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Influence of runoff, high frequency atmospheric forcing and model resolution on deep water mass formation regions and Atlantic Meridional Overturning Circulation, from a numerical model.

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Water mass formation regions act as windows to the deep ocean where surface waters are transformed to intermediate and deep waters. Within the North Atlantic, Labrador Sea Water (LSW) is convectively produced in the Labrador Sea while in the Nordic Seas the source waters for Denmark Strait Overflow Water (DSOW) and Iceland-Scotland Overflow Water (NEADW) are formed. They are the main components of the North Atlantic Deep Water (NADW) which forms the lower limb of the Atlantic Meridional Overturning Circulation (AMOC). We explore the changes of the LSW formation rates and in AMOC strength as consequence of runoff glacial melt, high frequency atmospheric forcing influence and variations in model's resolution. We use 1/4° resolution Arctic and Northern Hemisphere Atlantic (ANHA4) configuration from the Nucleus for European Modelling of the Ocean (NEMO) model. A nest using ANHA4 and the Adaptive Grid Refinement in FORTRAN (AGRIF) package was used to increase the resolution to 1/12° in the sub-polar gyre. The formation rate is calculated based upon a kinematic subduction approach where the exchange through the dynamic mixed layer base is calculated based on shallowing and deepening in the mixed layer, and convergence of horizontal transport into or out of the mixed layer. Lastly we use a Lagrangian tool (Ariane) to track the path of the DSOW and the NEADW from their formation source.