Review of manuscript by Hans van Haren

Technical Note: A note on stabilization mechanisms of, e.g., Atlantic Ocean meridional overturning circulation

This is a very interesting manuscript considering the AMOC as a complex system depending on many processes in the ocean.

The author shows that account for such physical processes as internal waves and internal tides influences the AMOC. Accurate account for these processes in the model would stabilize the circulation preventing its collapse.

The paper deserves publishing.

Minor remarks

(1) I think it is not correct to write abbreviation e.g. in the title

(2) The author writes on pages 53-54 that Schematically, the Atlantic(-Ocean) Meridional Overturning Circulation (AMOC) transports heat from the equator to the poles near the surface.

Then on page 70 he cites Wunsch and Ferrari and writes that the ocean is not a heat machine.

To my opinion on page 73 it should be written that in addition to the heat machine that warms in the tropics and cooled at high latitudes it is also wind driven and tide driven. Fomation of Antarctic Bottom Water that spreads to northern mid-latitude occurs only to cooling in the Weddell Sea and ice formation. Then tides and internal waves cause mixing.

Page 79 Without turbulent mixing, the AMOC would be confined to a 100-m thick near-surface layer and the deep-ocean would be a stagnant pool of cold water…

To my opinion this idea was first put forward by Mink and Wunsch (Abyssal receipts, DSR, 1998)

Abyssal recipes II: energetics of tidal and wind mixing

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Abstract

Without deep mixing, the ocean would turn, within a few thousand years, into a stagnant pool of cold salty water with equilibrium maintained locally by near-surface mixing and with very weak convectively driven surface-intensified circulation. (This result follows from Sandström's theorem for a fluid heated and cooled at the surface.) In this context we revisit the 1966 "Abyssal Recipes", which called for a diapycnal diffusivity of 10^{-4} m^2/s (1 cgs) to maintain the