Some climate models (CMIP3) indicate that the Atlantic Meridional Overturning Circulation (MOC) varies on Multi-decadal time scale, independent of external forcing. In these models the MOC is key to Atlantic Multi-decadal Variability (AMV), because of its poleward heat transport. However, there is large spread in simulated AMV, with major uncertainty in the roles played by the North Atlantic Oscillation (NAO) and ocean-atmosphere interaction.

In the Kiel Climate Model (KCM), the MOC fluctuates with a 60-years period, driving changes in Atlantic Sea Surface Temperature (SST). The mechanisms for this variability are studied using statistical analysis, including three-dimensional Temperature and Salinity Joint Empirical Orthogonal Functions (EOFs). The NAO plays little role in driving these fluctuations. Wintertime convection in the Greenland-Iceland-Norwegian (GIN), Irminger, and south Greenland Seas play different roles in MOC variability. Irminger Sea convection primarily drives MOC changes, leading them by about 15 year. In this region salinity contribution to density dominates. The Subpolar Gyre (SPG) also plays an important role, also leading MOC changes by about 15 years.