

# Analysis of the mechanisms for abrupt climate changes during the glacial periods using the MIROC 4m AOGCM

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It is well known that abrupt climate changes with global-scale impacts occurred repeatedly during the glacial periods. These abrupt climate changes have been shown to be closely related to the nonlinear mode shift of the Atlantic meridional overturning circulation (AMOC), and our recent studies show that the mode shifts are caused by internal factors in the atmosphere-ocean system rather than by external forcing. However, the exact role of the internal factors in determining the mode shift of the AMOC, especially the process of AMOC recovery, remains unclear. This study analyzes the mechanisms for self-induced oscillation of the AMOC that occurs in the global coupled atmosphere-ocean model MIROC 4m.

The results show that both subsurface warming and Southern Ocean feedback may play an important role in the recovery of the AMOC. In addition, the results from analysis during the transition stage of the AMOC suggest that both destabilization of density stratification in the North Atlantic and wind-sea-ice-convection feedback are important factors that determine the nonlinear mode shift of the AMOC.