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Contrasted Indo-Atlantic connections between modern and LGM conditions: Lagrangian diagnostics derived from OGCM results

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We point here a general question that arises in physical oceanography: Where do water masses come from and where are they going? Pathways and mechanisms for oceanic heat and fresh water transports are critical issues in the understanding of the present climate and in the study of its stability or past evolution. The ocean circulation transfers heat and fresh water between different climate regimes and between different ocean basins. Transports and pathways are often inferred by merging distinct (mostly Eulerian) sources of data and by matching available pieces of knowledge on a basin or global scale. Yet, the most natural approach to estimate origins and pathways of water masses is to follow their movement and their transformation. In this study, we derive quantitative and qualitative information about the description of the ocean mean seasonal state, combining with quantitative Lagrangian diagnostics the information contained in observational climatologies and in the dynamics computed by high performance ocean models. We will show examples of reconstructed oceanic pathways for the present climate and for the Last Glacial Maximum ocean circulation, from recent LSCE and Hadley Center numerical experiments. A special emphasis will be put on diagnostics capable of describing appropriately the North Atlantic overturning and of linking the involved water masses to remote origins as the Indian Ocean.