Assessing the link between AMV and weather regimes in GFDL climate simulations

Authors: Yohan Ruprich-Robert – NOAA (*yohan.ruprich-robert@noaa.gov*), Rym Msadek – NOAA, Tom Delworth – NOAA.

Abstract: The mechanisms of AMOC internal variability and its links with climate anomalies over land at decadal timescale are investigated in long control simulations using a suite of GFDL coupled models of various oceanic and atmospheric resolutions. We focus in particular on two coupled models, CM2.1 and FLOR, which have the same ocean model (~1° resolution) but different atmospheric resolution (200 km in CM2.1 vs. 50km in FLOR). The two models exhibit the same ~20 year oscillating mode of variability of the entire AMOC cell. We investigate the influence of increased resolution on the simulation of the AMOC impacts over land. Despite its better atmospheric mean state, FLOR suffers from persistent biases in the Atlantic (e.g. a displaced Gulf Stream path). We investigate the influence of such biases on the representation of AMOC variability and its climate impacts by comparing FLOR to a flux-adjusted version of the same model, FLOR-HAD, which corrects for momentum, enthalpy and freshwter fluxes, hereby strongly reducing the surface temperature biases.

The climate impact anomalies associated with the AMOC and AMV are assessed through a weather regime approach. More specifically, we determine the realism of the frequency of occurrence of blocking and NAO events in the model simulations and their relationship with AMV. This analysis is a first step in assessing the mechanisms of the atmospheric response in terms of weather extremes in response to AMV, which we further explore using sensitivity experiments that are briefly discussed.