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Rossby wave breaking and its relation with the general atmospheric circulation during the last glacial maximum in two PMIP2 ocean-atmosphere coupled models.

G. Rivière (1), A. Lainé (2), and G. Lapeyre (2)

(1) CNRM/GAME, CNRS and Météo-France, Toulouse, France (gwendal.riviere@meteo.fr), (2) LMD, Paris, France

Storm tracks play a crucial role in the dynamics of the general circulation of the atmosphere and especially at the end of the oceanic basins where they feedback onto the mean flow. A recent perspective to analyze the nonlinear eddy feedback is to focus on Rossby wave breaking. In the present climate, fluctuations of the large-scale jets related to teleconnections such as the North Atlantic Oscillation (NAO) were shown to be directly related to wave-breaking processes. Indeed, baroclinic waves may displace the large-scale jets in the eastern part of the oceanic basins during their breaking with anticyclonic and cyclonic wave breaking leading generally to a northward and southward displacement of the jets respectively.

A method to detect cyclonic and anticyclonic Rossby wave breaking is first presented and applied to the simulations obtained from two PMIP2 ocean-atmosphere coupled models (IPSL and CNRM). Rossby wave-breaking frequencies of occurrence in the simulations of the present climate are first presented and compared with those found in ERA40 reanalysis data. Then, the simulations of the last glacial maximum are considered and exhibit a clear increase of cyclonic wave-breaking compared to the present-climate runs especially in the Pacific whereas anticyclonic wave-breaking frequencies stay more or less the same. This may explain the southeastward shift of the eddy-driven jet and the storm-tracks in these regions during the last glacial maximum as described by Lainé et al. (2009). Different dynamical arguments are provided to explain this difference in wave-breaking frequencies.