

IBAM



BONUS

Baltic Organisations Network for Funding Science EEG

SMHI



**BONUS+ program cluster
workshop on "Uncertainties of
scenario simulations"
- the idea**



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2010-10-25



ECOSUPPORT

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



Annual General Assembly 15 Oct 2009

2010-10-25



ECOSUPPORT

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



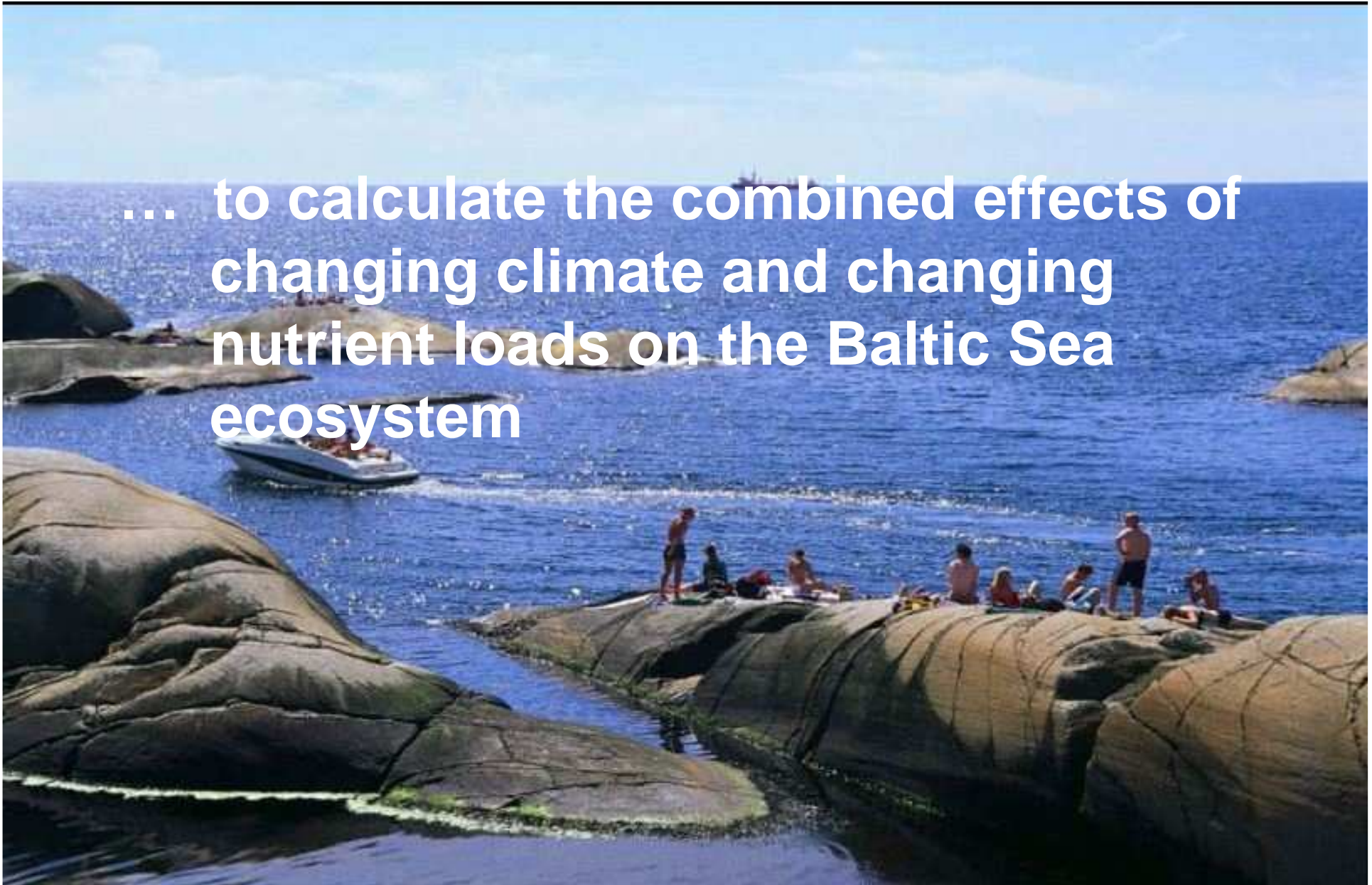
**11 partner institutes
from 7 Baltic Sea
countries
2009-2011**

Annual General Assembly 15 Oct 2009

2010-10-25

New system models are needed **SMHI**

... to calculate the combined effects of changing climate and changing nutrient loads on the Baltic Sea ecosystem

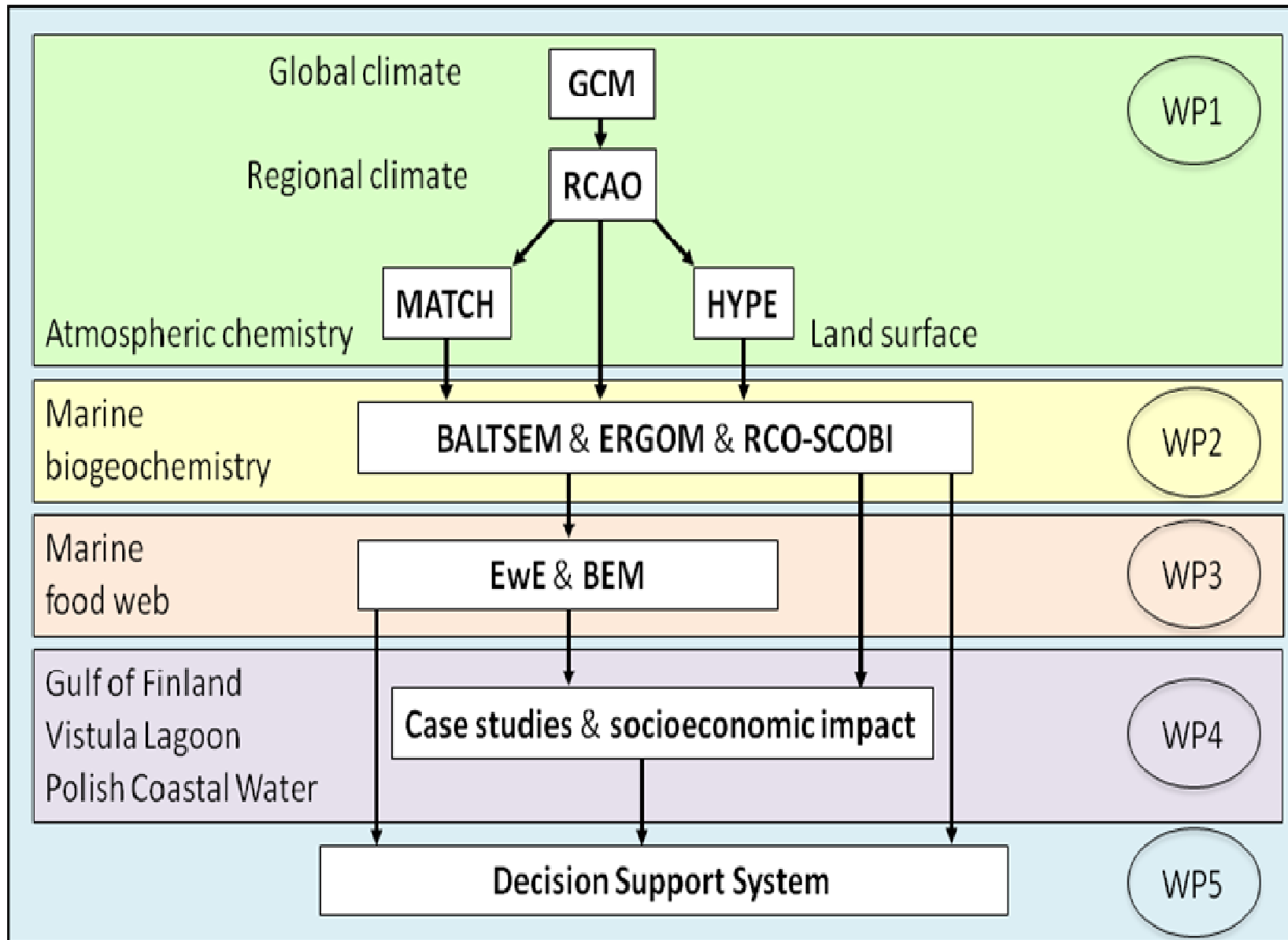


Model hierarchy in ECOSUPPORT

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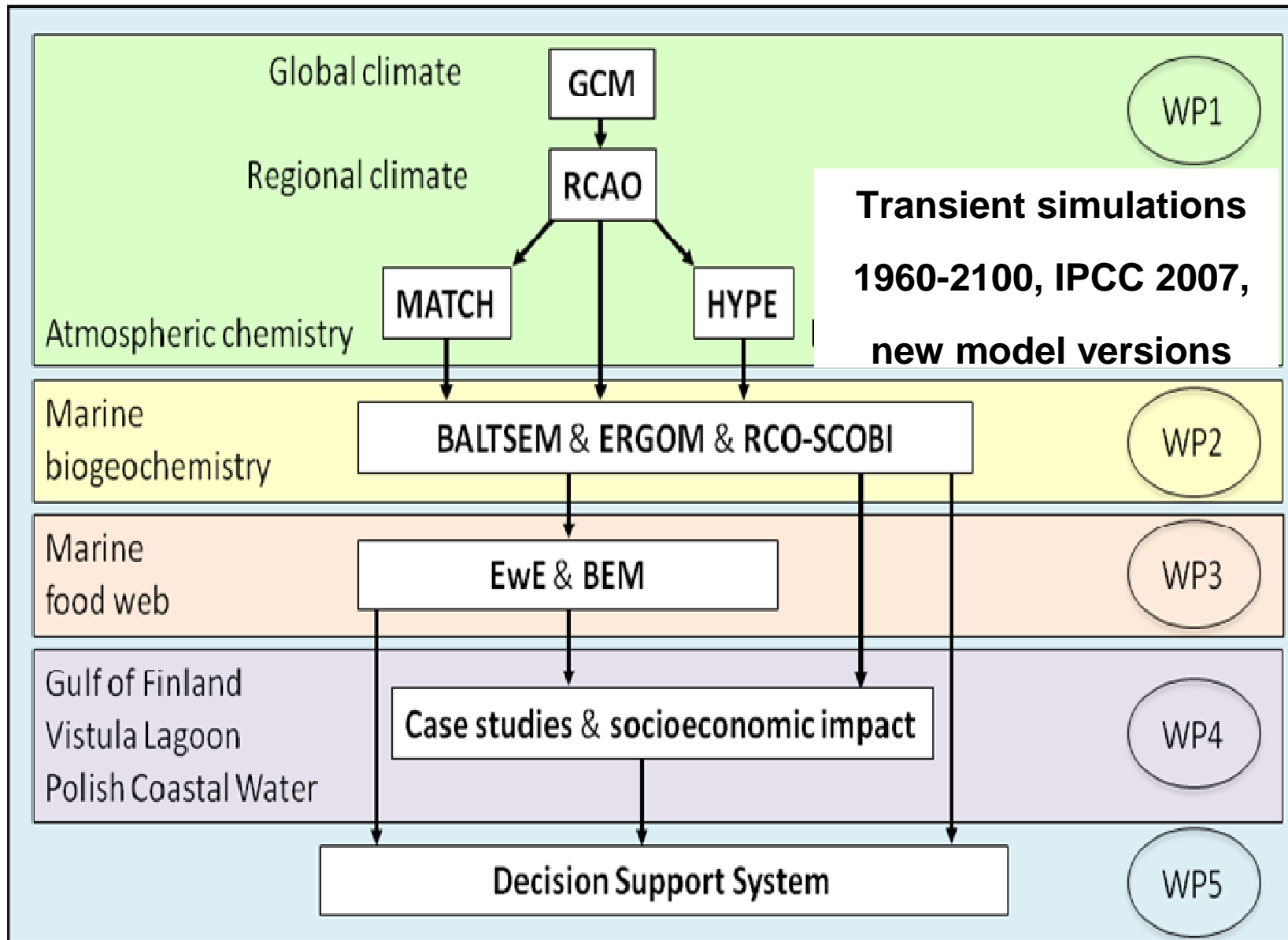
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www.baltex-research.eu/ecosupport



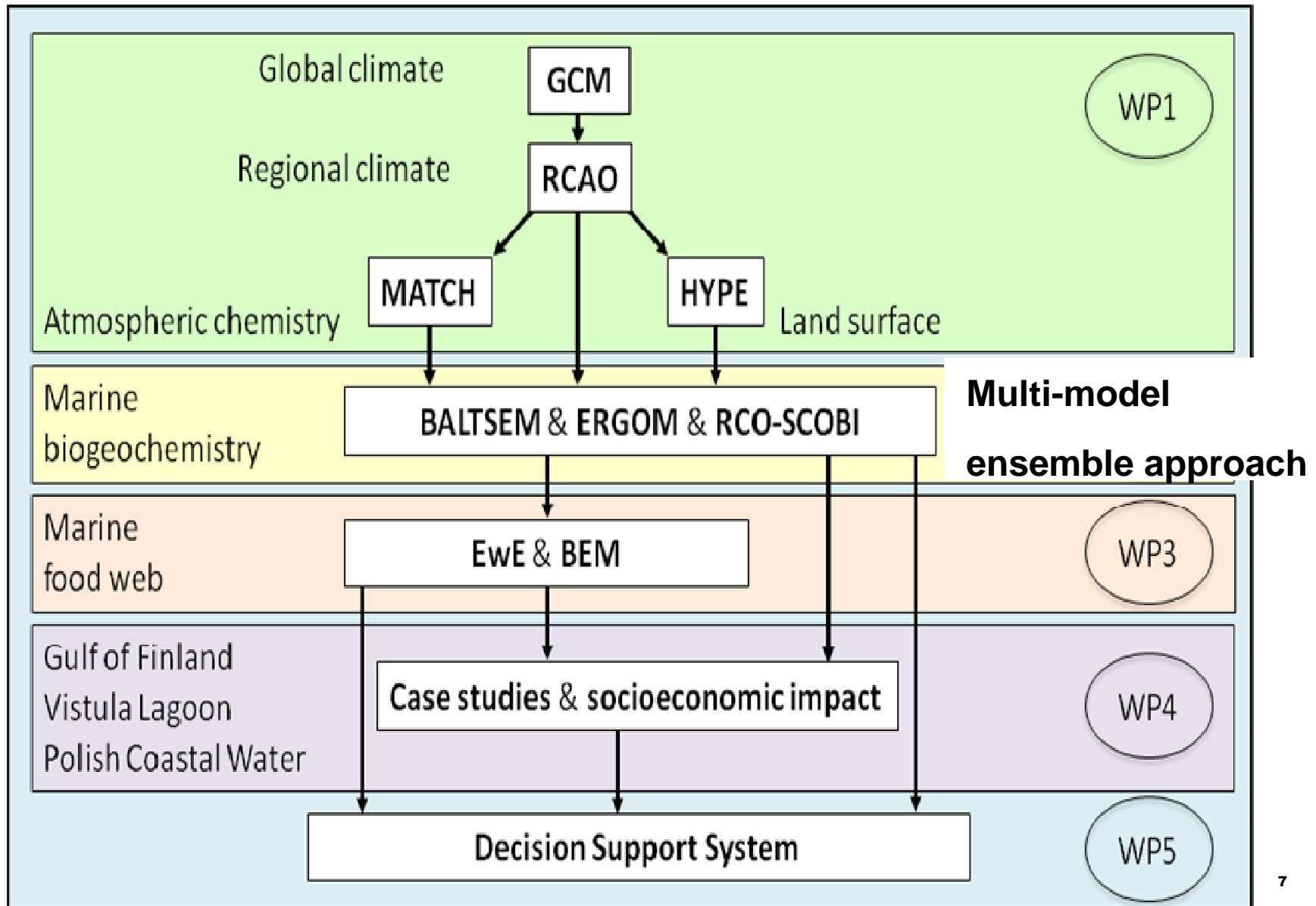
Model hierarchy in ECOSUPPORT

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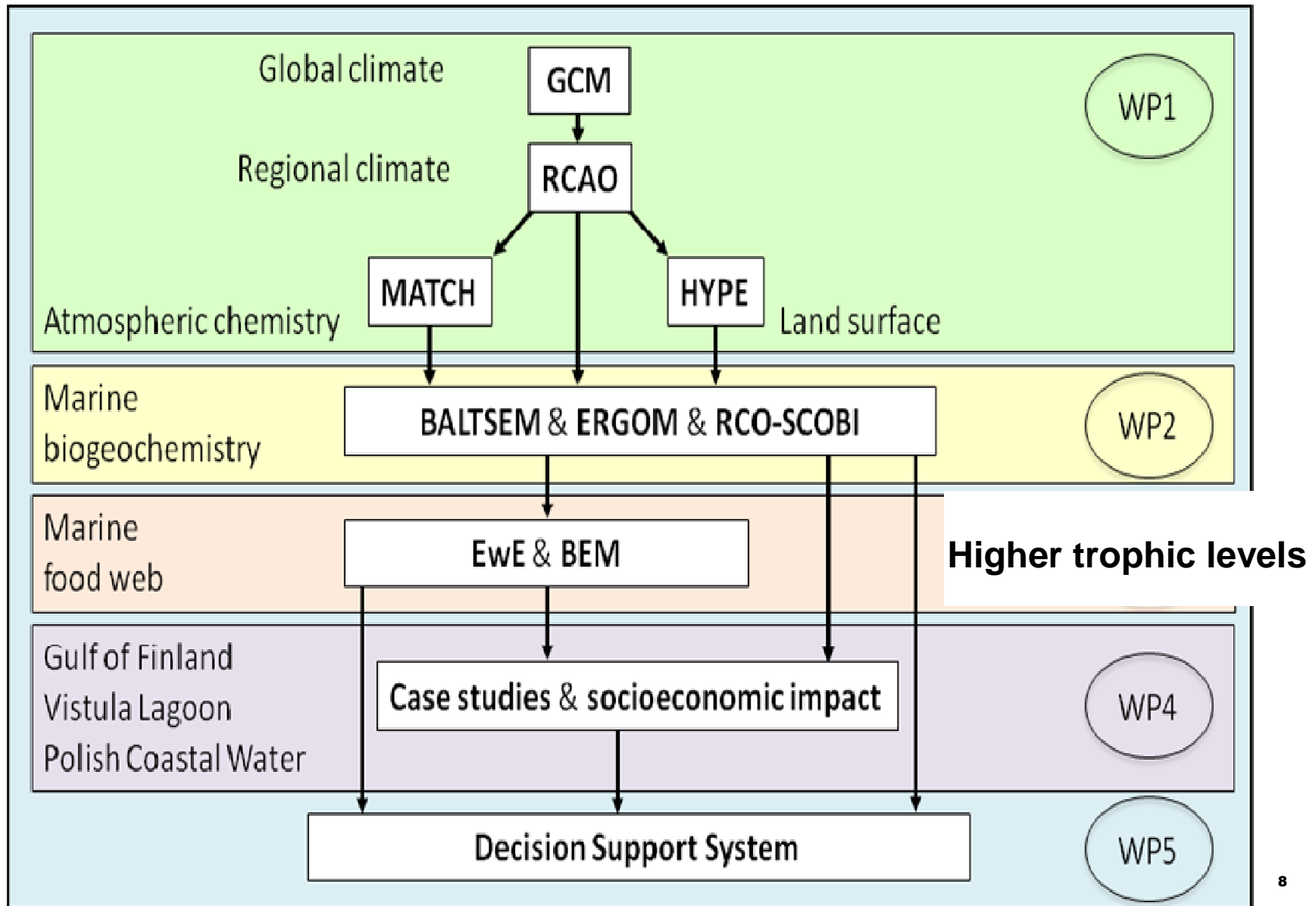
Model hierarchy in ECOSUPPORT

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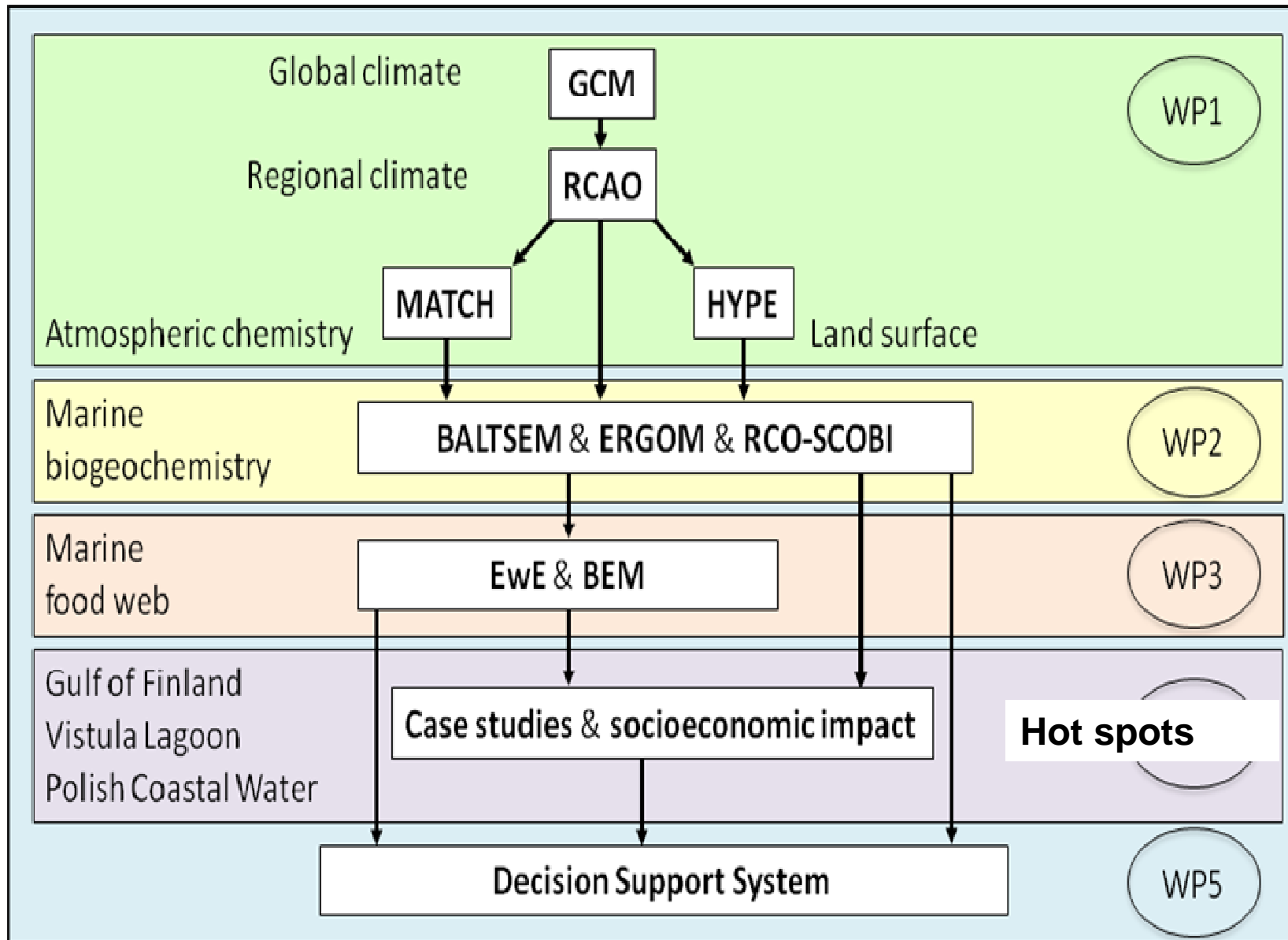
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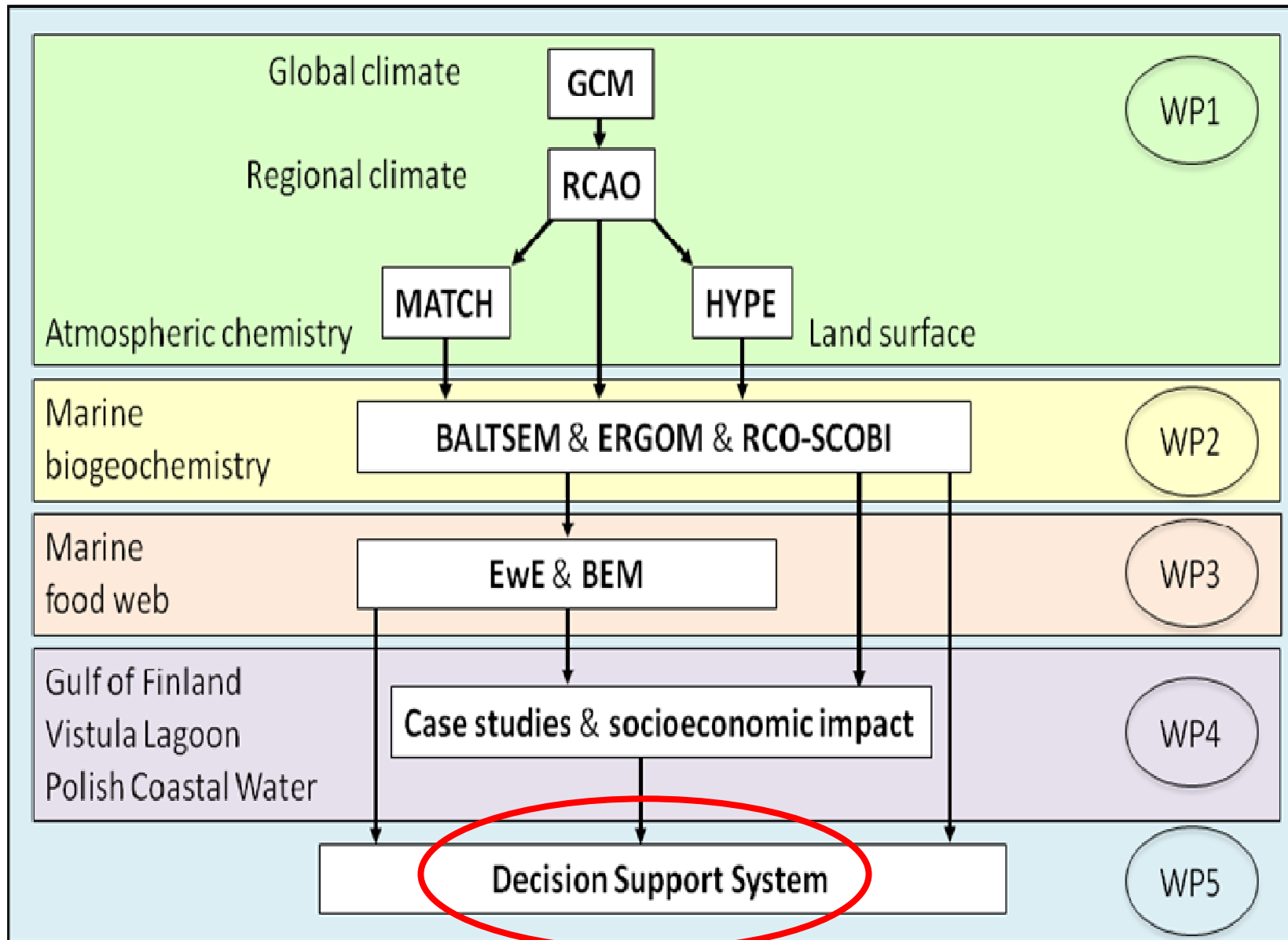
Model hierarchy in ECOSUPPORT

2010-10-25



Model hierarchy in ECOSUPPORT

2010-10-25





Quality assessment of atmospheric surface fields over the Baltic Sea from an ensemble of regional climate model simulations with respect to ocean dynamics

H.E.M. Meier, A. Höglund, R. Döscher, H. Andersson, U. Löptien and E. Kjellström

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The Rossby Centre ensemble

Different AOGCMs

Different initial conditions

Different model formulation (GCM)

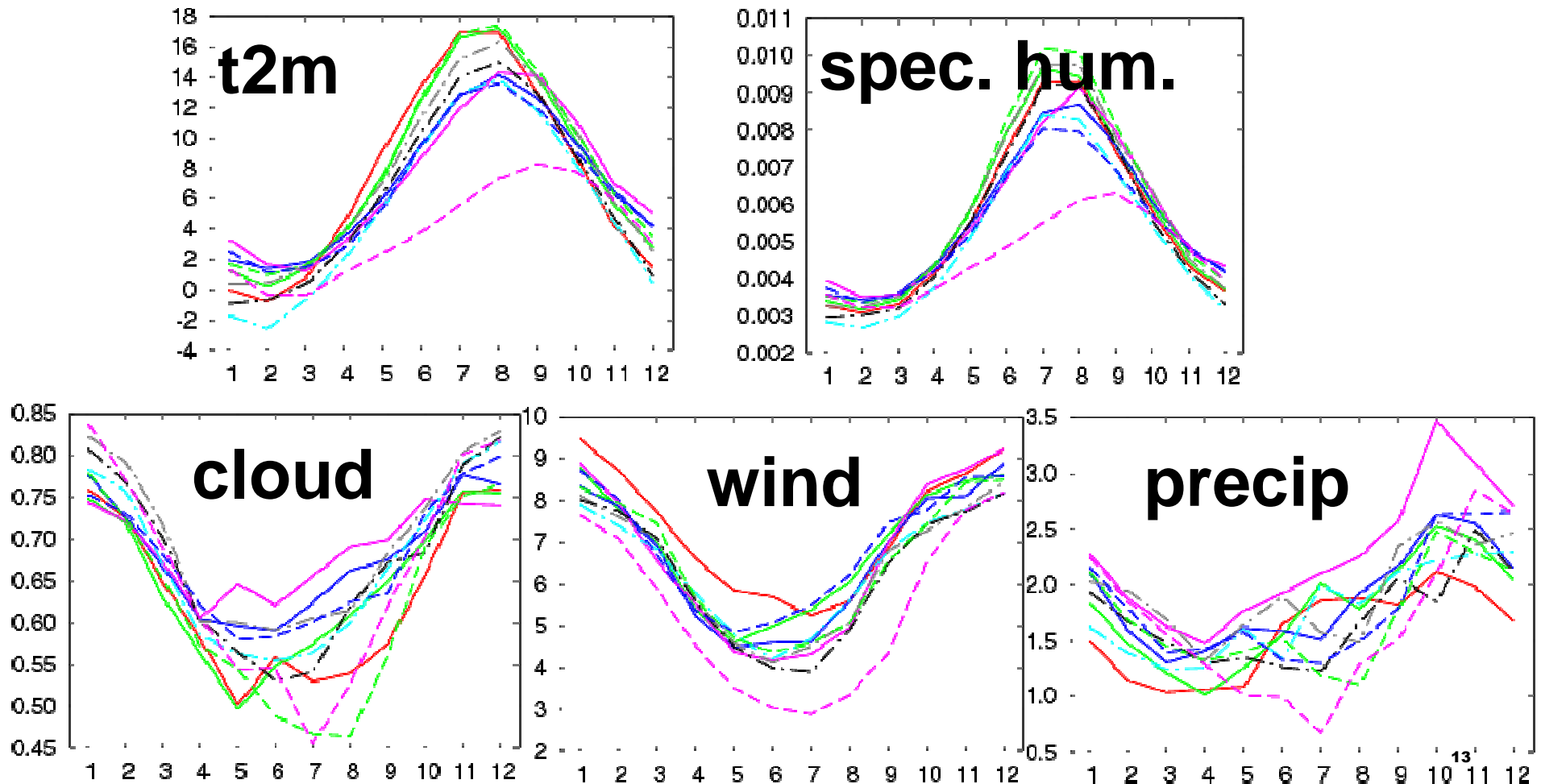
Different emission scenarios

Different horizontal resolution

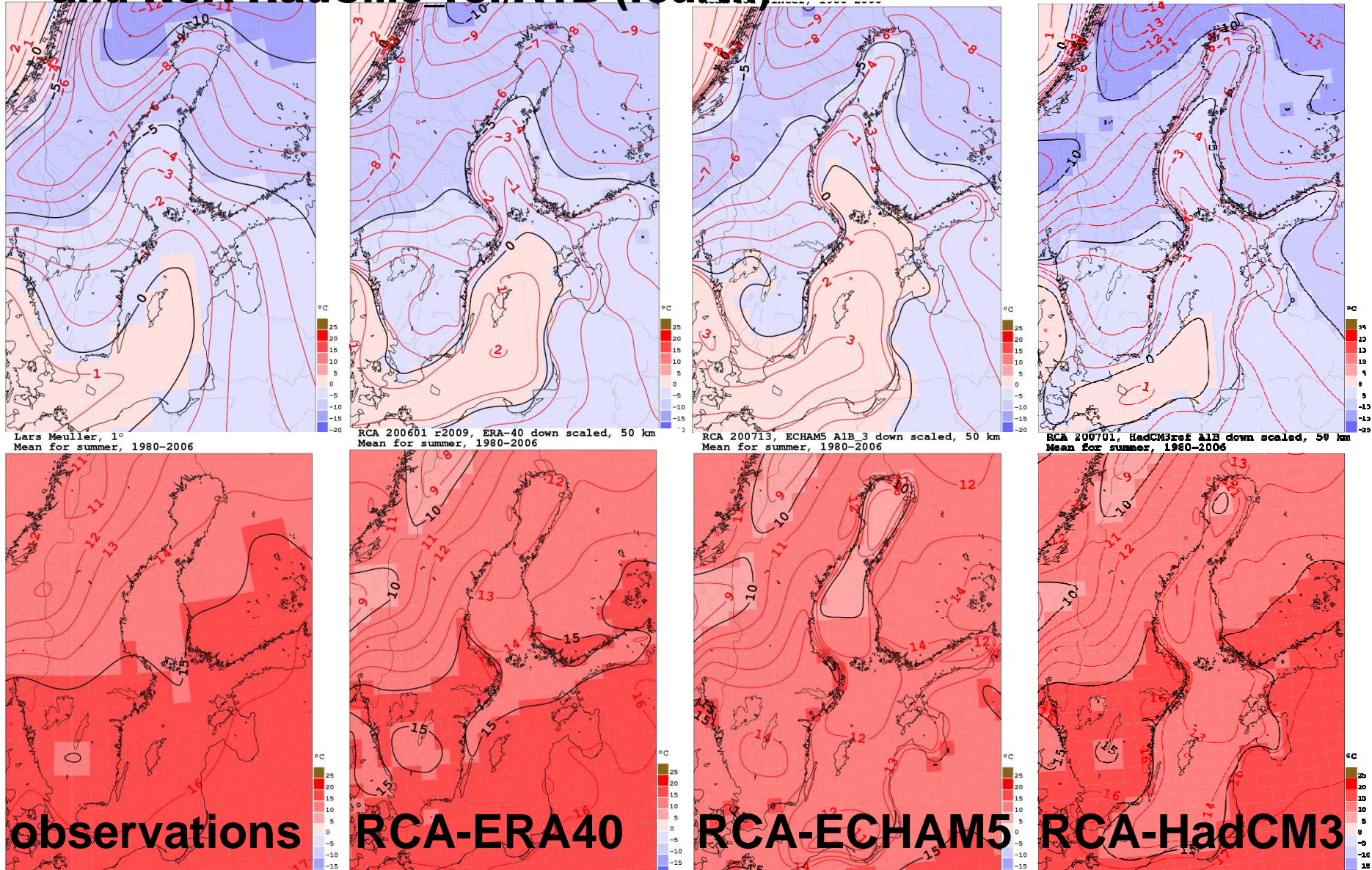
All simulations on the ENSEMBLES grid with RCA3

No	AOGCM (Institute, country)		Emission scenario	Horizontal resolution (km)
1	Arpège (CNRM, France)		A1B	50
2	BCM (NERSC, Norway)		A1B	50
3				25
4	CCSM3 (NCAR, USA)		A2	50
5			A1B	50
6			B2	50
7	ECHAM4 (MPI-met, Germany)		A2	50
8			B2	50
9	ECHAM5 (MPI-met, Germany)		A2	50
10				A1B
11			50	
12			50	
13			25	
14	12.5			
15			B1	50
16	HadCM3 (Hadley Centre, UK)	ref (Q0)	A1B	50
17		low (Q3)		50
18		high (Q16)		50
19		low (Q3)		25
20	IPSL-CM4 (IPSL, France)		A1B	50

Monthly mean 2m air temperature and standard deviation at Gotland Deep for 1980-2006 (RCA with 50km)



Winter (DJF; upper) and summer (JJA; lower) mean 2 m air temperature (°C) for 1980-2006: gridded observations (first column), RCA-ERA40 (second), RCA-ECHAM5/A1B_3 (third), and RCA-HadCM3 ref/A1B (fourth)



Mean biases (without BCM)

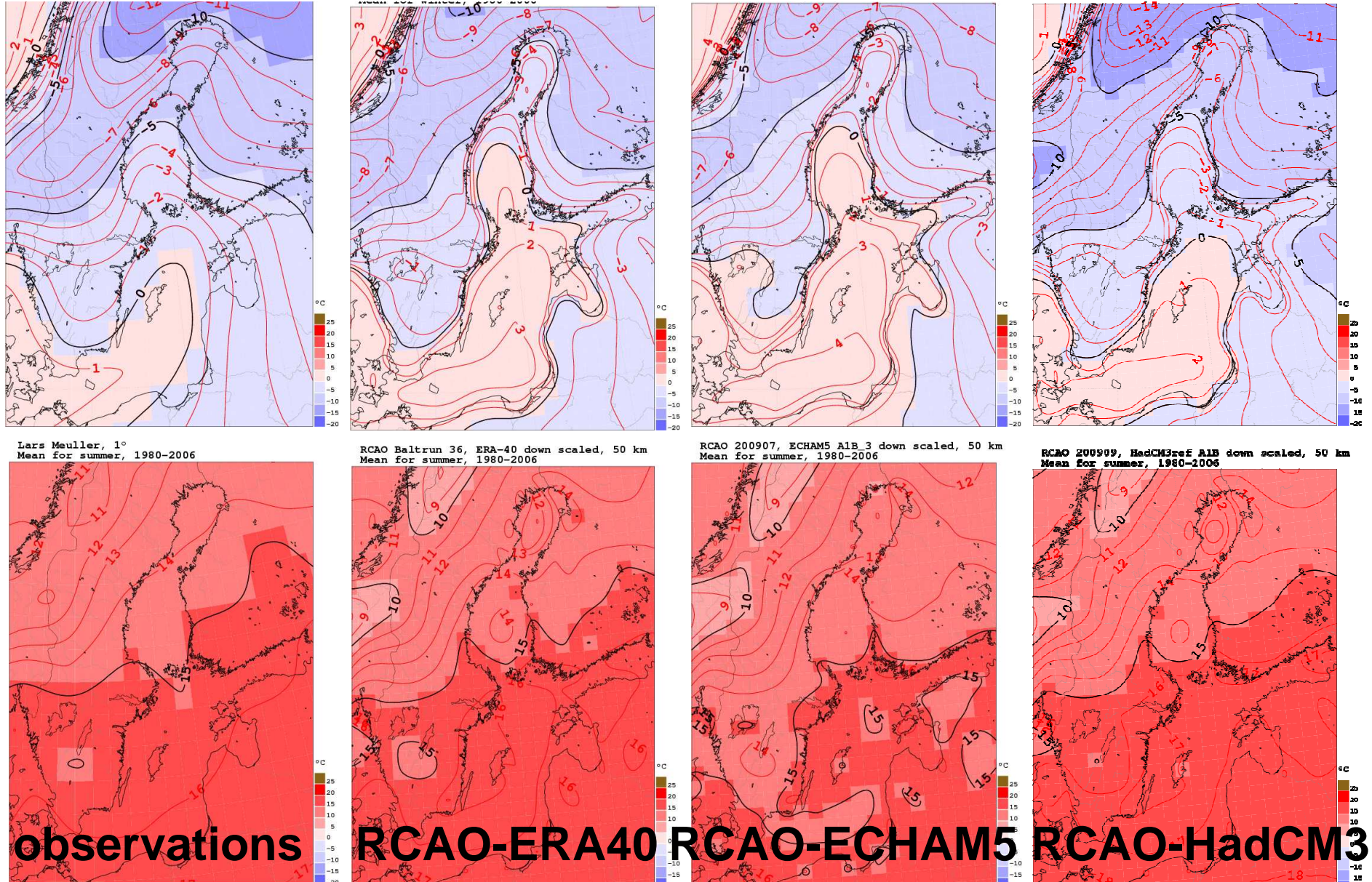
- air temperature: 0.07°C (ERA40), +0.7 ... -2.0°C (GCMs)
- cloudiness: -0.1% (ERA40), 0 ... +9.5% (GCMs)
- wind speed: -16% (ERA40), -12 ... -18% (GCMs)
- precipitation: +2% (ERA40), +5 ... +32% (GCMs)

**RCA scenario results
should not be used as
forcing for Baltic Sea
models !!!**

New transient simulations at SMHI (ECOSUPPORT):

- **Hindcast simulation 1961-2007: RCAO/ERA-40 (25km)**
- **Two transient simulations 1961-2099: RCAO/HadCM3 and RCAO/ECHAM5 A1B (and A2)**

Winter (DJF; upper) and summer (JJA; lower) mean 2 m air temperature (°C) for 1980-2006: gridded observations (first column), RCAO-ERA40 (second), RCAO-ECHAM5/A1B_3 (third), and RCAO-HadCM3_ref/A1B (fourth)

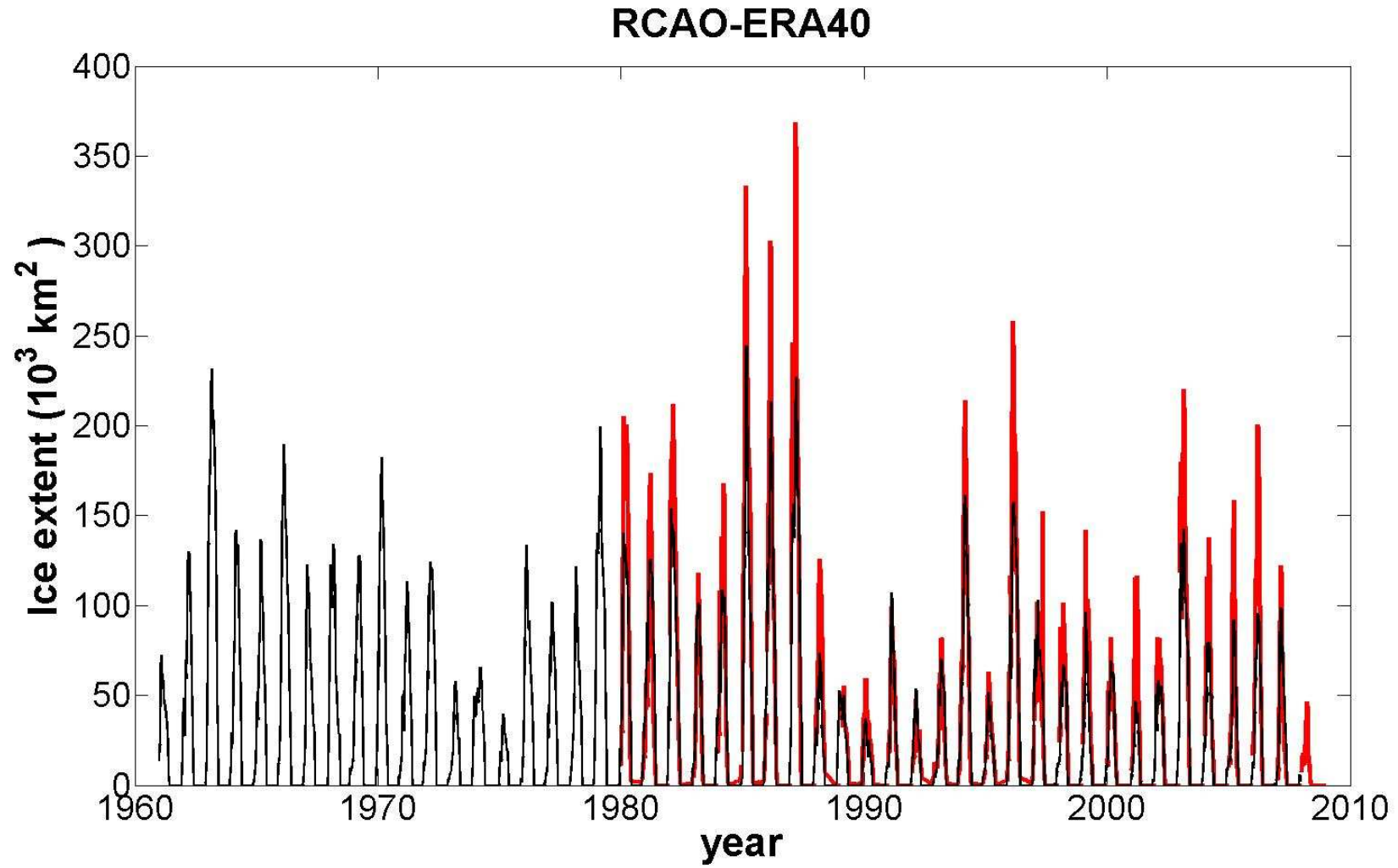


Lars Meuller, 1°
Mean for summer, 1980-2006

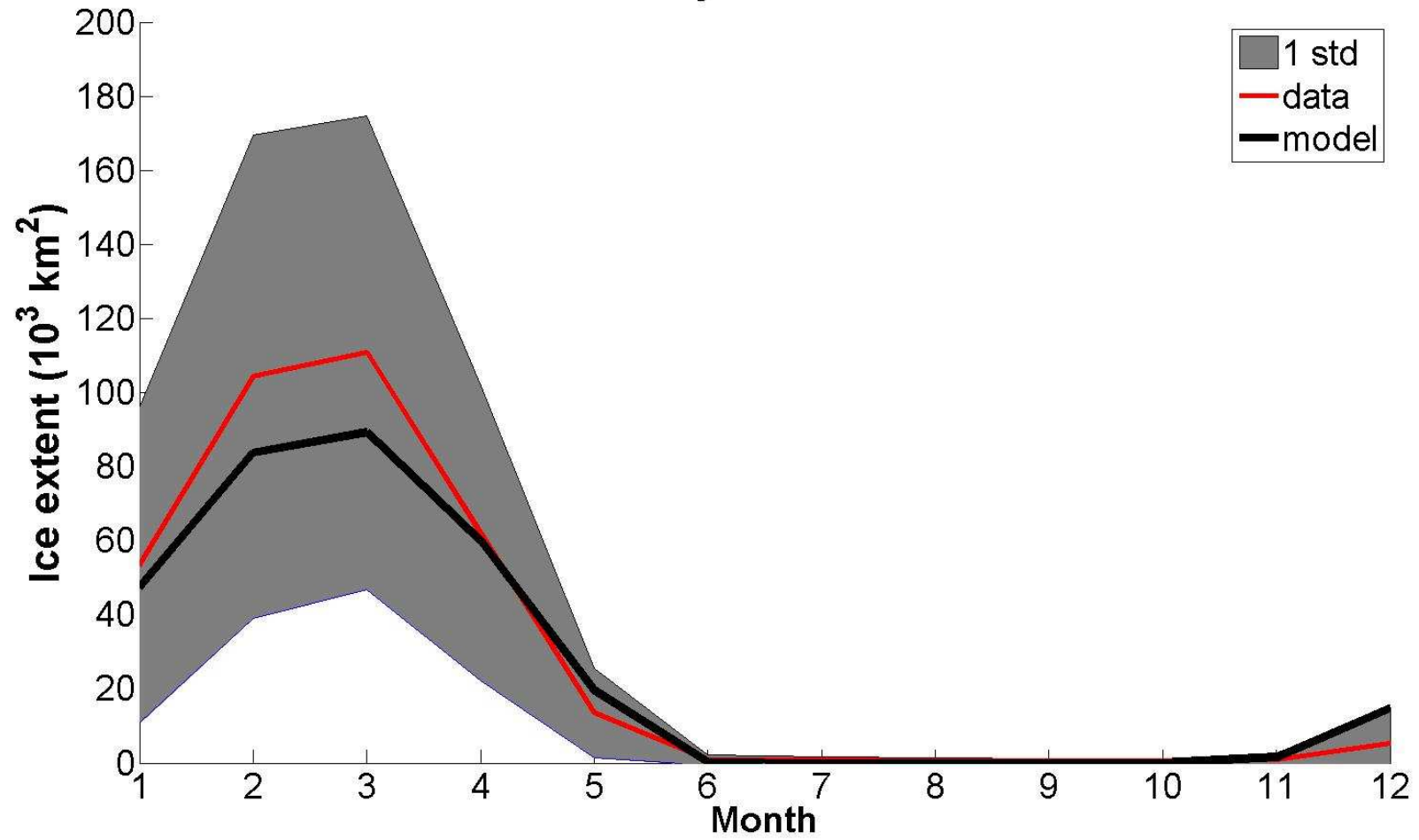
RCAO Baltrun 36, ERA-40 down scaled, 50 km
Mean for summer, 1980-2006

RCAO 200907, ECHAM5 A1B_3 down scaled, 50 km
Mean for summer, 1980-2006

RCAO 200909, HadCM3ref A1B down scaled, 50 km
Mean for summer, 1980-2006



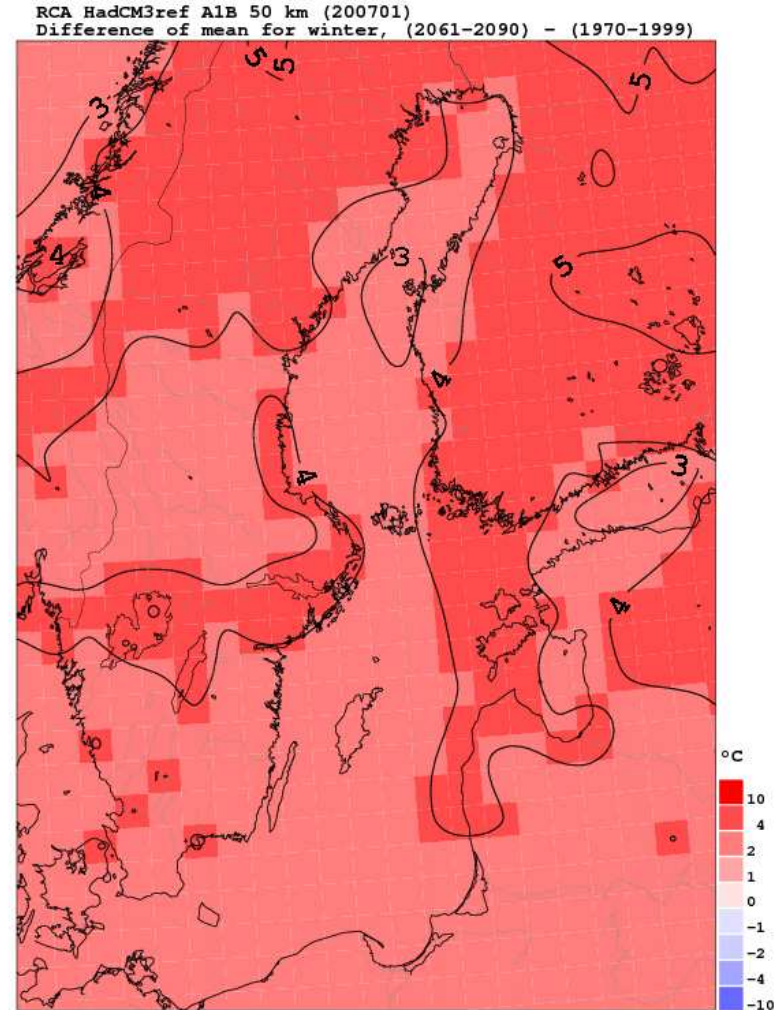
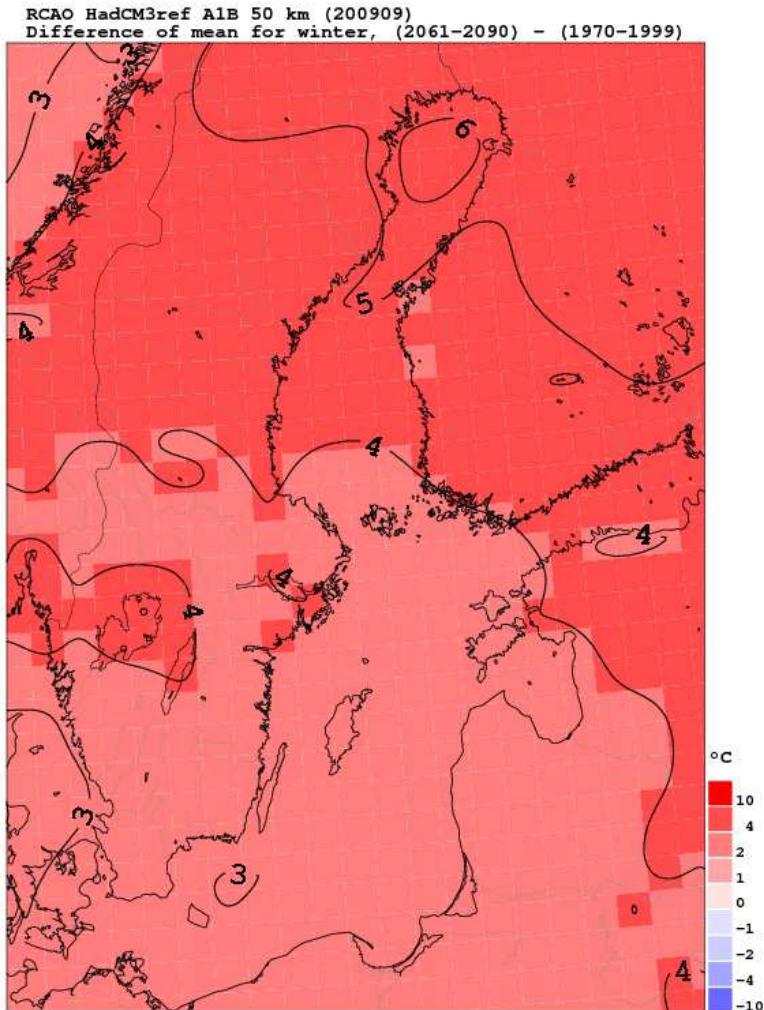
Seasonal Cycle RCAO-ERA40



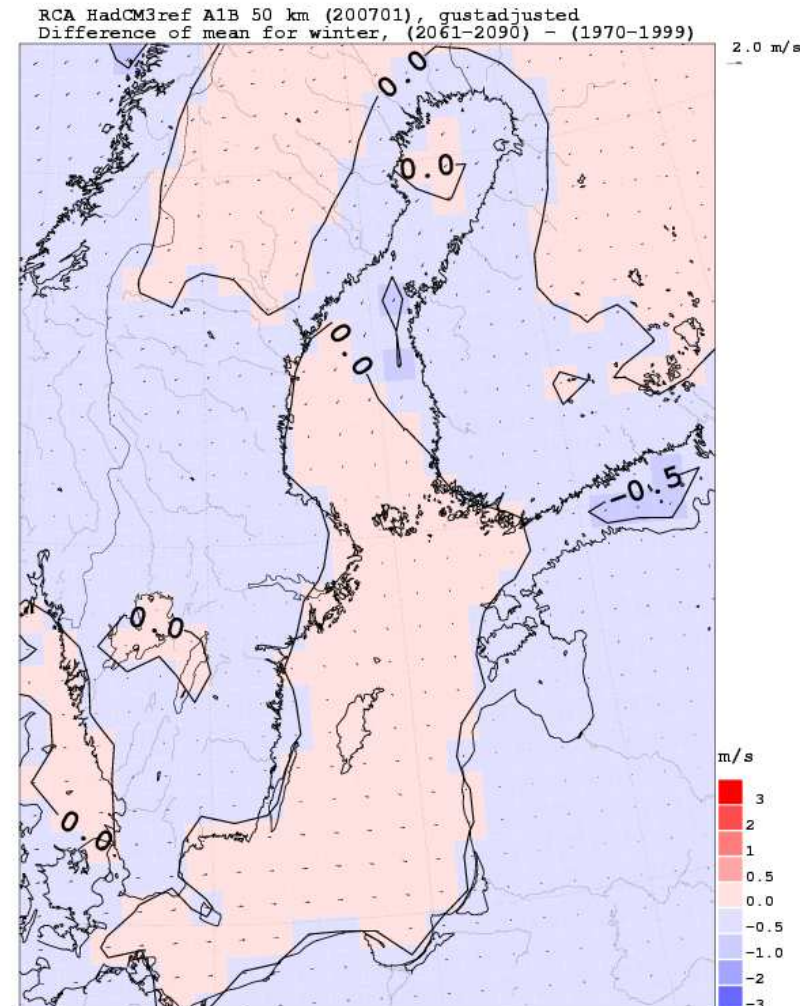
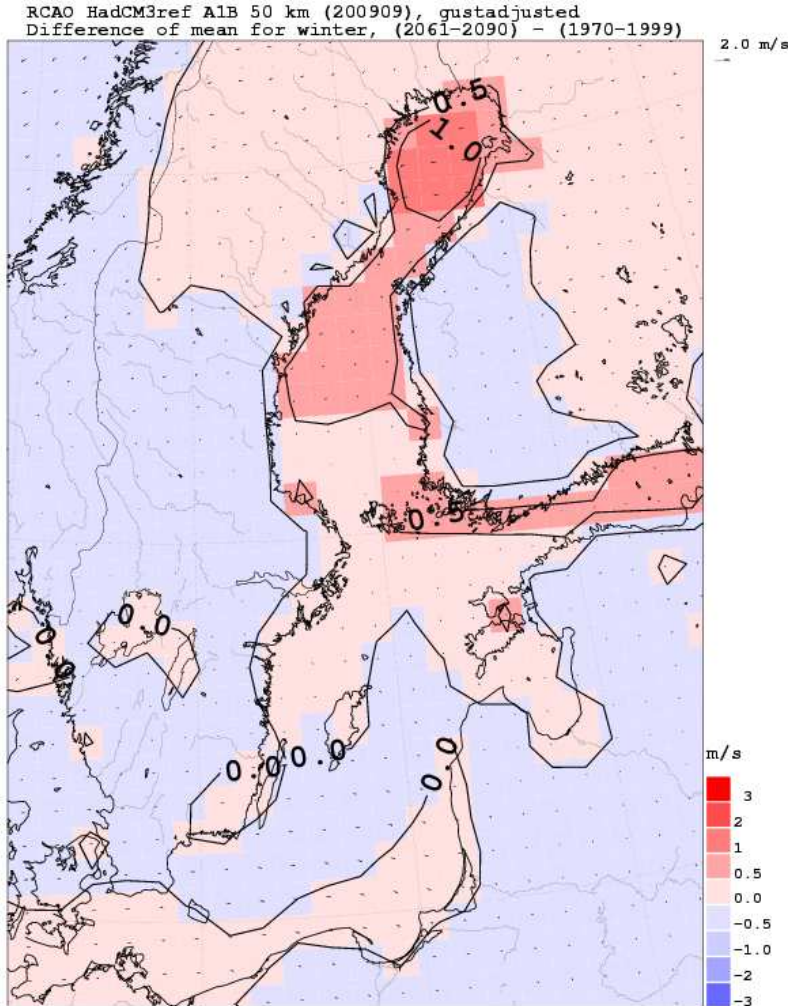
Scenario simulations



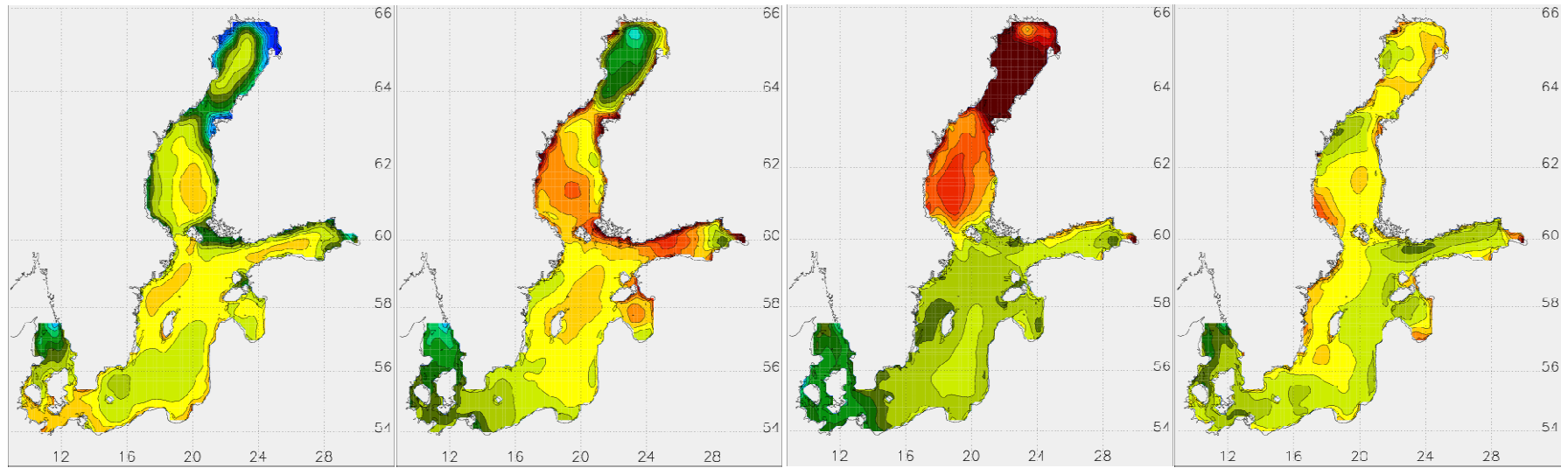
Winter mean 2m air temperature changes (°C) RCAO/HadCM3 (left) and RCA/HadCM3 (right) A1B, 2061-2090 minus 1970-1999



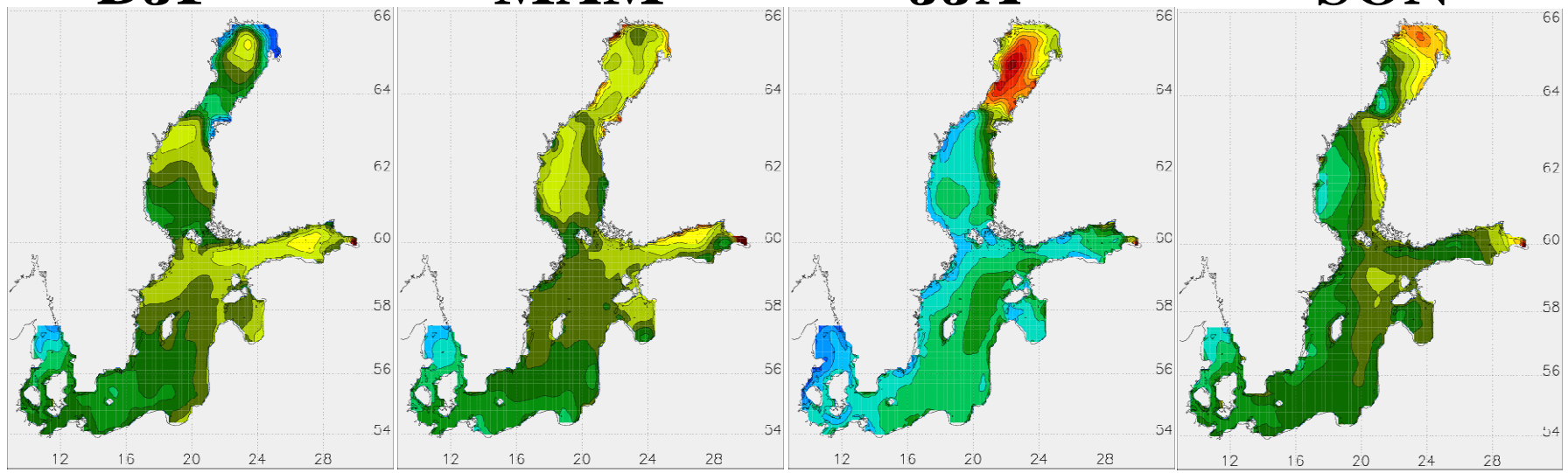
Winter mean 10m wind speed changes (m/s) RCAO/HadCM3 (left) and RCA/HadCM3 (right) A1B, 2061-2090 minus 1970-1999



Seasonal SST changes (°C) RCAO/HadCM3 A1B (upper) and RCAO/ECHAM5 A1B (lower) 2089-2060 minus 1970-1999

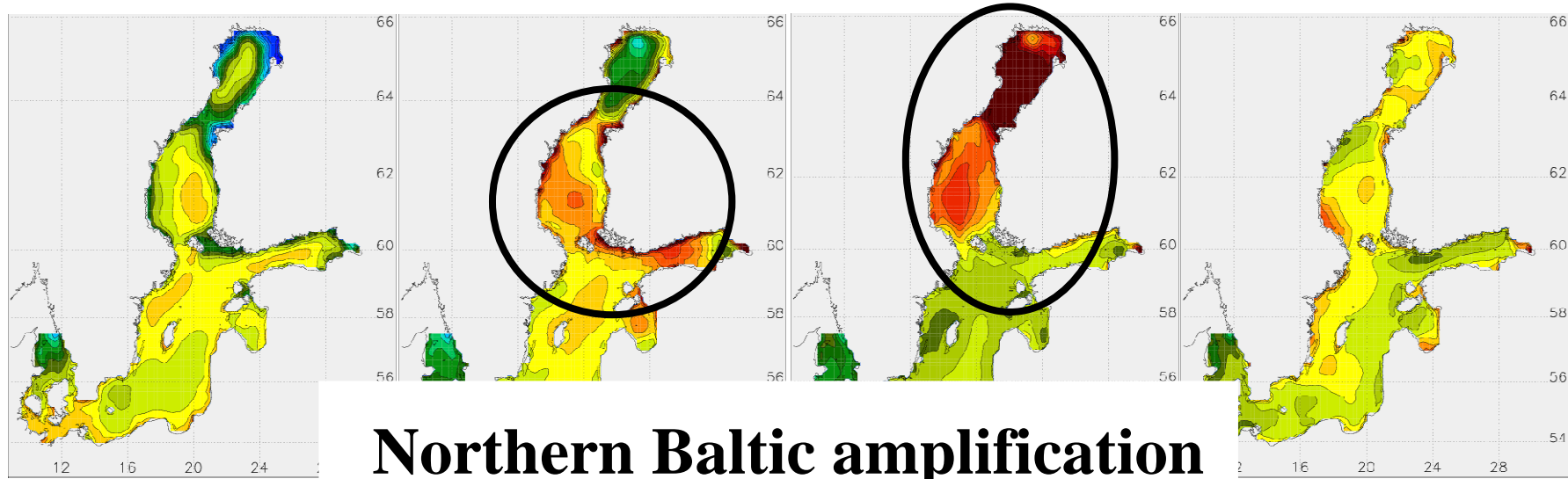


DJF **MAM** **JJA** **SON**



0.0 0.4 0.8 1.2 1.6 2.0 2.4 2.8 3.2 3.6 4.0 0.0 0.4 0.8 1.2 1.6 2.0 2.4 2.8 3.2 3.6 4.0 0.0 0.4 0.8 1.2 1.6 2.0 2.4 2.8 3.2 3.6 4.0 0.0 0.4 0.8 1.2 1.6 2.0 2.4 2.8 3.2 3.6 4.0

Seasonal SST changes (°C) RCAO/HadCM3 A1B (upper) and RCAO/ECHAM5 A1B (lower) 2089-2060 minus 1970-1999



Northern Baltic amplification

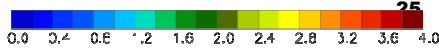
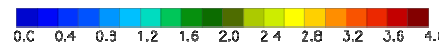
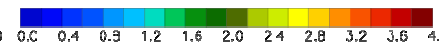
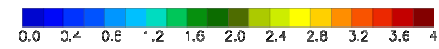
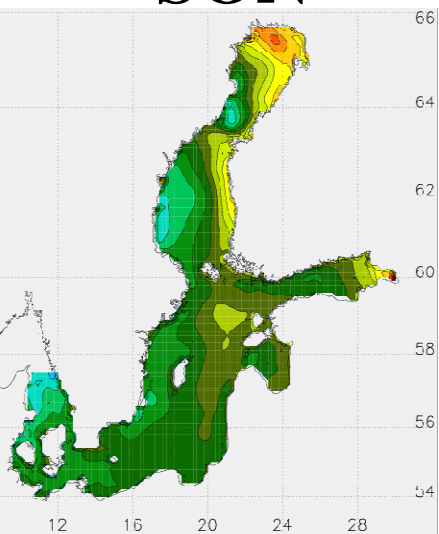
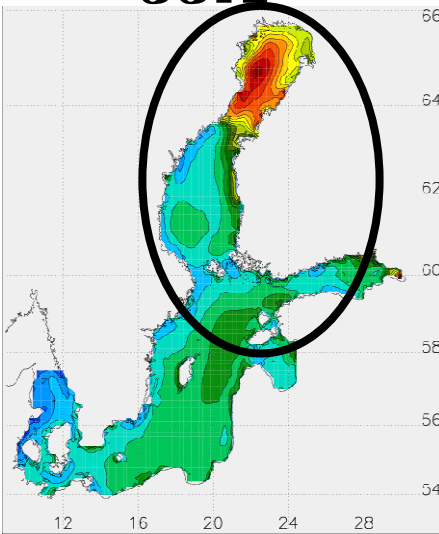
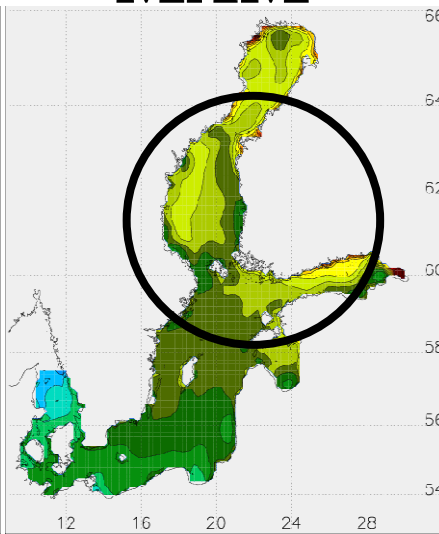
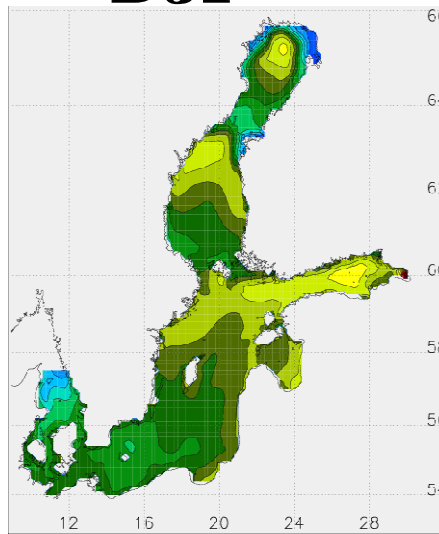


DJF

MAM

JJA

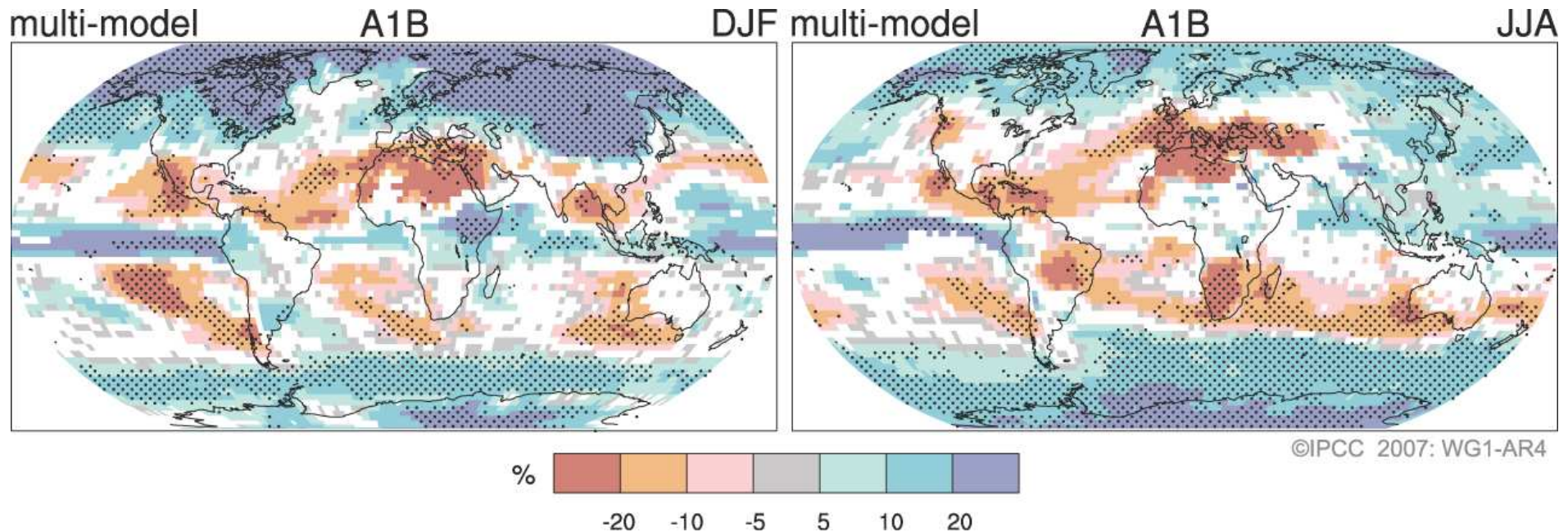
SON



The salinity problem

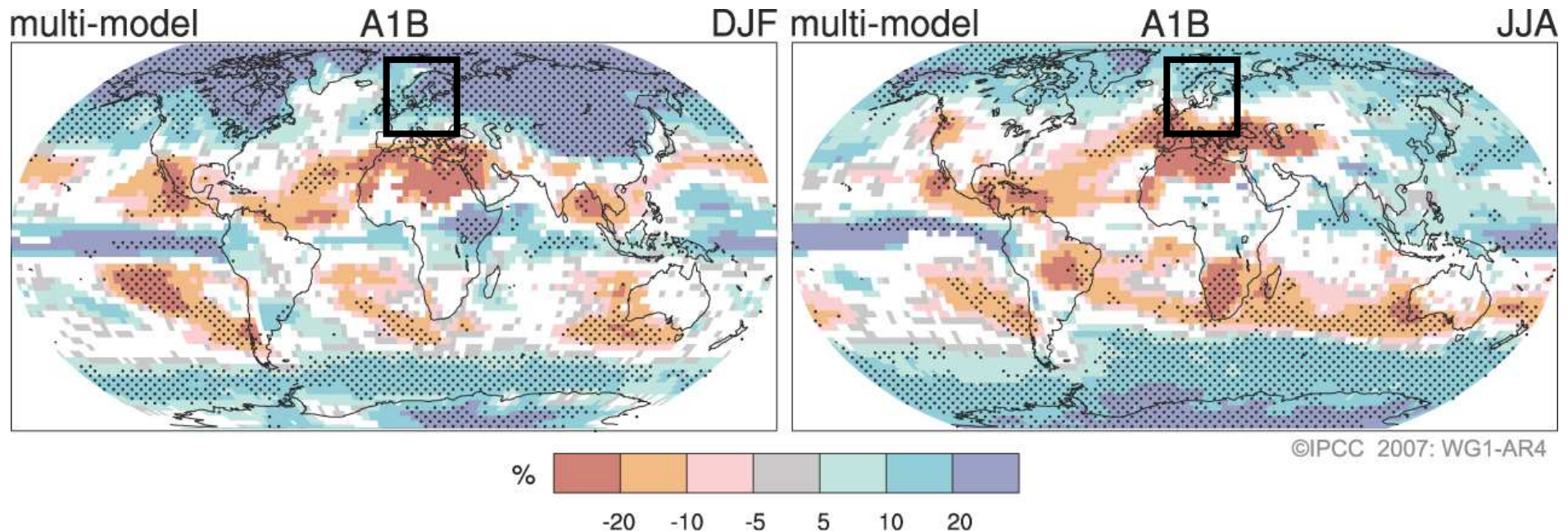


Relative changes in precipitation (in percent) for the period 2090–2099, relative to 1980–1999. Values are multi-model averages based on the SRES A1B scenario for December to February (left) and June to August (right).



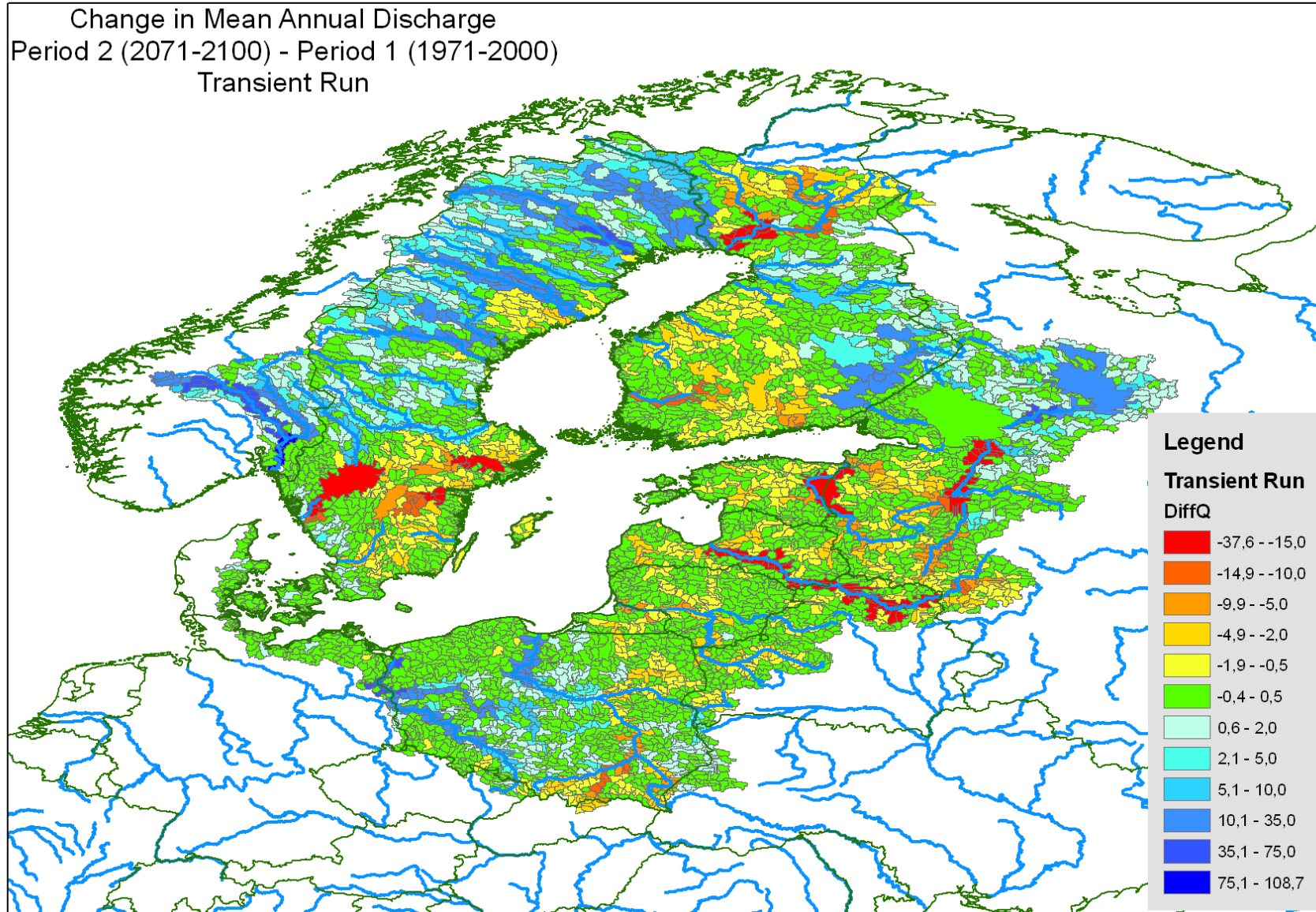
White areas are where less than 66% of the models agree in the sign of the change and stippled areas are where more than 90% of the models agree in the sign of the change. ²⁷

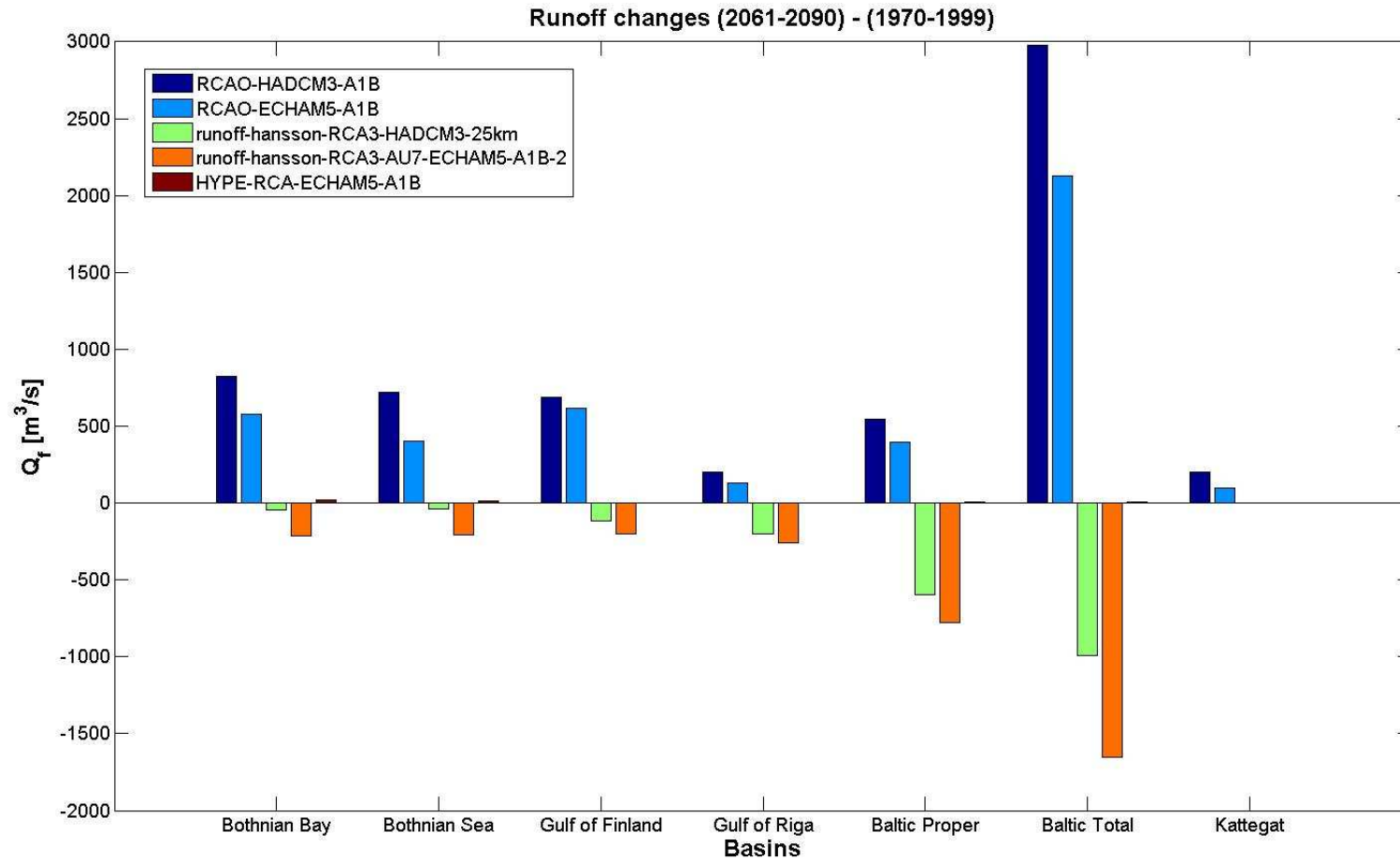
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HYPE results forced with RCA/ECHAM5 A1B 3





1. The quality of GCMs differs significantly. As a starting point we have selected ECHAM5 and HadCM3.
2. The added value of RCAO versus RCA: (a) improved summer air temperature, (b) temperature and wind speed change in HadCM3 driven simulations (biases affect the ice-albedo feedback)
3. Reduced uncertainty in RCAO concerning temperature !!!
The price: no large model ensemble available.
4. Large uncertainty of salinity scenarios: (a) transient zone of changing precipitation is uncertain in both GCMs and RCMs, (b) statistical versus dynamical hydrological modelling (HYPE), (c) rising sea level

2010-10-25

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**Thank you for
your attention!**

**Cyanobacteria
bloom 2008**

2010-10-25