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Evaluating mean dynamic topography and transport in two boundary currents from in situ and satellite observations

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Ocean mean dynamic topography (MDT) is essential for deriving total surface geostrophic currents and estimating transport from hydrography. A number of MDTs are now available that rely on different combinations of observations and assumptions. The estimates of MDT in boundary currents regions are of particular concern because these currents transport considerable mass but are difficult to sample due to their small size and high variability. We create and evaluate several MDTs and resulting transports in subtropical and subantarctic boundary currents near New Zealand by combining Argo float trajectories and altimeter height anomalies with a series of hydrographic and current meter observations collected under two altimeter tracks. In the subtropical current the mean surface velocities derived from the CNES-CLS09 MDT and those derived from Argo float trajectories and shipboard hydrography are similar within error estimates, suggesting these two independent measures of the barotropic component are similar. The surface velocities estimated from altimetry and shipboard hydrography and the level of no motion typically used in the region are less consistent with those from the other MDTs and result in considerably different transport. The results suggest that the growing archive of Argo float trajectories is already useful in resolving the MDT in boundary currents.