GSTM2024-14, updated on 15 May 2025
https://doi.org/10.5194/gstm2024-14
GRACE/GRACE-FO Science Team Meeting

Connecting NADW transports to ocean bottom pressure variations with the high-resolution ocean model VIKING20X

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Estimating oceanic transports of volume, heat, carbon, and freshwater is fundamental to understanding the ocean's role in the changing climate system. Unique in this context is the Atlantic Meridional Overturning Circulation (AMOC) that comprises a net northward transport of relatively warm water at depths of □1 km throughout the Atlantic basin, compensated at depths of □1–5 km by a colder net southward return flow (NADW).
While in-situ measurements, such as the RAPID array at 26.5°N, are considered the 'gold standard' to monitor changes in the AMOC, measurements at many latitudes and the detection of e.g. basin-wide modes are not feasible with such costly arrays.
However, variations in the geostrophic part of the AMOC are to a good degree described by variations in NADW transport and therefore in principle accessible through ocean bottom pressure measurements and possibly future satellite gravimetry missions.

Here, we investigate the connection between changes in the NADW transport and associated variations in bottom pressure along the western continental slope and shelf in the North and South Atlantic in the regional high-resolution ocean model VIKING20X provided by GEOMAR. We assess to what degree the transport variations can be inferred from bottom pressure signatures alone, limitations of the approach and especially how such signatures could be implemented into a future iteration of the ESA Earth-System-Model which is commonly used in simulation studies for satellite gravimetry. This would allow the inclusion of these transport-related OBP changes in dedicated simulation studies in preparation for future satellite gravimetry missions.