

Will slowing of the MOC warm or cool Europe?

Abstract IUGG PS011

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2/23/07

We were motivated by Bryden et al. (2005) analysis which implies that the MOC has slowed down significantly (20%) during the past 50 years and that, as a result, Europe should have cooled during this period. Although the article has been subject to strong criticism, and, although there have been claims in various blogs (e.g., www.realclimate.com) that Bryden himself retracted at least some of his conclusions, his results are consistent with recent observations of an increased fresh water flux into the Atlantic. And yet, western Europe “failed” to cool during the past 50 years.

To examine this issue, we considered a coupled analytical model where fundamental counter-intuitive heat-flux aspects are considered. On that basis, we suggest that, in contrast to what the global numerical climate models predict, a slow down of the MOC will cause Europe to warm, not cool. As in the numerical models, the analytically modeled slow-down is accompanied by a reduced heat flux to the atmosphere. However, this reduced amount of heat is applied to a significantly smaller amount of air. We show that the strong horizontal diffusion that is unavoidably employed by the numerical simulations camouflages the local warming by mixing the negative heat flux anomaly around making it appear as if there is a broad cooling.