

VARIABILITY IN FLORIDA STRAITS

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Context



IPCC, AR5



-10 -8 -6 -4 -2 0 2 4 6 8 10 (°C)

Anomalous surface temperature relative to zonal mean FeulIner et al. (2013)



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Combine velocity field and property field to give property transport



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Heat and freshwater transports correlated with MOC



Time series of transports (1Sv = 10⁶m³s⁻¹)

- Florida Straits contains the majority of the northward flowing MOC
- Measured by cable



	mean	change
GST	31.4	-0.5
UMO	-18.0	-2.2
MOC	17.0	-2.5
Ekman	3.6	0.2
LDW	-5.9	1.9
UDW	-11.9	0.3

Smeed et al. (2018)

• Change is 2012-2017 minus 2004-2008



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Transport weighted properties in Florida Straits

$$transport = \iint velocity \ dxdz$$

$$property \ transport = \iint velocity. property \ dxdz$$

$$property \ weighted \ transport = property \ transport \ / \ transport$$



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Figure 4. Mean annual cycle of observed Florida Current flow weighted temperature (FWT_{mm}; solid line), with the individual section data (Pegasus profiler sections) shown as grey circles.

and Meinen, 2017

Shoosmith et al., 2005.

- Indication of variability in salinity (decadal) ۲
- Indication of variability in temperature (seasonal) •



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Cable transport and repeat hydrography



Examine variability relevant to RAPID era and RAPID flux calculations



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Water mass view of Florida Straits



 Lower Salinity water originates in South Atlantic

 High Salinity water from North Atlantic

South Atlantic



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Water mass view of Florida Straits

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Reconstruct time series within water masses



Correlation with cable, seasonal, interannual



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		cable	cable + seasonal	cable + seasonal + interannual	
					Most variance
Transport	> 24°C	19%	58%	70%	
(Sv)	12°C-24°C	33%	56%	66%	described by cable transport
	<12°C	40%	47%	54%	
Τw θ	> 24°C	0%	93%	95%	
(°C)	12°C-24°C	0%	51%	63%	seasonal cycle
	<12°C	4%	26%	38%	
Tw salinity	> 24°C	4%	23%	72%	
(psu)	12°C-24°C	2%	11%	37%	interannual variability
	<12°C	4%	21%	39%	

Variance of hydrographic described by Cable + seasonal + interannual



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Transport in water masses



Reconstructing time series

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Transport in water masses



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Transport weighted salinity and temperature



Mostly fresher Interannual variability

Same seasonal cycle Interannual variability



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Impact on heat and freshwater transports



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0.15 Sv

0.1 PW

Summary

Significant interannual variability in transport weighted properties – captured by repeat hydrography

Northern water masses decreasing in transport, temperature and salinity

Southern water masses, warming with opposing transport and salinity trends

Impact on freshwater transport across section of up to 0.15Sv

Impact on heat transport across section up to 0.1PW



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