Estimating the Deep Overturning Transport Variability at 26°N using Bottom Pressure Recorders

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INTRO

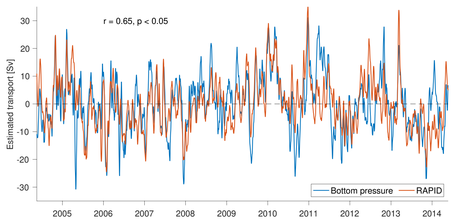
- The **Atlantic meridional overturning circulation** (AMOC) has been observed by the RAPID project at 26°N to have declined since 2004, especially in the deep return flow.
- Deep barotropic transport can be estimated from **bottom pressure**, but recorders are subject to **instrument drift**, so RAPID calculates it as a residual.
- Removing instrument drift conventionally also removes true low frequency signals.
- **GRACE** provides a monthly global grid of bottom pressure data, used here to correct drift in bottom pressure recorders at 26°N.

METHODS

1. Instrument drift is estimated as the linear fit to the difference between bottom pressures from recorders and GRACE.
2. This linear fit is subtracted from the bottom pressure records to correct for drift.
3. Total trans-basin transport is estimated from summing the transports between GRACE-corrected bottom pressures, and compared to RAPID's residual barotropic transport term.

RESULTS

- Transport estimates from GRACE-corrected bottom pressure records match RAPID barotropic transports (fully independent) after removing the 10-year trend.



DISCUSSION

- Satellite gravimetry (GRACE) can correct for drift in bottom pressure recorders.
- Issues may arise from comparing single point bottom pressures against GRACE 3° resolution.
- Transport variability is concentrated to west of Mid-Atlantic Ridge – a new result.
- Transport from GRACE-corrected bottom pressures shows an opposite trend to RAPID residual.
- 10-year trend is introduced by GRACE data.

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We used **satellite gravimetry** from **GRACE** to correct **instrument drift** in ocean **bottom pressure** recorders.

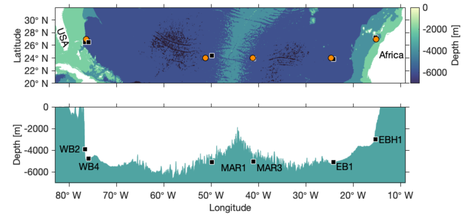
Take a picture to **download** the **full paper**

Datasets used:

- Bottom pressure recorder data from six RAPID moorings, from May 2004 to May 2014.
- JPL GRACE Mascon Equivalent Water Height RL05M.1, version 2.

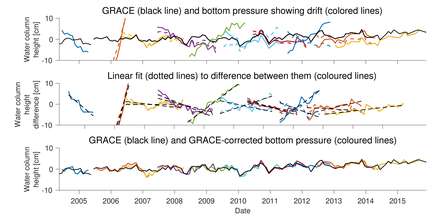
RAPID array at 26°N

■ RAPID moorings ● center of GRACE 3° mascon



Correcting instrument drift with GRACE

- Bottom pressure record from WB2 mooring.

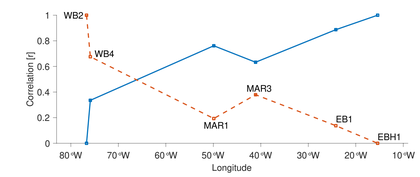


Estimating barotropic transport variability

$$T' = \frac{H}{f\,\rho}\,[P'_{east} - P'_{west}]$$

Correlation vs. longitude

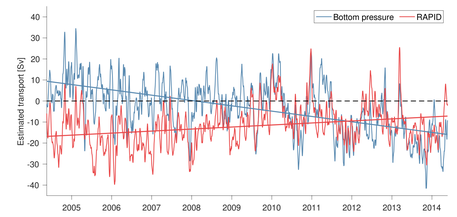
- Correlation between cumulative sum of mooring pair transports and RAPID barotropic transports, summed from east-to-west (red) and west-to-east (blue).



- Shows barotropic variability is concentrated west of Mid-Atlantic Ridge.

Trend over 10 years

- 10-year trend introduced by GRACE opposes 10-year trend from RAPID.



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