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Density decline of Ross Sea shelf water masses

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In the Southern Ocean (SO) shelf waters play an important role on the production and export of the Antarctic Bottom Water (AABW), which ventilates the world ocean bottom as part lower limb of the Meridional Overturning Circulation (MOC). Applying the Coordinated Ocean–Ice Reference (CORE) interannual forcing we have run a 60-year simulation (1948–2007) using ROMS with sea ice/ice shelf thermodynamics module to investigate the oscillation on Ross Sea (RS) shelf waters partaking in local AABW production. Although the ice shelf parameterization applied does not reproduce the basal melting mass exchange, the ice shelf thermodynamics allows the representation of the supercooled Ice Shelf Water (ISW) and the High Salinity Shelf Water (HSSW), both being shelf archetypes of the RS variety of AABW. Results from three cross sections analyzed on the RS continental shelf show an overall freshening followed by a density decreasing trend for the shelf waters. During the simulation period, ISW maintains the very cold signature (θ < -1.85), but exhibits a salinity drop from S $\sim$ 34.85 to S $\sim$ 34.70. Along the Glomar-Challenger Trough, the main export path of the ISW, density decreased about $\sim$ 0.13 kg.m$-$3 during the 6 decades. HSSW salinity displays a more intense decline from S $\sim$ 35.20 to S $\sim$ 34.95, while sea water density along the Drygalsky Trough (HSSW's domain) displays the most significant density decrease of about $\sim$ 0.16 kg.m$-$3. As the shelf waters tend to become lighter, the bottom water production at the shelf slope can be directly influenced, resulting in a lessened dense waters formation rate and/or the production of a lighter bottom water, especially the AABW.