Ocean circulation under snowball earth conditions

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The dynamics of ocean circulation under Snowball conditions is still largely unexplored. Here we study oceanic circulation under a complete ice cover using the MIT oceanic general circulation model. We use idealized aqua-planet conditions with meridionally variable sea glacier depth and surface temperature, and spatially constant geothermal heating. We examine convection and meridional circulation developing due to brine rejection associated with ice production and freezing temperature variations, due to the dependence of freezing temperature on pressure and thus on the ice thickness. We show that variable freezing temperature and salinity have a crucial role on ocean circulation. These two factors may therefore have a significant effect on sea glacier dynamics as the heat flux at the bottom of the ice, and hence ice melting, is strongly affected by ocean circulation.