Deconstruction of a science paper's data-evidence basis

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MPO 624

Spring 2018

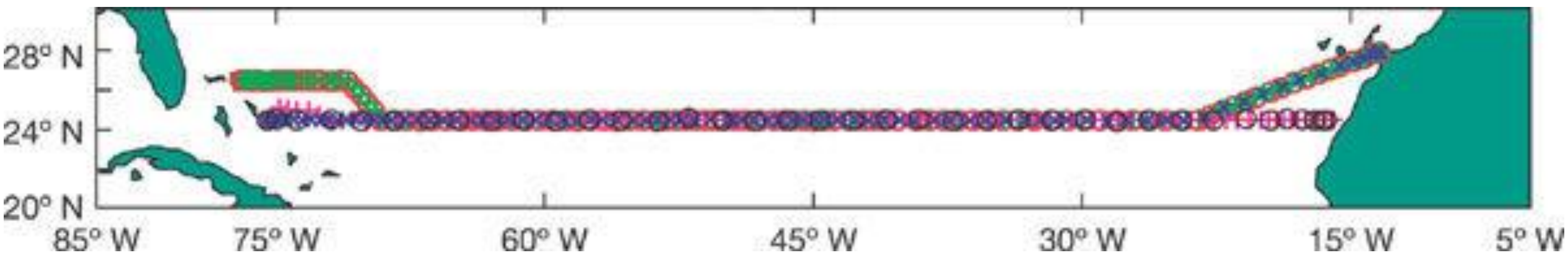
My Paper

- Title, citation
  - Slowing of the Atlantic meridional overturning circulation at 25°N
    - Longworth, H. R., & Bryden, H. L. (2007). Discovery and quantification of the Atlantic meridional overturning circulation: The Importance of 25°N. *Ocean Circulation: Mechanisms and Impacts—Past and Future Changes of Meridional Overturning Geophysical Monograph Series,* 5-18.
- Size of evidence set:
  - 2 figures (plus 3 in supplement), 1 table (plus 1 in supplement), 0 magic-number (in-text) results

Instructions

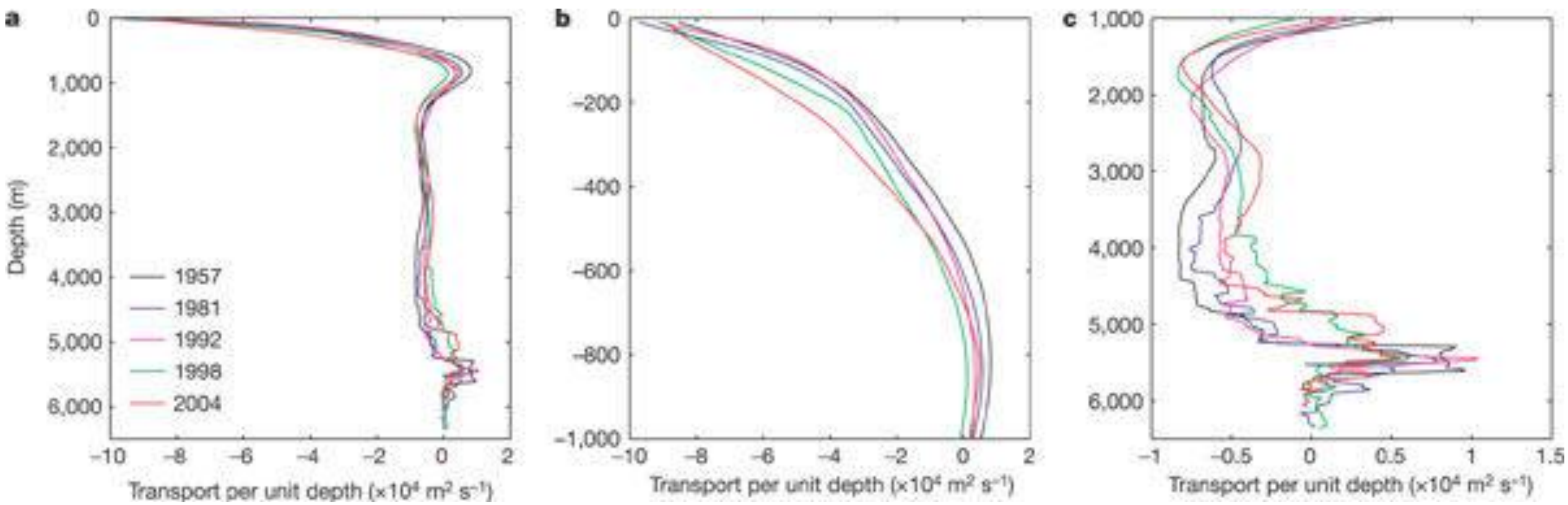
1. Copy each figure, table, or # into a slide of this powerpoint
2. Categorize it according to the list at EVIDENCE_TYPES.md on the course repo
3. If none of those categories quite fit, expand EVIDENCE_TYPES.md in your fork, and make a pull request! Try to follow the outline there, to keep our ideas compact and coherent. I may suggest edits before final PR acceptance.
4. Finally, put the Abstract on a last slide. Annotate it with little figure thumbnails connected to each claim or account of nature, to show how those are rooted in the figures (and thus in data).
5. Put your .pptx in your fork of the class repo, and

Figure 1



- This figure provides summary info
  - Illustrates the station positions of the 25°N transatlantic hydrographic sections (1957, 1981, 1992, 1998, and 2004)
- You are meant to see a base map and variations in previous analysis

Figure 2



- This figure is a claim of relationships
  - Figure 2a provides claim of similarity in the overall vertical structure of the mid-ocean geostrophic circulation over time
  - Figure 2b provides a claim of differences in the stronger southward flow during 1998 and 2004
  - Figure 2c provides a claim of differences of the bottom water transport over time

Table 1

Table 1 | Meridional transport in depth classes across 25° N

	1957	1981	1992	1998	2004
Shallower than 1,000 m depth					
Gulf Stream and Ekman	+35.6	+35.6	+35.6	+37.6	+37.6
Mid-ocean geostrophic	−12.7	−16.9	−16.2	−21.5	−22.8
Total shallower than 1,000 m	+22.9	+18.7	+19.4	+16.1	+14.8
1,000–3,000 m	−10.5	−9.0	−10.2	−12.2	−10.4
3,000–5,000 m	−14.8	−11.8	−10.4	−6.1	−6.9
Deeper than 5,000 m	+2.4	+2.1	+1.2	+2.2	+2.5

Values of meridional transport are given in Sverdrups. Positive transports are northward.

- This table provides a summary of raw data and claims relationships
  - Further illustrates arguments put forth in figure 2
  - Claim of difference through an increase in southward transport above 1000m depth, claim of similarity in transport between 1000m-3000m depth, claim of difference in transport below 3000m

Figures S1 and S2

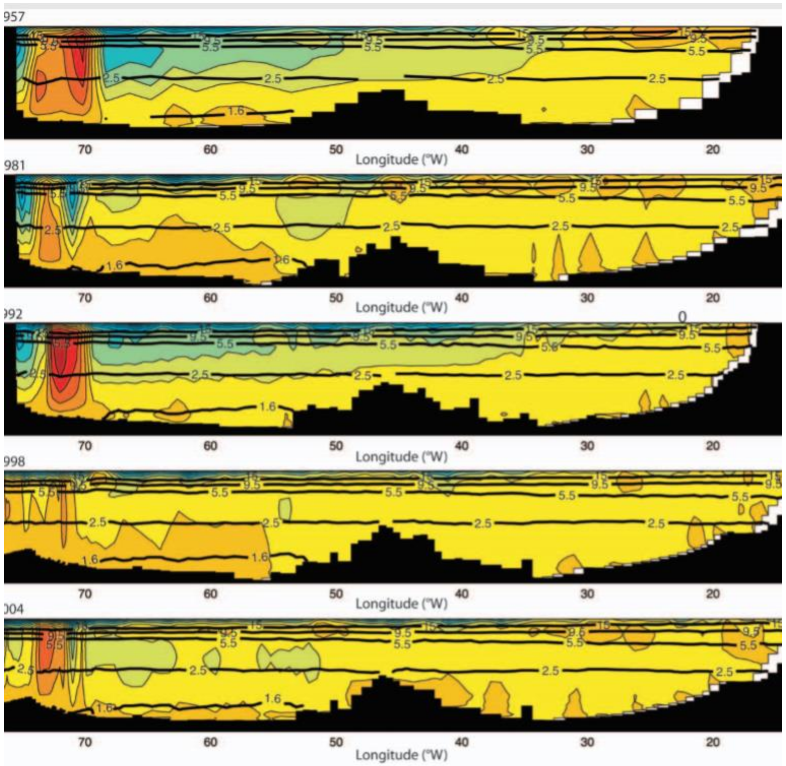


Figure S1

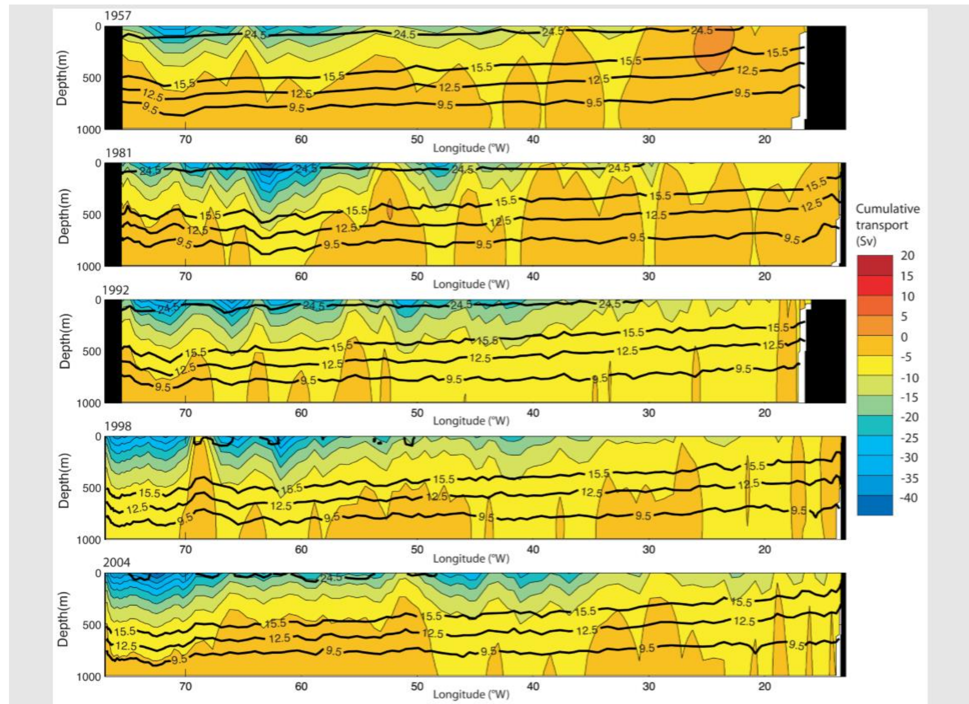


Figure S2

- These figures provide a summary of raw data
  - The supplementary figures provide a more detailed look at the meridional transport at 25°N
  - You are meant to see changes in the transport across the different years

Figure S3

- This figure claims a feature/relationship
  - You are meant to see clear variability along the western boundary across the different transatlantic sections

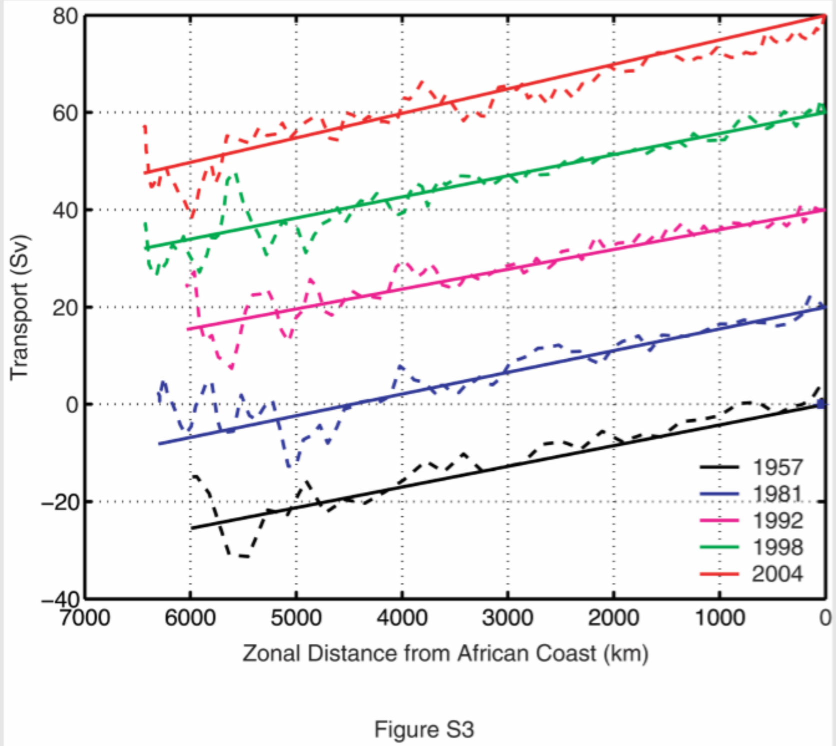


Figure S3

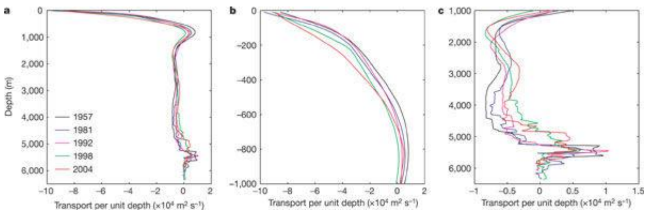
Table S1

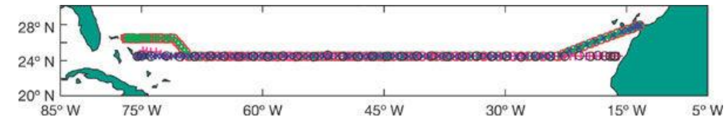
Table S1 Mid-ocean meridional geostrophic water mass transports (Sv) across 26ºN in potential temperature (θ) classes

Year	1957	1981	1992	1998	2004
Upper Layer (θ > 9.5ºC)	**-15.8**	**-18.6**	**-17.2**	**-22.5**	**-24.0**
Lower Layer ($\theta \leq$ 9.5ºC)	**-19.8**	**-17.0**	**-18.4**	**-15.1**	**-13.6**
AAIW (5.5 < $\theta \leq$ 9.5ºC)	4.0	2.0	0.8	-0.3	1.5
UNADW (2.5 < $\theta \leq$ 5.5ºC)	-12.5	-8.9	-9.6	-11.1	-10.4
LNADW (θ_B < $\theta \leq$ 2.5ºC)	-16.2	-13.8	-10.5	-6.8	-6.6
AABW ($\theta \leq \theta_B$ ºC)	4.9	3.7	0.9	3.1	1.9

- This table provides a summary of raw data and claims a relationship
  - Highlights a relationship between temperature and the increase southward transport

The Abstract, and how figures support its claims





Abstract

The Atlantic meridional overturning circulation carries warm upper waters into far-northern latitudes and returns cold deep waters southward across the Equator[1]. Its heat transport makes a substantial contribution to the moderate climate of maritime and continental Europe, and any slowdown in the overturning circulation would have profound implications for climate change. A transatlantic section along latitude 25° N has been used as a baseline for estimating the overturning circulation and associated heat transport[2,3,4]. Here we analyse a new 25° N transatlantic section and compare it with four previous sections taken over the past five decades. The comparison suggests that the Atlantic meridional overturning circulation has slowed by about 30 per cent between 1957 and 2004. Whereas the northward transport in the Gulf Stream across 25° N has remained nearly constant, the slowing is evident both in a 50 per cent larger southward-moving mid-ocean recirculation of thermocline waters, and also in a 50 per cent decrease in the southward transport of lower North Atlantic Deep Water between 3,000 and 5,000 m in depth. In 2004, more of the northward Gulf Stream flow was recirculating back southward in the thermocline within the subtropical gyre, and less was returning southward at depth.

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Values of meridional transport are given in Sverdrups. Positive transports are northward.