Regional variations in mean sea level as mapped by satellite altimetry, provide information on the spatial characteristics of the recent sea level rise. Some regions may be more exposed to global warming and exhibit a higher sea level rise than others while some regions may be more affected by changes in the winds. Regional changes in the mean sea level may also provide information about changes in the surface geostrophic mean circulation. Changes in the geostrophic ocean currents will have an impact on both the volume and the heat transport in the oceans which, in turn, will have an impact on the local environment and climate. Analyses of such effects, however, require accurate information about the mean circulation itself.

The Gravity and Ocean Circulation Experiment - GOCE satellite mission measures the Earth gravity field with unprecedented accuracy. Recent studies have shown that the GOCE geoid models lead to substantial improvements in the estimation of the mean dynamic topography (MDT), hence leading to substantial improvements in the modelling of the ocean circulation and transport. In this presentation results from a study where the regional changes in mean sea level are combined with a state-of-the-art GOCE MDT to analyse the changes in the mean circulation. A clear example is the increasing sea level south of Greenland which signals a slow down in the North Atlantic sub-polar gyre.