Supplement of Biogeosciences Discuss., 11, 8607–8634, 2014
http://www.biogeosciences-discuss.net/bgd-11-8607-2014/
doi:10.5194/bgd-11-8607-2014-supplement


Biogeosciences
Discussions
Open Access

*Supplement of*

# Projected pH reductions by 2100 might put deep North Atlantic biodiversity at risk

**M. Gehlen et al.**

*Correspondence to:* M. Gehlen (marion.gehlen@lsce.ipsl.fr)

## Supporting materiel

**Earth system models, model output:** This study draws on standard CMIP5 output from the Program for Climate Model Diagnosis and Intercomparison (http://pcmdi3.llnl.gov/esgcet/home.htm). It uses models for which three-dimensional pH fields are available and that were part of a multi-model evaluation (Bopp et al., 2013). The complete set of RCPs is not available for all models. Individual models have been evaluated by the respective groups.

Table S1. Models used in this study and available RCP per model. References cite key papers for model validation. Esmfixclim2 = CMIP5 identifier for the simulation referred to as RCP4.5/fixclim in this study.

| model name | available RCPs | piControl (years) | Ref. |
|---|---|---|---|
| CESM1-BGC | 4.5, 8.5 | 500 | Hurrell et al. (2013) , Long et al. (2013) |
| GFDL-ESM2G | 2.6, 4.5, 6.0, 8.5 | 500 | Dunne et al. (2013) |
| GFDL-ESM2M | 2.6, 4.5, 6.0, 8.5, esmfixclim2 | 500 | Dunne et al. (2013) |
| IPSL-CM5A-LR | 2.6, 4.5, 6.0, 8.5, esmfixclim2 | 1000 | Séférian et al. (2013) |
| IPSL-CM5A-MR | 2.6, 4.5, 8.5 | 300 | Séférian et al. (2013) |
| MPI-ESM-MR | 2.6, 4.5, 8.5 | 1000 | Ilyina et al. (2013) |
| NorESM1-ME | 2.6, 4.5, 6.0, 8.5 | 252 | Tjiputra et al. (2013) |

## References

Bopp, L. et al.: Multiple stressors of ocean ecosystems in the 21st century: projections with CMIP5 models, Biogeosciences, 10, 6225-6245, doi:10.5194/bg-10-6225-2013, 2013.

Dunne, J. P. et al.: GFDL's ESM2 Global Coupled Climate–Carbon Earth System Models. Part I: Physical Formulation and Baseline Simulation Characteristics. Journal of Climate 25: 6646–6665 doi: 10.1175/JCLI-D-11-00560.1, 2013.

Hurrell, J. W. et al.: The Community Earth System Model: A Framework for Collaborative Research. Bulletin Amer. Meteor. Soc. 94, 1339-1360, 2013.

Ilyina, T. et al.: The global ocean biogeochemistry model HAMOCC: Model architecture and performance as component of the MPI-earth system model in different CMIP5 experimental realizations. Journal of Advances in Modeling Earth Systems, doi:10.1002/jame.20017, 2013.

Séférian, R. et al.: Skill assessment of three earth system models with common marine biogeochemistry. Climate Dynamics 40: 2549–2573 doi:10.1007/s00382-012-1362-8, 2013.

Tjiputra, J. F. Et al.: Evaluation of the carbon cycle components in the Norwegian Earth System Model (NorESM). Geosci. Model. Dev. 6: 301-325, 2013.

## Supporting Figures

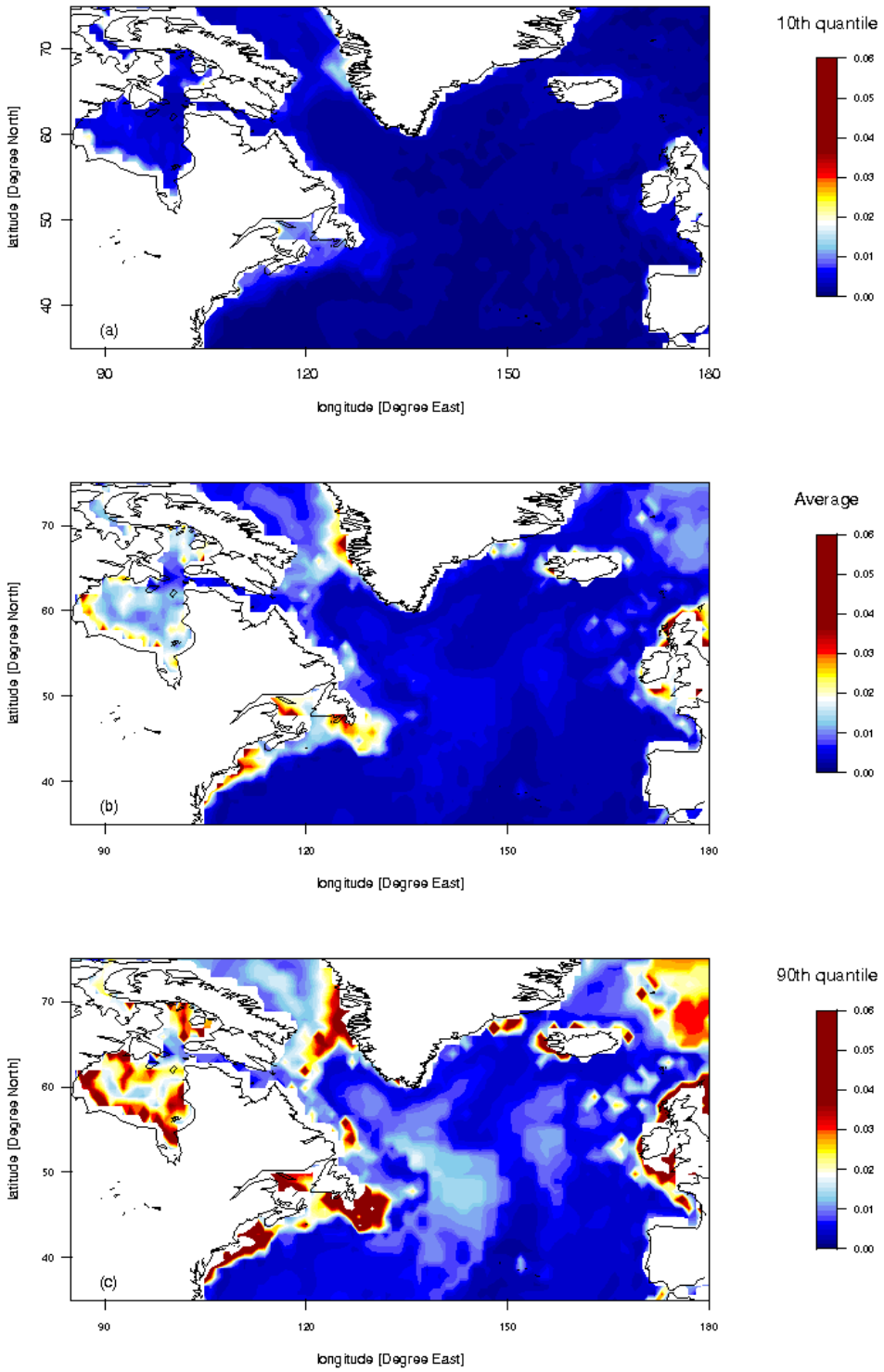
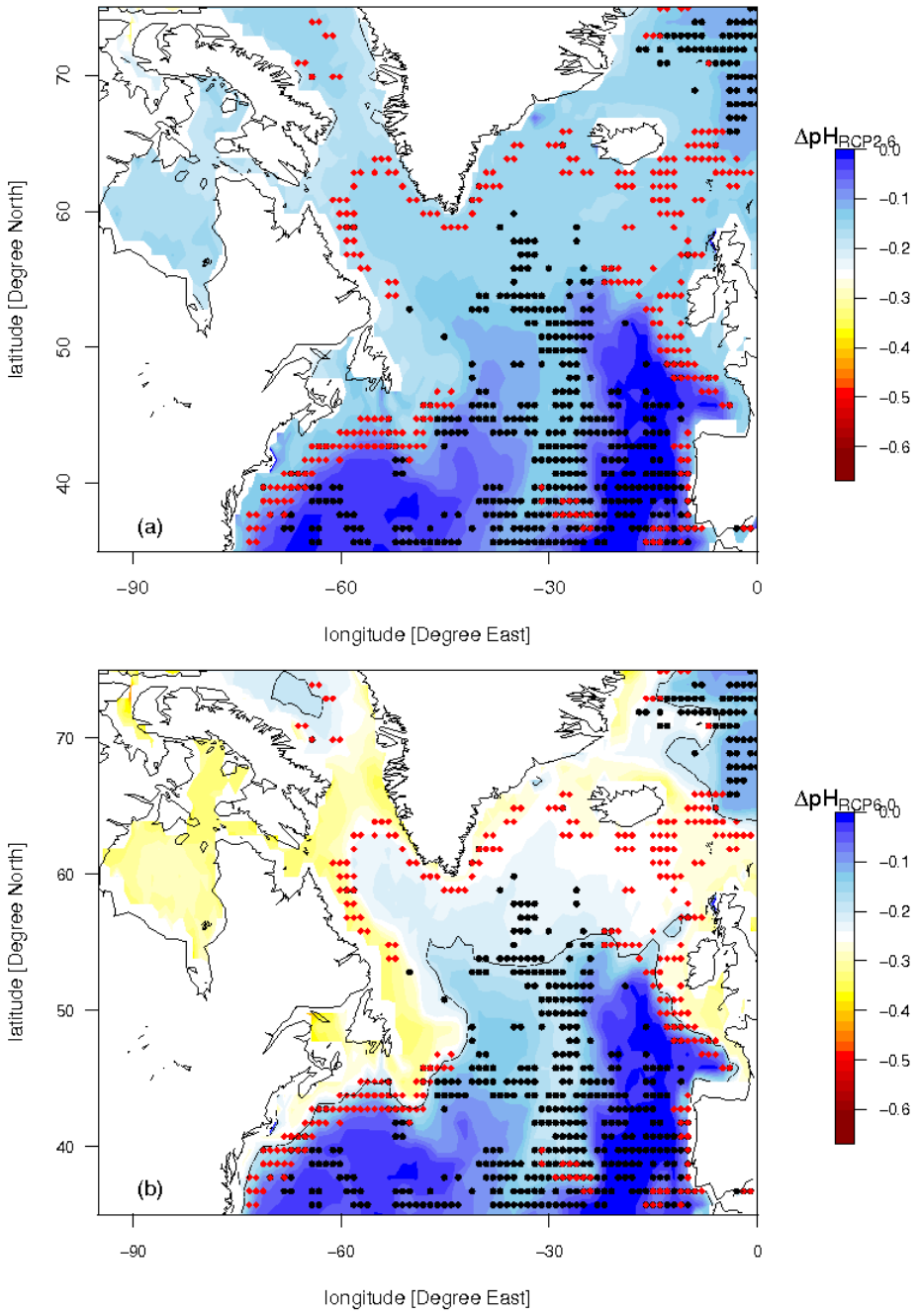



Figure S1. The simulated natural variability of deep-water pH from seven Earth system models. The standard deviation (sdv) of pH is computed for each individual model for the pre-industrial simulation piControl with the multi-model mean sdv shown on panel (b) and the multi-model range in sdv as defined by the 10% (a), respectively 90%(c) quantiles.




59

60 Figure S2. Projected changes in deep ocean pH between pre-industrial and the two IPCC RCP
61 scenarios RCP2.6 and RCP6.0 by 2100. The panels represent the difference in mean pH
62 between the pre-industrial and the 2090-2100 average for (a) RCP2.6 and (b) RCP6.0.
63 Locations of deep-sea canyons and seamounts are indicated as red and black symbols,
64 respectively. The -0.2 pH contour line is plotted to delineate areas experiencing pH reductions
65 beyond this threshold.