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The role of diapycnal mixing schemes for deep convection in the Irminger Sea

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Although Nansen (1912; doi: 10.1002/iroh.19120050102) already suspected the Irminger Sea as one of the few sites where open-ocean deep convection occurs, a long period of discounting this notion followed – until measurements over the last decade confirmed intermittent deep convection in the southwestern Irminger Sea. Local formed water masses in the Irminger Sea constitute the warmest and saltiest part of the intermediate Labrador Sea water and are important for the variability of the Atlantic meridional overturning circulation and for the storage of anthropogenic carbon. Measurement campaigns and model studies revealed that deep convection in the Irminger Sea occurs only under favorite conditions: (i) a positive NAO index, (ii) a preconditioning of the water column, and (iii) a strong heat loss to the atmosphere due to the frequently occurring Greenland tip jets. Unclear is, however, what role the chosen diapycnal mixing scheme plays in modelling the deep convection in the Irminger Sea. To study the impact of the mixing scheme on the deep convection, we performed simulations with the Max Planck Institute Ocean Model (MPIOM) with three different mixing schemes (PP, KPP, and TKE) driven by ERA-Interim (1979–2017). We analyse the interaction of the aforementioned influence factors and when these conditions cause deep convection in the Irminger Sea in dependence of the chosen diapycnal mixing scheme.