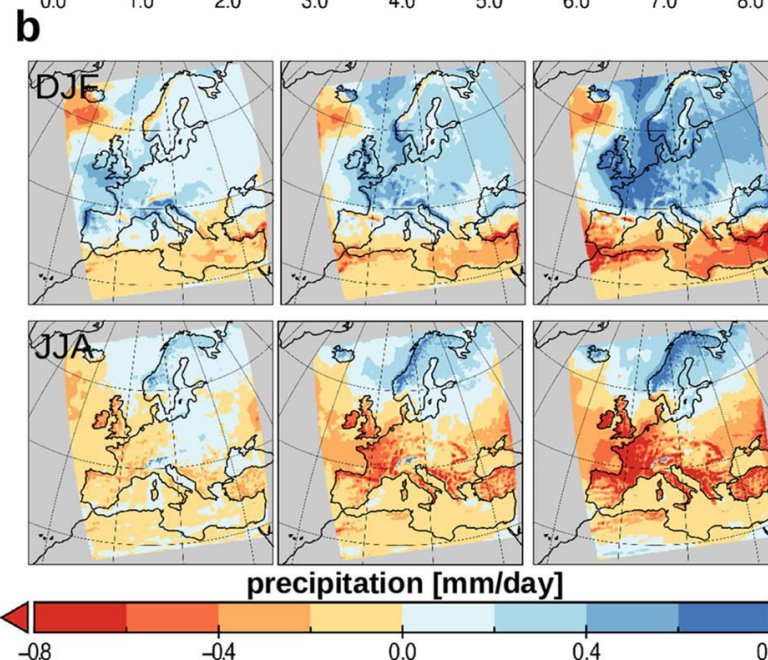
Precipitation changes

(Source: Gröger et al., 2021, Climate Dynamics)

Tropical nights

RCP2.6   RCP4.5   RCP8.5

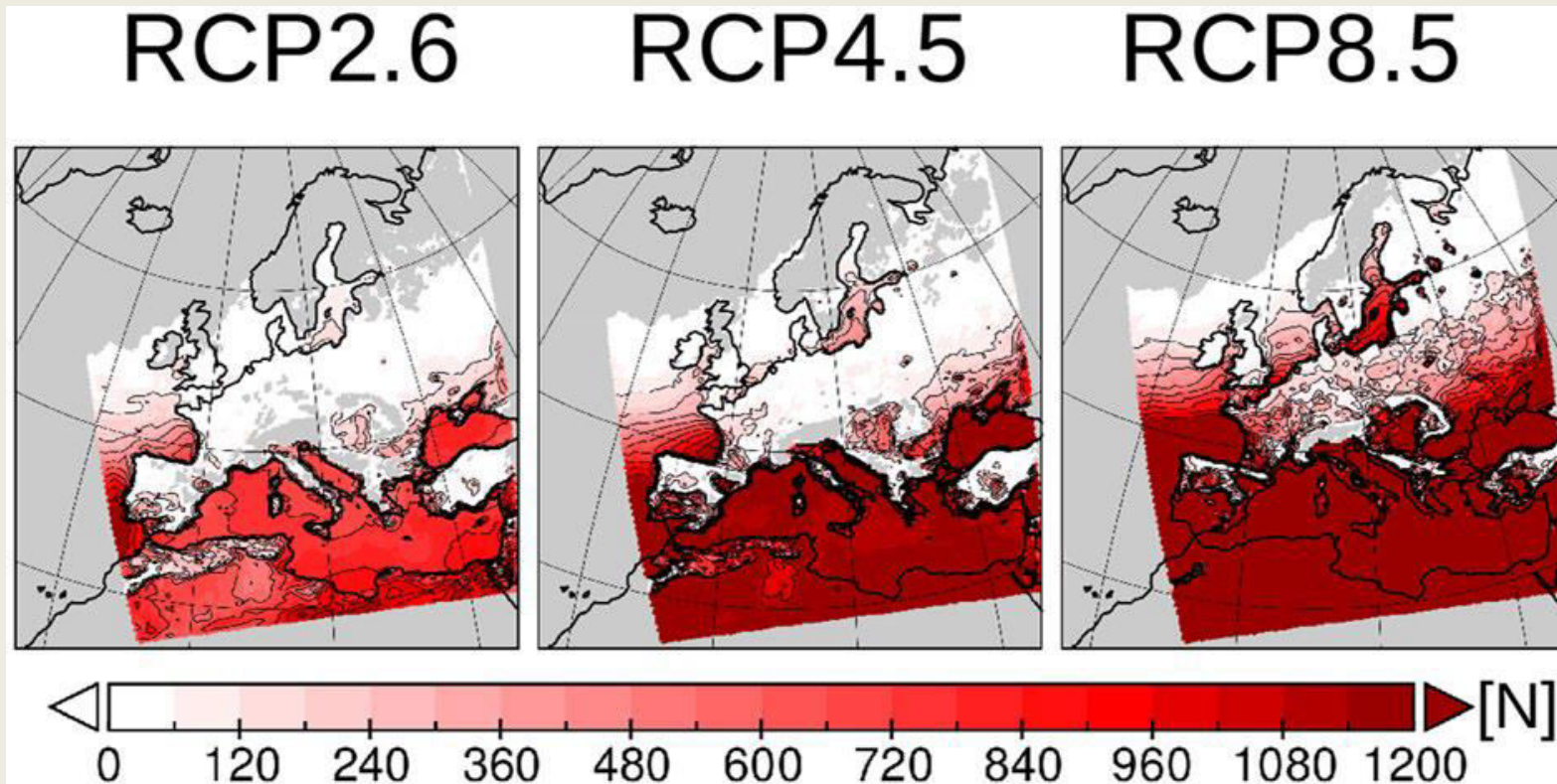0   120   240   360   480   600   720   840   960   1080 1200   [N]

Fig. 11 Number of tropical nights within 2070–2099 in the 3 concentration scenarios RCP2.6, RCP4.5, and RCP8.5. Tropical nights are defind as days where the minimum temperature does not fall below 20 °C. Shown is the difference to the historical period (2070–2099 minus 1970–1999). A bias adjusted figure is available from the Suppl. Mat. S3)

(Source: Gröger et al., 2021, Climate Dynamics)

Hypoxic area
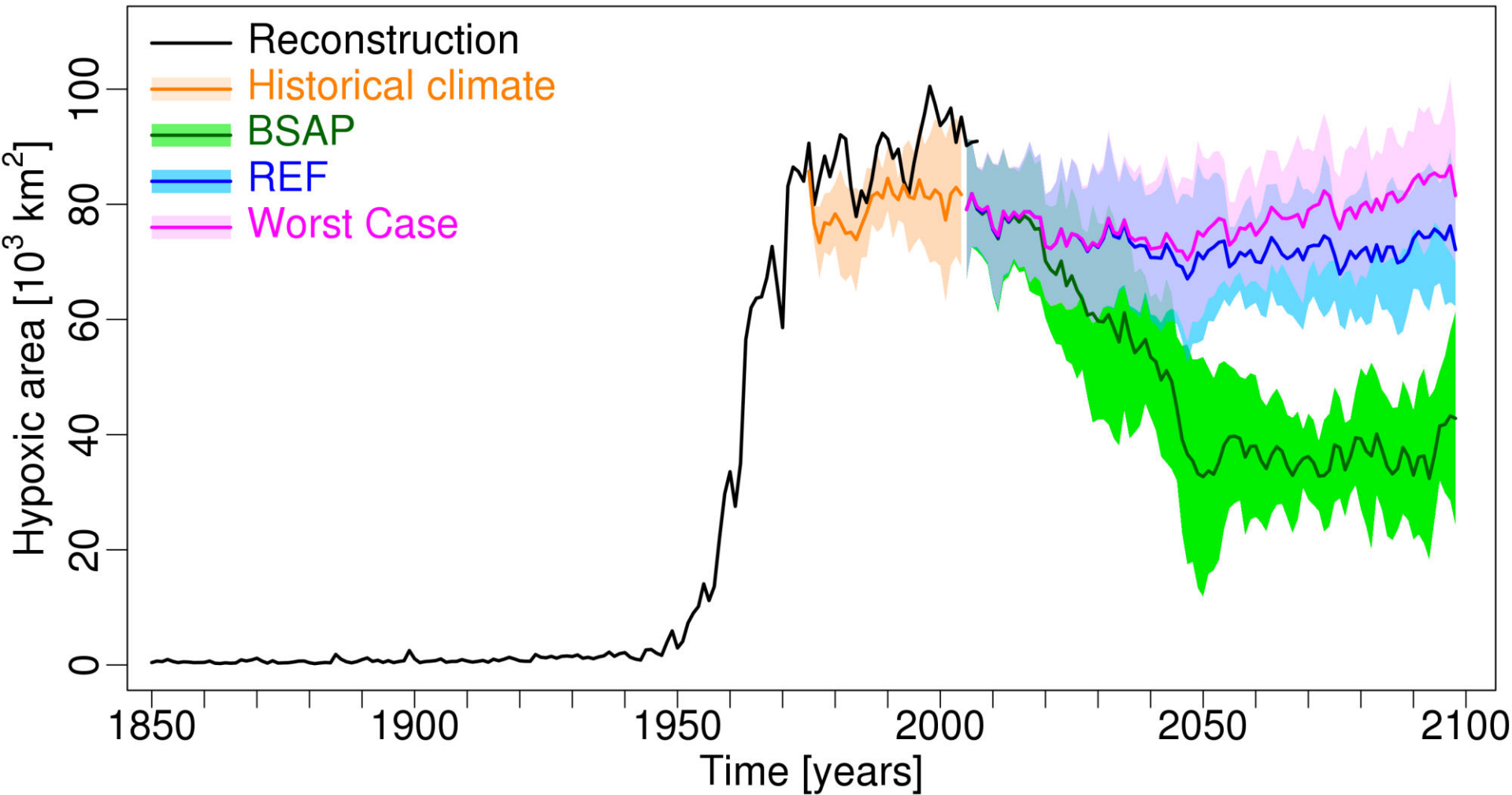
(Source: modified after Meier et al., 2019)

Selected results

(1) Scenarios for the Baltic Sea project a **sea surface temperature** increase of 1.1°C (RCP2.6) to 3.2°C (RCP8.5) by the end of this century, compared to 1976-2005.

(2) In the future, it is very likely that the **maximum sea ice extent** will further decrease.

(3) Due to the large uncertainty in projected freshwater supply from the catchment area, wind and global sea level rise, **salinity** projections show a widespread trend, and no robust changes were identified.

(4) Even if alkalinity in the Baltic Sea should increase, a doubling of atmospheric pCO_2 will still result in lower pH (**acidification**).

(5) Implementation of the BSAP will lead to significantly improved deep water **oxygen** conditions, irrespective of the climate projection.

Thank you very much for your attention and thank you to the EN CLIME Author Team!