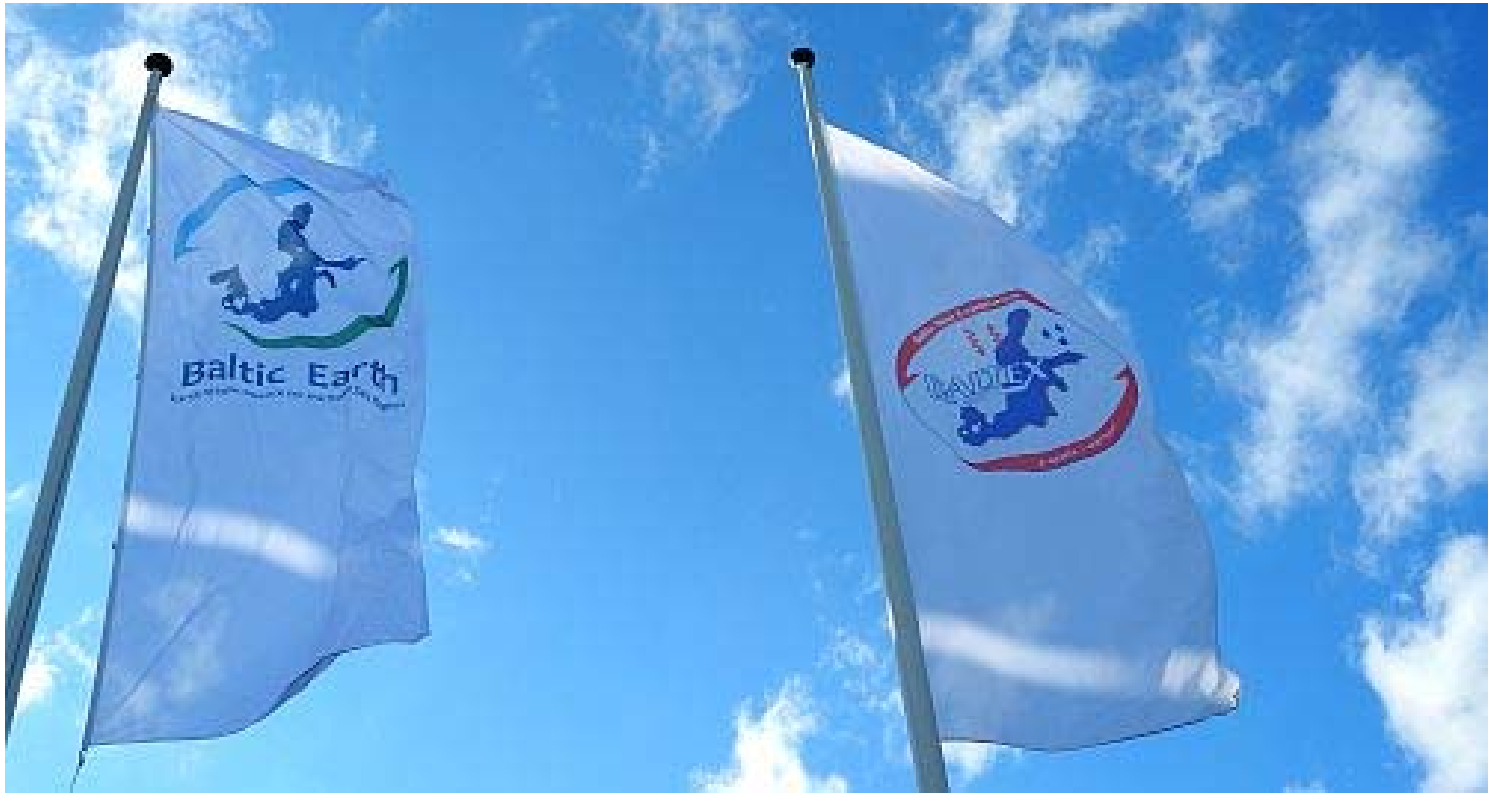
Baltic Earth working group meeting on scenario simulations

H.E. Markus Meier[1,2]
[1]Swedish Meteorological and Hydrological Institute
and
[2]Stockholm University
E-mail: markus.meier@smhi.se

SMHI

Baltic Earth



http://www.baltex-research.eu/balticearth

BALTEX successor programme lauched at the
7th Study Conference on BALTEX, Borgholm, Öland, Sweden,
10-14 June 2013

Vision of the new programme

To achieve an improved Earth System understanding of the Baltic Sea region

- **Interdisciplinary** and **international** collaboration (study conferences, workshops, etc.)
- **Holistic view** on the Earth system of the Baltic Sea region, encompassing processes in the **atmosphere**, on **land** and in the **sea** and also in the **anthroposphere**
- **"Service to society"** in the respect that **thematic assessments** provide an overview over knowledge gaps which need to be filled (e.g. by funded projects)
- **Education** (summer schools)
- Inherits the BALTEX network of scientists and infrastructure

Baltic Earth

Earth System Science for the Baltic Sea Region

Baltic Earth Science Plan and Grand Challenges

- Flexible science plan with a continuously on-going definition of core research questions which are identified to be key scientific issues, so-called "**Grand Challenges**" (GCs)
- New Grand Challenges will be identified at conferences and by using **assessments** of existing research by dedicated working groups. Grand Challenges are envisaged to be research foci for periods of about 3-4 years (then terminated or updated)
- The new programme will **communicate** with stakeholders and research funding agencies to promote funding relevant for the Grand Challenges
- International embedment (GEWEX?, Future Earth?, to be decided by ISSG by June 2014)

Suggested Grand Challenges

- GC1: Salinity dynamics in the Baltic Sea
- GC2: Land-Sea biogeochemical feedbacks in the Baltic Sea region
- GC3: Natural hazards and extreme events in the Baltic Sea region
- GC4: Understanding sea level dynamics using new technologies (remote sensing)
- GC5: Understanding regional variability of water and energy exchanges

- The human impact will be assessed at all levels, wherever possible and senseful

- Website in preparation: www.baltic-earth.eu

Baltic Earth Infrastructure

- International BALTEX Secretariat continued as **International Baltic Earth Secretariat** for the time being
- **Interim Science Steering Group (ISSG)** installed, with mandate until June 2014, then presentation of **Baltic Earth Science Plan** and permanent Science Steering Group
- **ISSG members**: Excellent, active "young" scientists; country balance, gender balance, discipline balance, institutional balance
- **Working Groups** installed for each GC plus
  - WG on Outreach and Communication
  - WG on Education
  - WG on the Added Value of Regional Climate System Models
  - WG on the Assessment of BSAP Scenario Simulations for the Baltic Sea 1960-2100
  - BALTEX Assessment of Climate Change
- **Senior Advisory Board**

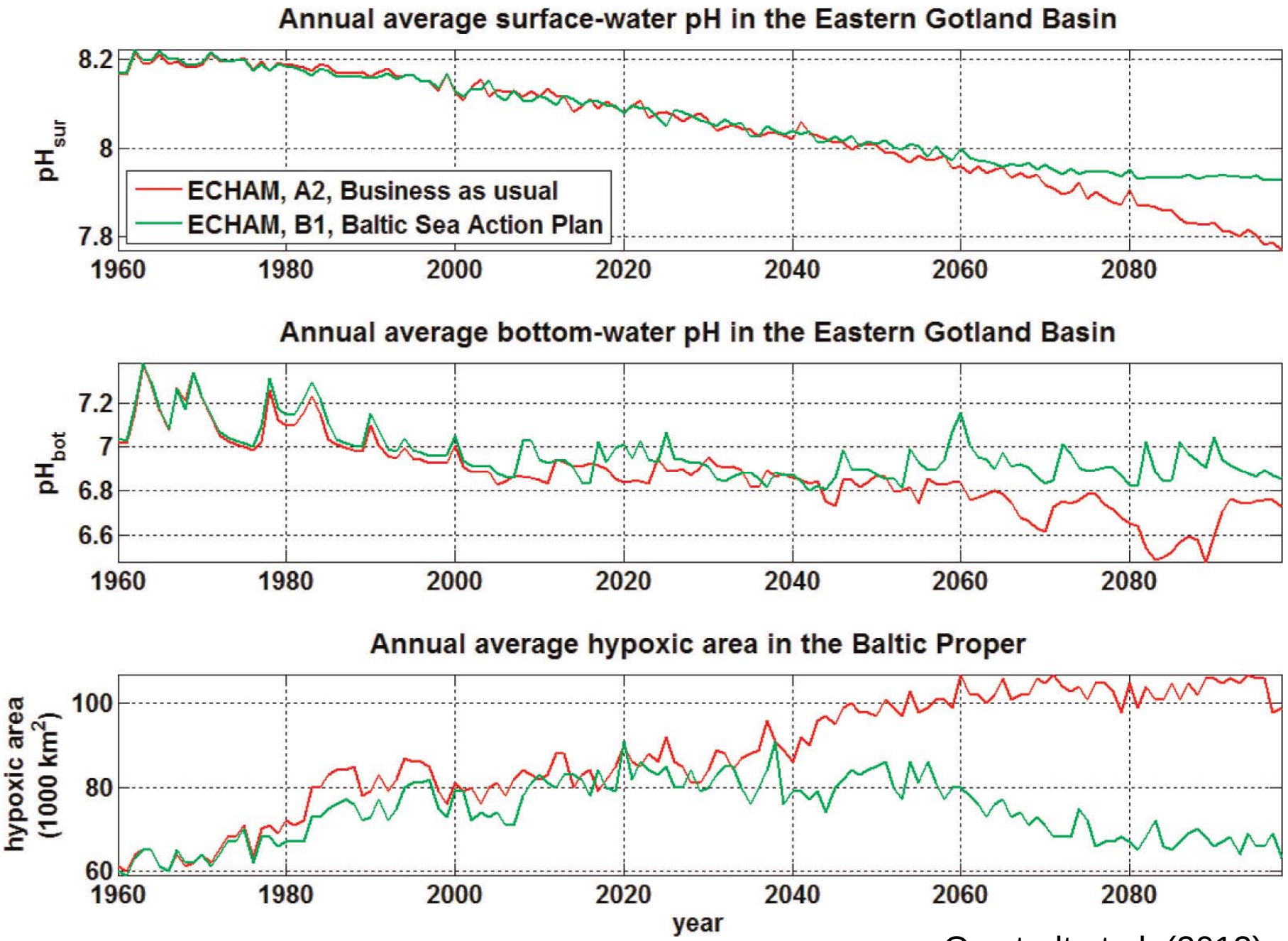
ISSG chairs:

Markus Meier, Head of Oceanographic Research Dept. of SMHI and Professor at Stockholm University, Sweden.
http://www.smhi.se/en/Research/Research-departments/Oceanography

Anna Rutgersson, Professor of Meteorology, Uppsala University, Sweden.
http://katalog.uu.se/empInfo/?languageId=1&id=N96-3829

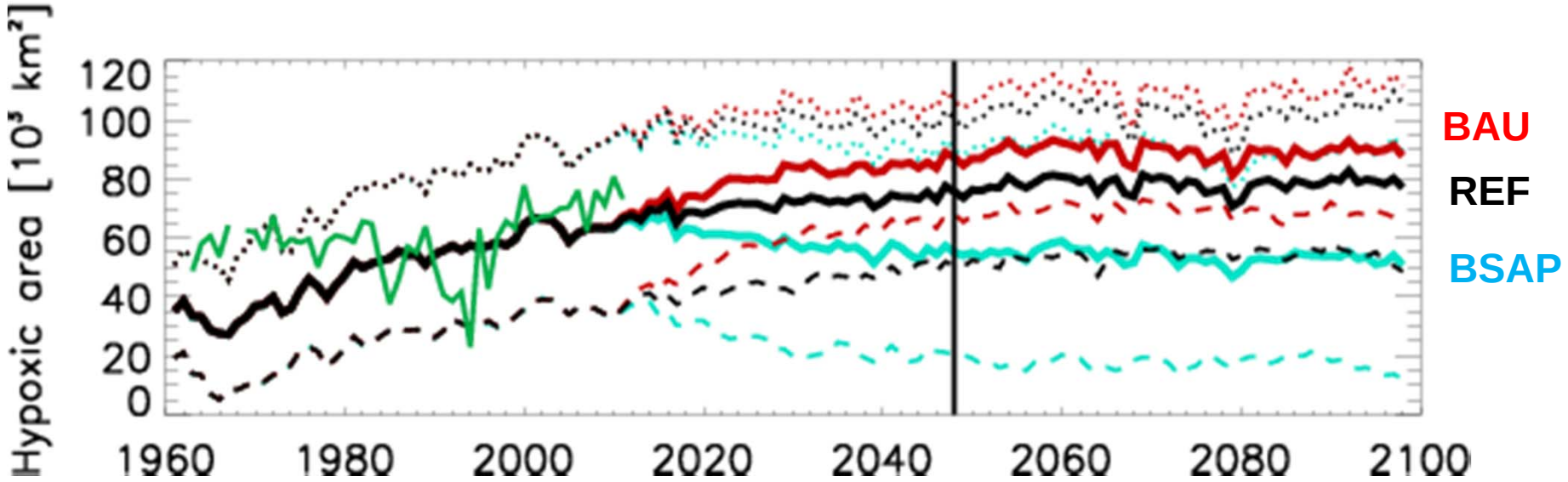
Both have been active in BALTEX for many years

Different responses in scenario simulations



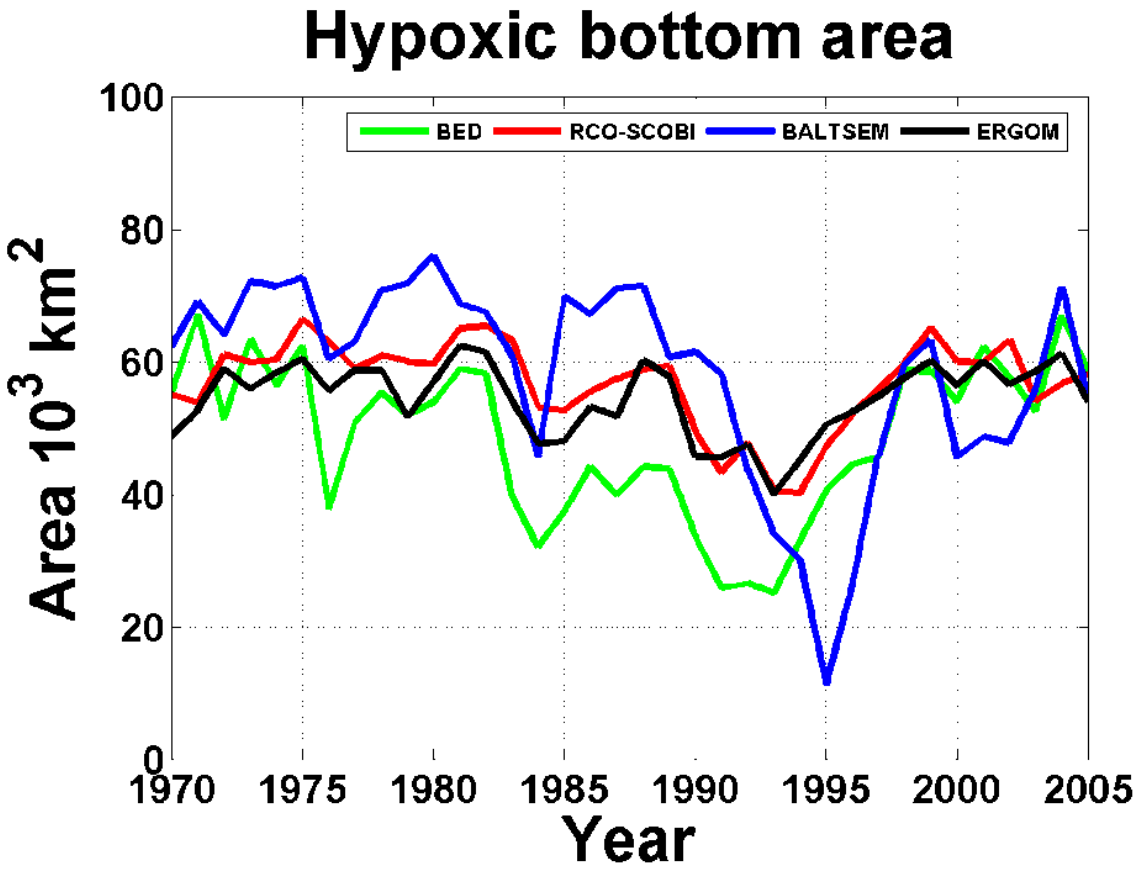
Omstedt et al. (2012)

Ensemble mean hypoxic areas



observations

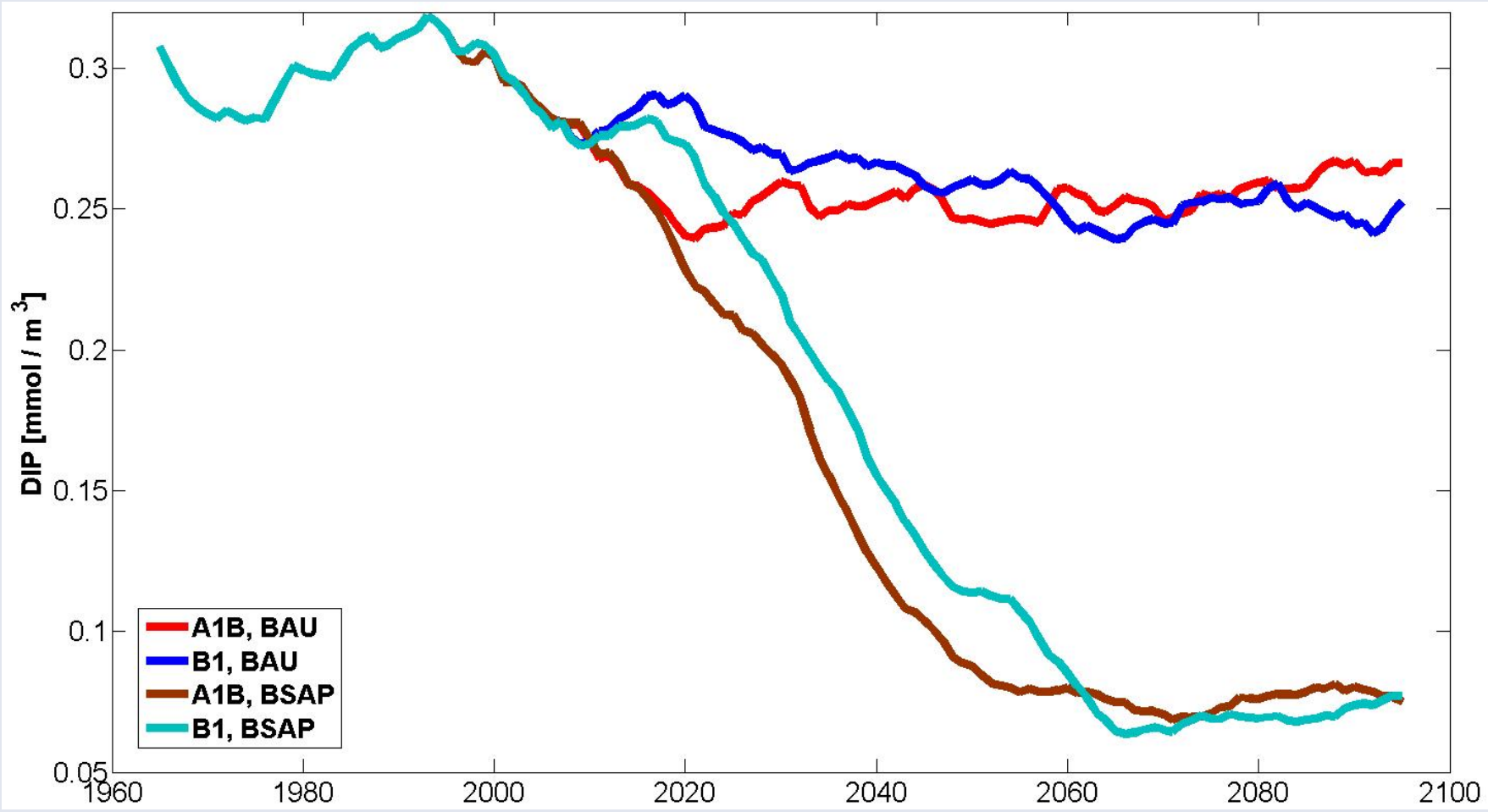
(Source: Meier et al., 2011)

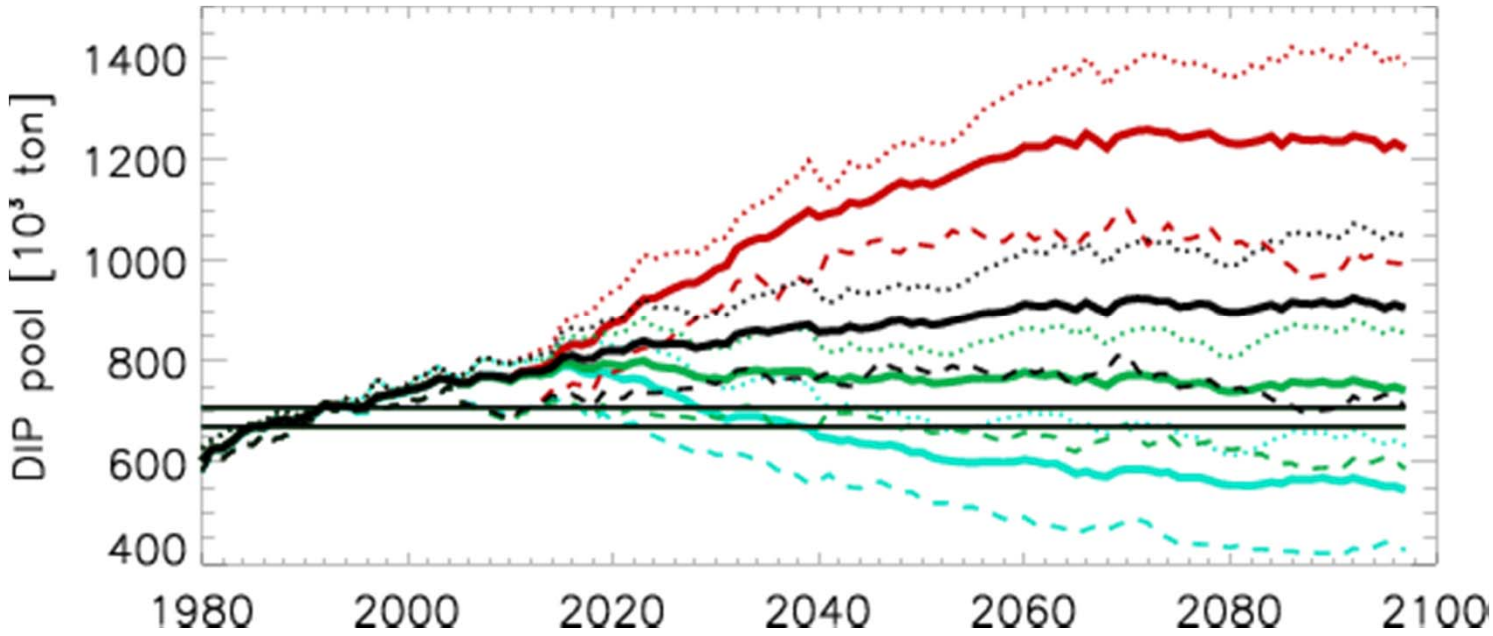


Annual averages of the integrated hypoxic area in the Baltic proper. The green solid line indicates the mean value of BED data. The red, blue and black lines show the mean values of the RCO-SCOBI, BALTSEM and ERGOM models, respectively.

(Source: Eilola et al., 2011)

Strong decline of the available DIP (14-22˚E, 54-60˚N, 0-50m, summer)





(Source: Meier et al., 2012, Clim Dyn)

Different GCMs, emission scenarios, downscaling setups

Baltic Sea - how to approach the future?

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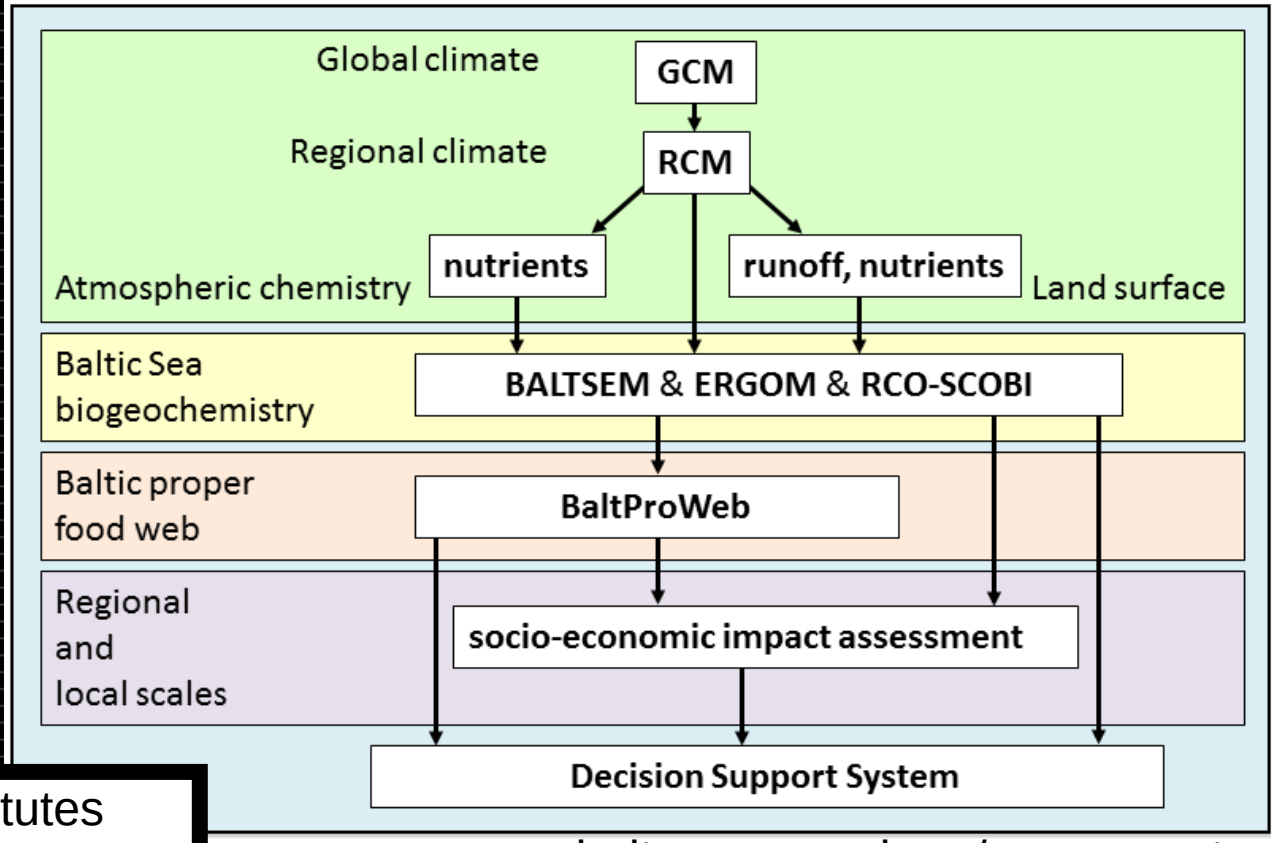
Advanced modeling tool for scenarios of the Baltic Sea ECOsystem to SUPPORT decision making

ECO SUPPORT



11 partner institutes from 7 Baltic Sea countries 2009-2011

www.baltex-research.eu/ecosupport

BONUS

SCIENCE FOR A BETTER FUTURE OF THE BALTIC SEA REGION

Uncertainty in simulated processes

(Source: Eilola et al., 2011)

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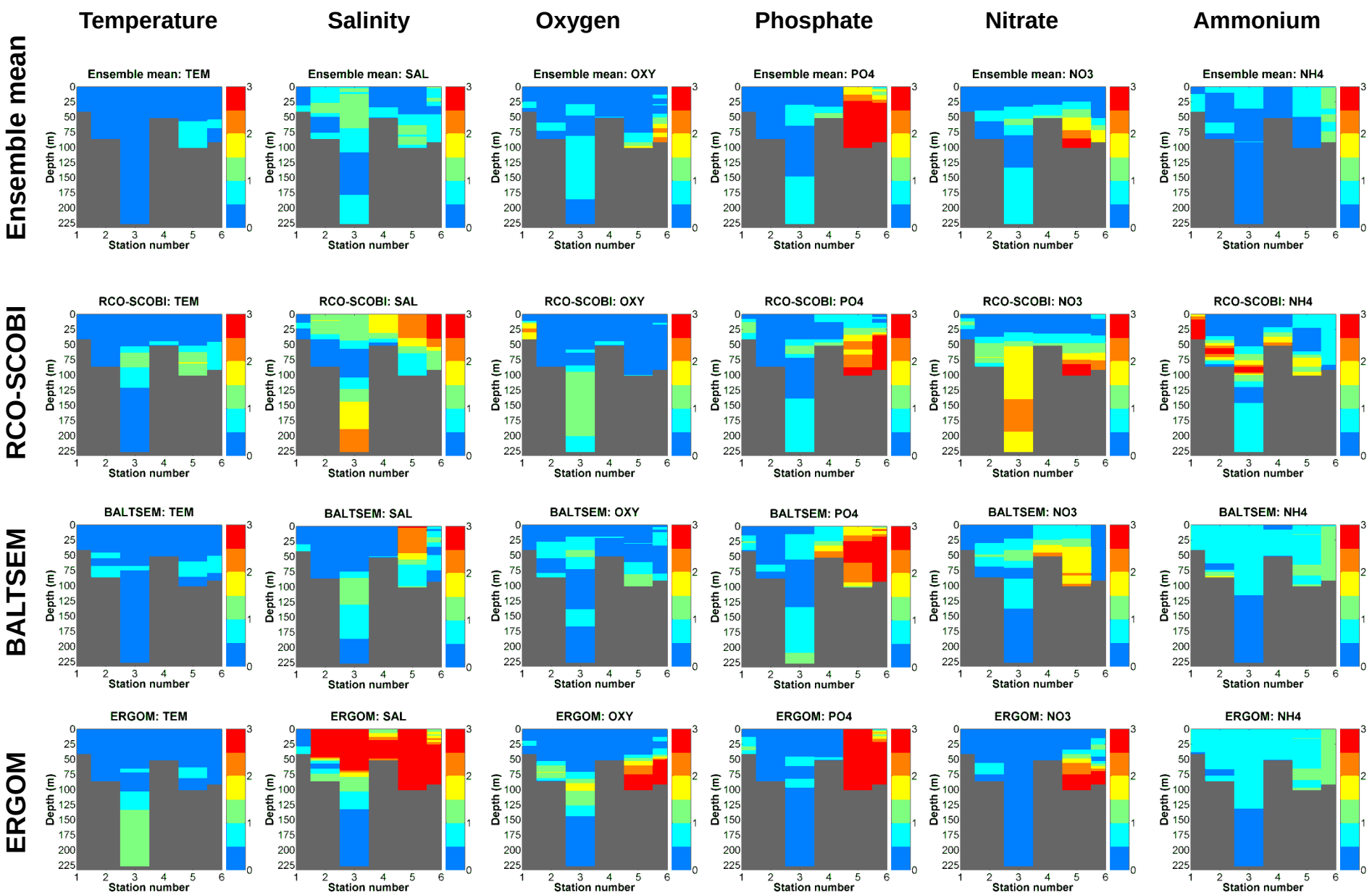
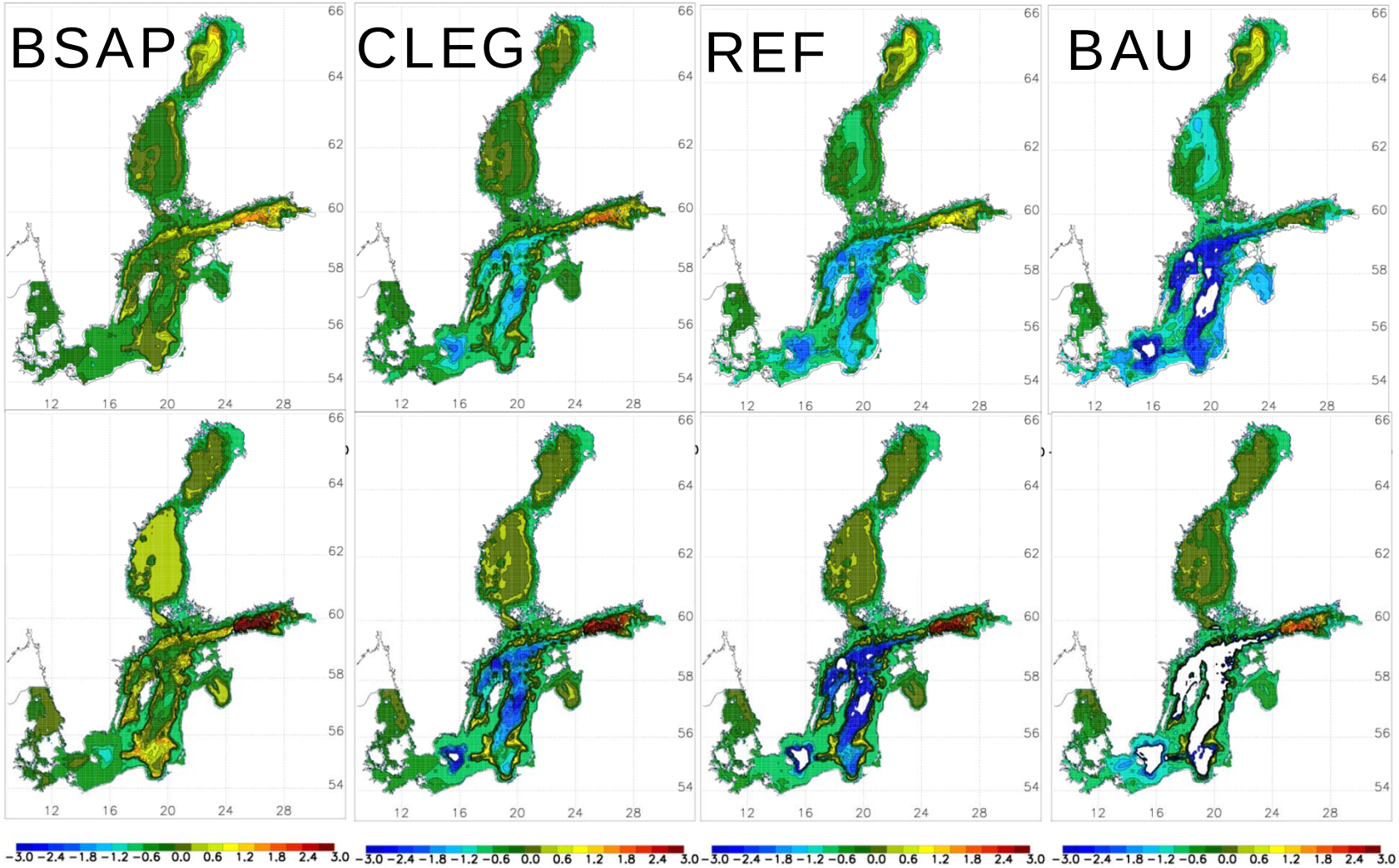
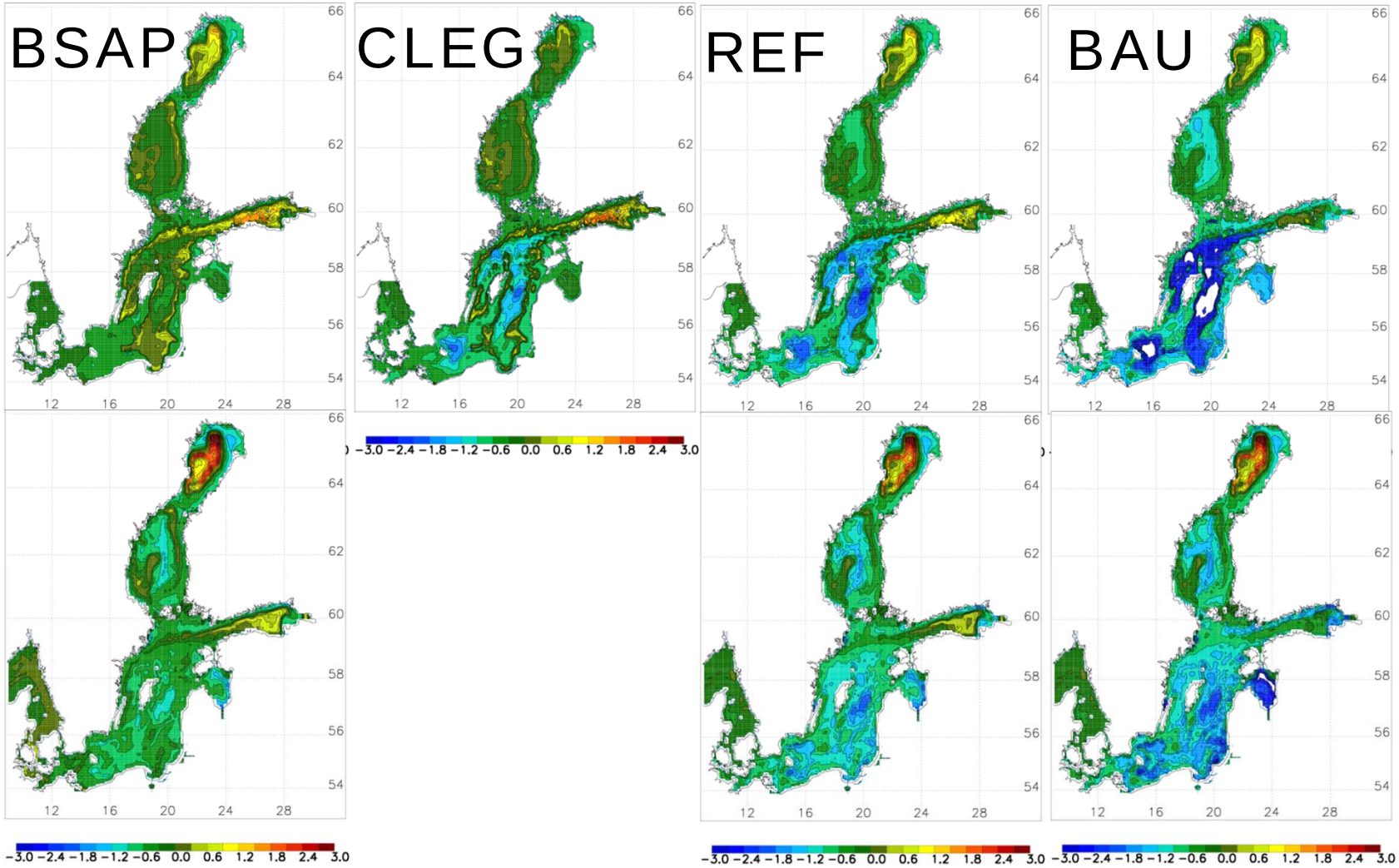


Uncertainty in model sensitivity

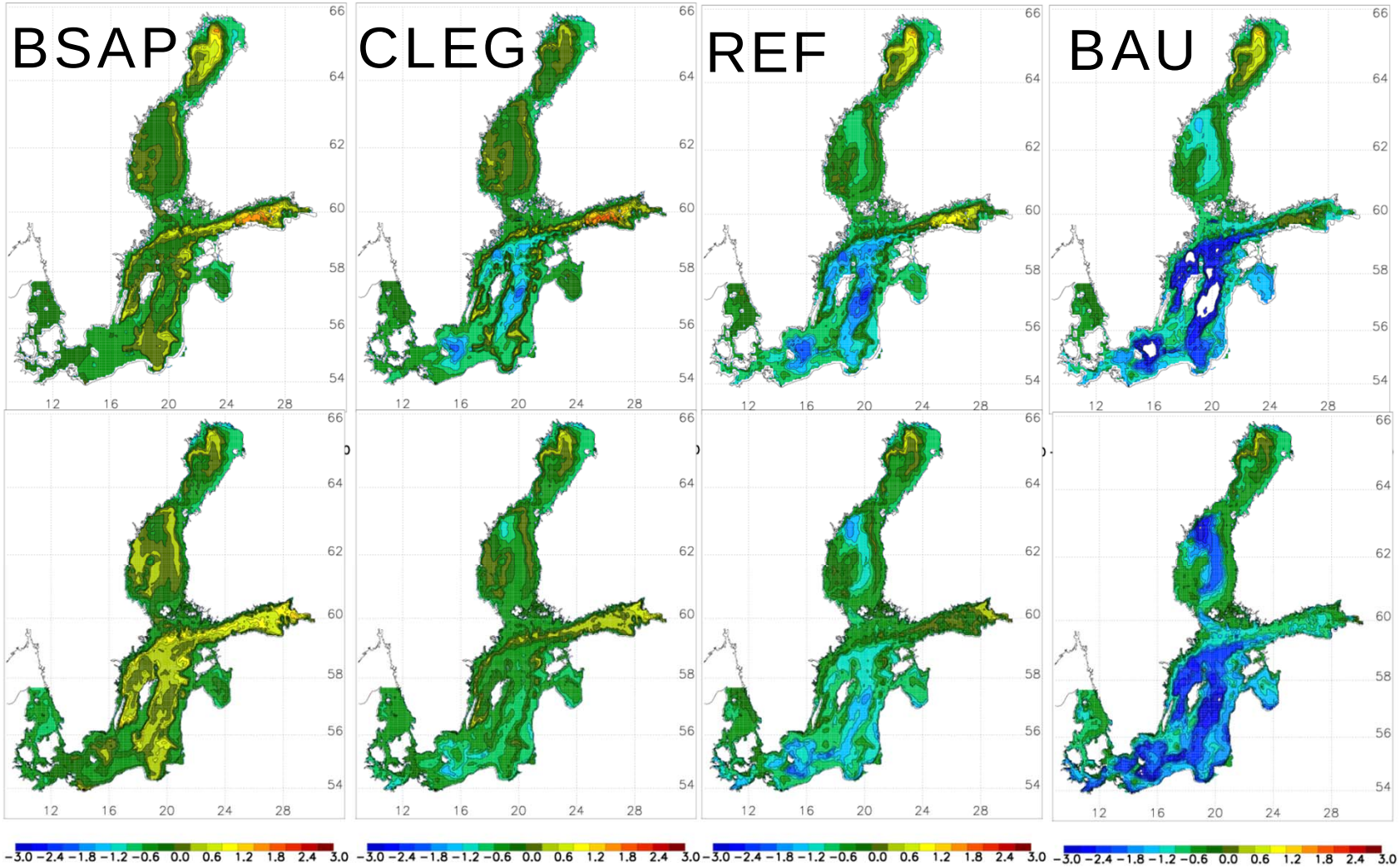
Ensemble (upper) and BALTSEM (lower) mean summer bottom oxygen concentration changes between 2070-**2099 relative to 1978-2007**



Ensemble (upper) and ERGOM (lower) mean summer bottom oxygen concentration changes between 2070-**2099 relative to 1978-2007**



Ensemble (upper) and RCO-SCOBI (lower) mean summer bottom oxygen concentration changes **between 2070-2099 relative to 1978-2007**



Uncertainty in nutrient loads and bioavailability

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Baltic Sea Action Plan

	Phosphorus (tonnes)	Nitrogen (tonnes)
Denmark	16	17,210
Estonia	220	900
Finland	150	1,200
Germany	240	5,620
Latvia	300	2,560
Lithuania	880	11,750
Poland	8,760	62,400
Russia	2,500	6,970
Sweden	290	20,780
Transboundary Common pool	1,660	3,780

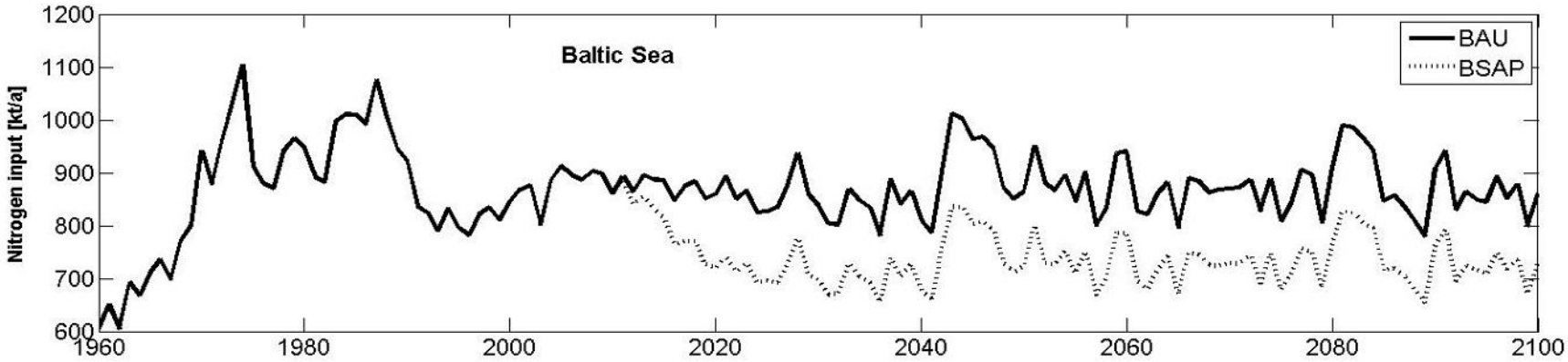
Annual nutrient load reductions:

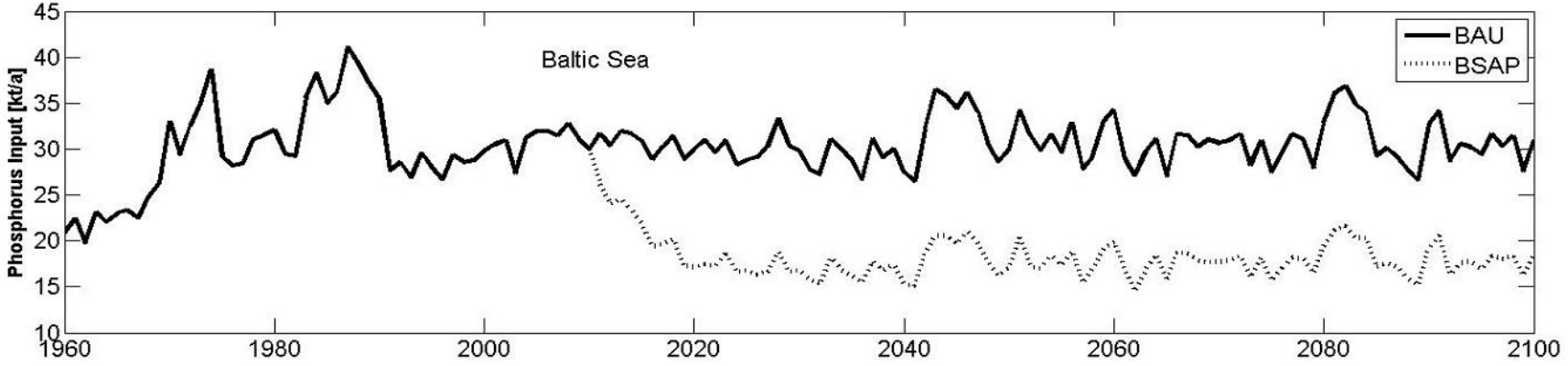
15 000 t phosphorus and 133 000 t nitrogen

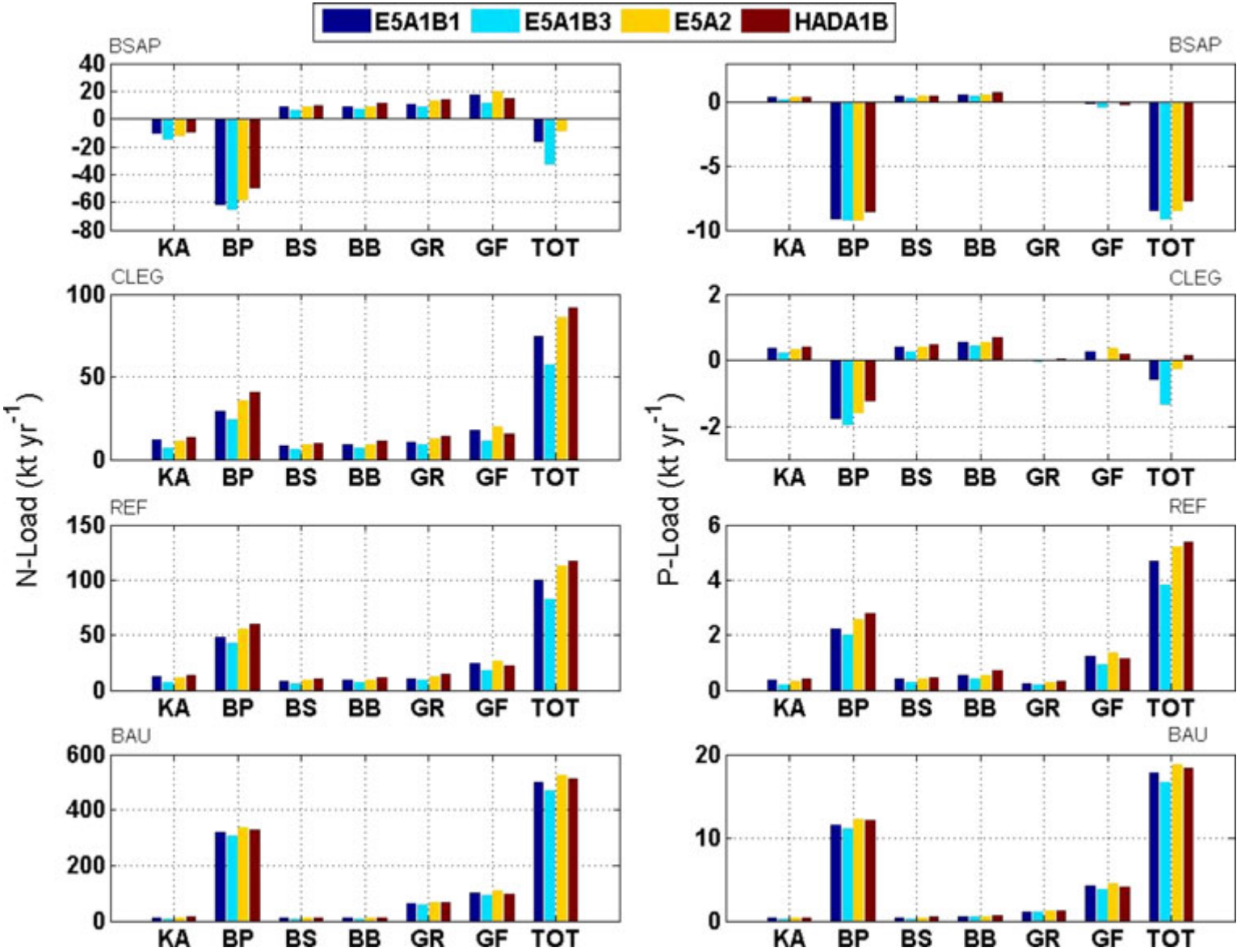
Simulations of eutrophication scenarios

BALTEX, Borgholm 10.-14.6.2013

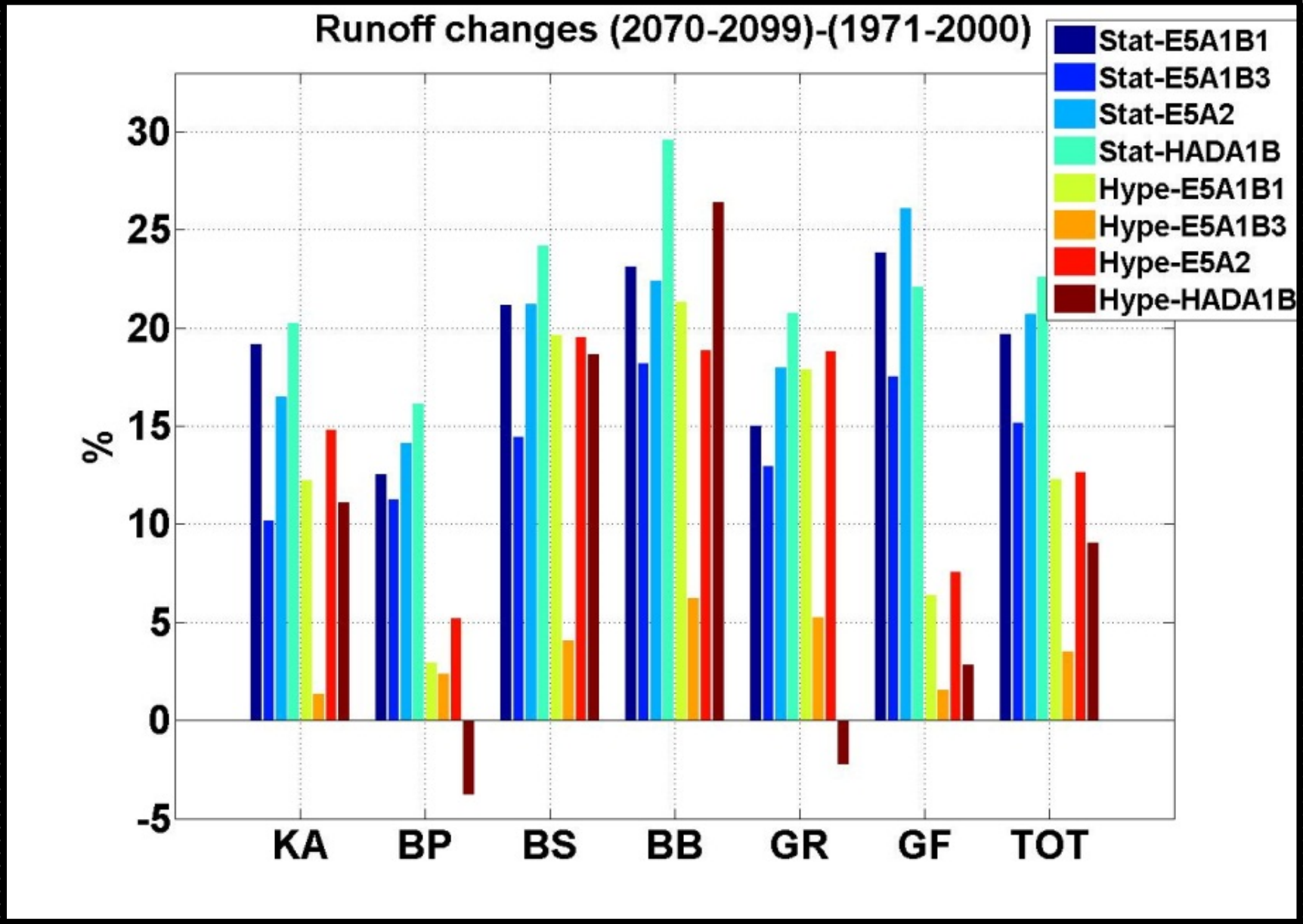
Waterborne nutrient loads	N [t/a]	P [t/a]	N/P
1997-2003	736.720	36.310	≈ 20,3
BSAP (from 2021)	601.720	21.060	≈ 28,6






E5A1B1
E5A1B3
E5A2
HADA1B
BSAP
CLEG
REF
BAU
KA
BP
BS
BB
GR
GF
TOT
N-Load (kt yr-1)
P-Load (kt yr-1)

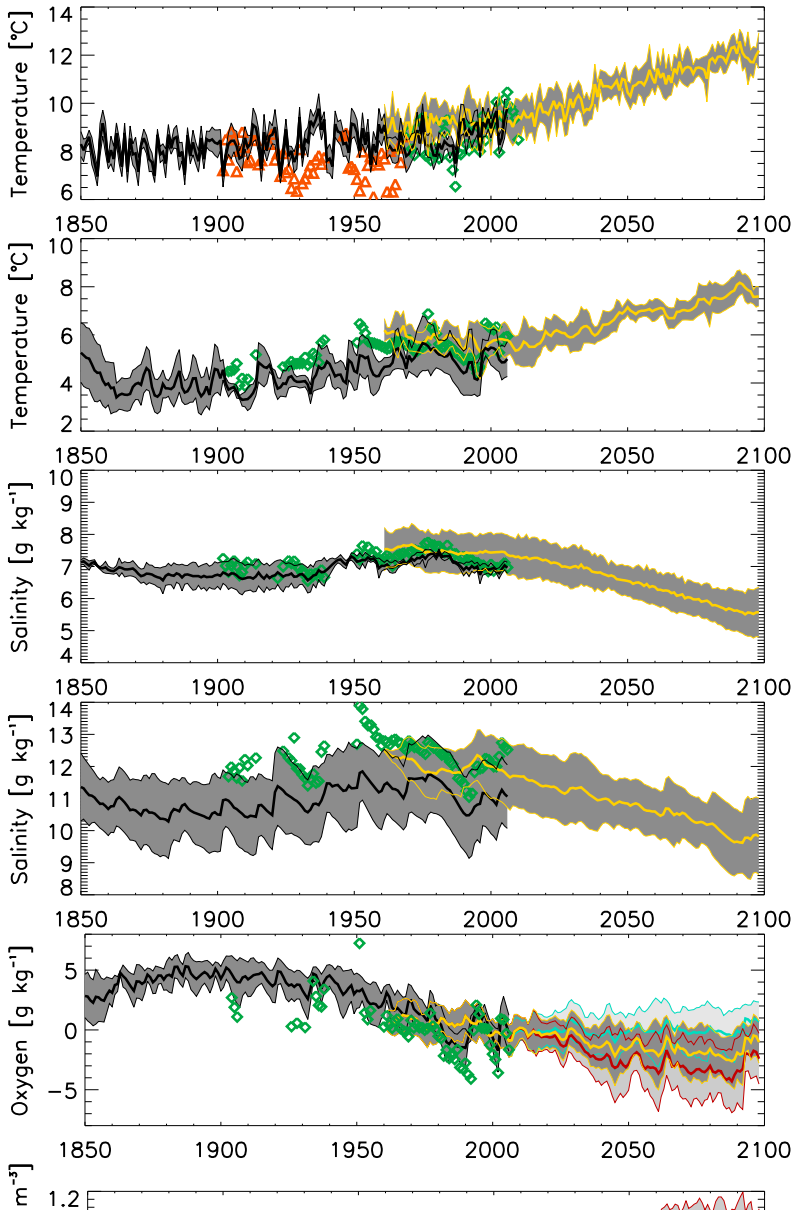
Meier et al. (2012), Clim Dyn



Uncertainty in initial conditions

(Source: Meier et al., 2012, ERL)

Simulated ensemble averages and observed annual mean water temperatures ((a), (b)) and salinities ((c), (d)) at Gotland Deep at 1.5 and 200 m depth, annual mean oxygen concentrations at 200 m depth (e), and winter (January–March) mean surface phosphate (f) and nitrate (g) concentrations. Shaded areas denote the ranges of plus/minus one standard deviation around the ensemble averages. The various nutrient load scenarios (1961–2098) are shown by colored lines (REF—yellow, BSAP—blue, BAU—red) and the reconstruction (1850–2006) by the black line. For comparison, observations from monitoring cruises at Gotland Deep (green diamonds, in panel (a) since 1970 only) and from the light ship Svenska Björn, operated during 1902–1968 (orange triangles in panel (a)), were used.



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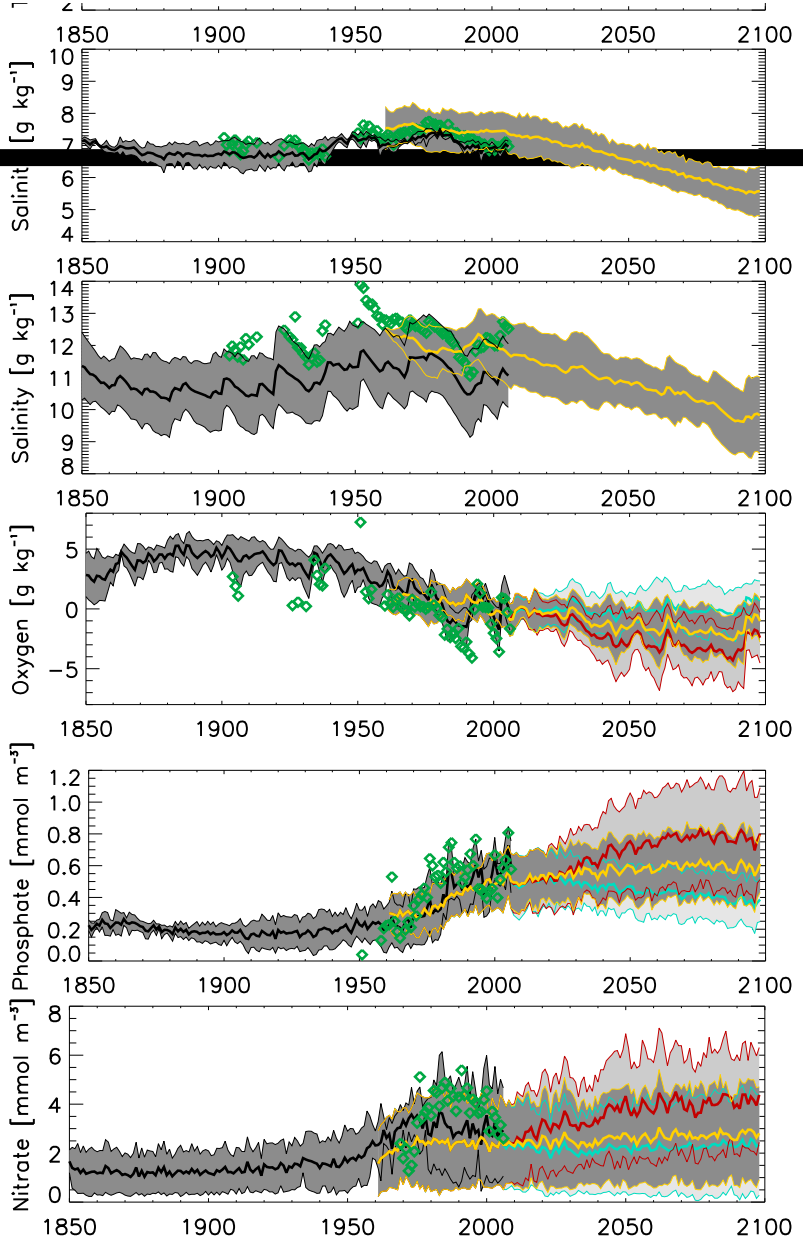

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Outcome

Peer-reviewed article

“Assessment of scenario simulations for biogeochemical and carbonate cycles in the Baltic Sea 1960-2100**”**

One option AMBIO special issue organized by ECOCHANGE and BEAM

“Baltic Sea ecosystem-based management in an era of climate change”

State-of-the-art and recommendations for new scenario simulations

Stakeholder: HELCOM, follow-up to BACCII