Recent and future baroclinic sea level changes based on observation data and a projection using a climate model

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Using gridded ocean temperature and salinity fields based on observations and future projection by climate model, we have investigated the recent and future baroclinic sea level changes. Patterns of regional sea level change are principally determined by the baroclinic component (density change) due to movements and transformations of water mass. The first baroclinic mode mainly represents the vertical displacement of ocean main pycnocline, which is related to the movements of water mass. The rest of the baroclinic modes include the response of substantial water mass property transformations. The distribution of the recent first baroclinic sea level change is strongly influenced by interannual variations, and the global warming trend is not clear. The rest of baroclinic sea level changes are seen in the subtropical regions accompanying with the substantial water mass property changes. Similar regional sea level response appears in a future projection under CO2-induced global warming using a climate model, suggesting that the global warming signal potentially appears as the regional sea level response to the changes in the substantial water mass property.