

Home

Online Library CP

- ▣ Recent Final Revised Papers
- ▣ [Volumes and Issues](#)
- ▣ Special Issues
- ▣ Library Search
- ▣ Title and Author Search

Online Library CPD

Alerts & RSS Feeds

General Information

Submission

Review

Production

Subscription

Comment on a Paper

Impact
Factor
2.542

ISI
indexed



▣ [Volumes and Issues](#) ▣ [Contents of Issue 3](#)

Clim. Past, 5, 551-570, 2009
www.clim-past.net/5/551/2009/

© Author(s) 2009. This work is distributed under the Creative Commons Attribution 3.0 License.

Glacial climate sensitivity to different states of the Atlantic Meridional Overturning Circulation: results from the IPSL model

M. Kageyama¹, J. Mignot², D. Swingedouw³, C. Marzin¹, R. Alkama^{1,4}, and O. Marti¹

¹LSCE/IPSL, UMR CEA-CNRS-UVSQ 1572, CE Saclay, L'Orme des Merisiers, Bât. 701, 91191 Gif-sur-Yvette Cedex, France

²LOCEAN, Université Pierre et Marie Curie, Case courrier 100, 4 place Jussieu, 75252 Paris Cedex 05, France

³CERFACS, 42 Avenue Gaspard Coriolis 31057 Toulouse, France

⁴CNRM, 42 av Coriolis, 31057 Toulouse cedex 1, France

Abstract. Paleorecords from distant locations on the globe show rapid and large amplitude climate variations during the last glacial period. Here we study the global climatic response to different states of the Atlantic Meridional Overturning Circulation (AMOC) as a potential explanation for these climate variations and their possible connections. We analyse three glacial simulations obtained with an atmosphere-ocean coupled general circulation model and characterised by different AMOC strengths (18, 15 and 2 Sv) resulting from successive ~ 0.1 Sv freshwater perturbations in the North Atlantic. These AMOC states suggest the existence of a freshwater threshold for which the AMOC collapses. A weak (18 to 15 Sv) AMOC decrease results in a North Atlantic and European cooling. This cooling is not homogeneous, with even a slight warming over the Norwegian Sea. Convection in this area is active in both experiments, but surprisingly stronger in the 15 Sv simulation, which appears to be related to interactions with the atmospheric circulation and sea-ice cover. Far from the North Atlantic, the climatic response is not significant. The climate differences for an AMOC collapse (15 to 2 Sv) are much larger and of global extent. The timing of the climate response to this AMOC collapse suggests teleconnection mechanisms. Our analyses focus on the North Atlantic and surrounding regions, the tropical Atlantic and the Indian monsoon region. The North Atlantic cooling associated with the AMOC collapse induces a cyclonic atmospheric circulation anomaly centred over this region, which modulates the eastward advection of cold air over the Eurasian continent. This can explain why the cooling is not as strong over western Europe as over the North Atlantic. In the Tropics, the southward shift of the Inter-Tropical Convergence Zone appears to be strongest over the Atlantic and Eastern Pacific and results from an adjustment of the atmospheric and oceanic heat transports. Finally, the Indian monsoon weakening appears to be connected to the North Atlantic cooling via that of the troposphere over Eurasia. Such an understanding of these teleconnections and their timing could be useful for paleodata interpretation.

▣ [Final Revised Paper](#) (PDF, 4607 KB) ▣ [Discussion Paper](#) (CPD)



Search CP

Library Search

Author Search

News

- ▣ Two Editors of Climate of the Past among EGU 2009 medalists
- ▣ Publications by EGU Medalists
- ▣ Online textbook in climatology available
- ▣ TWO editors of Climate of the Past funded by ERC

Recent Papers

01 | CP, 01 Dec 2009: Pollen-based biome reconstructions for Latin America at 0, 6000 and 18 000 radiocarbon years ago

02 | CP, 27 Nov 2009: Corrigendum to Preface "Climate change: from the geological past to the uncertain future – a symposium honouring André Berger" published in Clim. Past, 5, 707–711, 2009

03 | CPD, 27 Nov 2009: Mountain uplift and the threshold for sustained Northern Hemisphere

Citation: Kageyama, M., Mignot, J., Swingedouw, D., Marzin, C., Alkama, R., and Marti, O.: Glacial climate sensitivity to different states of the Atlantic Meridional Overturning Circulation: results from the IPSL model, *Clim. Past*, 5, 551-570, 2009. [Bibtex](#) [EndNote](#) [Reference Manager](#)