









Three-dimensional structure of a standing meander in the Antarctic Circumpolar Current

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Contents

- Standing meanders in the ACC
- Observations voyage
- Vertical T, S and density structure
- Gravest Empirical Mode (GEM)-field and anomalies
- Mixing regions and front separation
- Horizontal velocity structure





Adjustment mechanism





Existing observational data



<u>RV Southern Surveyor</u> <u>1998</u>

SW of Tasmania/

Downstream of South East Indian Ridge

- 99 CTD profiles
- 11 transects
- 1526 dbar depth
- Underway ADCP 200-350 dbar



Reference GEM-field



\Box Steep isopycnals \Box 2D lookup-table from 99 CTD profiles \Box Strong relation $\Theta(D,p)$ $S_A(D,p)$



Anomalies from GEM-field





Anomalies from **GEM**-field





Warming/ cooling or heaving?

Pure warming or cooling Pure heaving Conservative Temperature anomaly (pure warming), $\Theta'|_{V_0}$ (°C) Conservative Temperature anomaly (pure heaving), $h l_{\frac{\partial \Theta}{\partial z}}^{\partial \Theta} |_{\gamma_0}$ (°C) Transect Transect: 8 Transect: 11 Transect: 10 Transect: 9 Transect: 8 Transect: 9 26.50 26.50 0.867 0.867 26.75 26.75 27.00 27.25 27.25 0.600 0.600 27.50 27.50 27.75 27.75 0.333 0.333 Transect: 7 Transect: 6 Transect: 5 Transect: 7 Transect: 6 Transect: 5 (kgm^{-3}) Neutral density, γ_n (kgm $^{-3}$) 26.50 26.50 26.75 26.75 ٢ 0.067 27.00 27.00 0.067 density, 27.25 27.25 27.50 27.50 Neutral -0.200 -0.200 27.75 27.75 Transect: Transect: 2 Transect: 1 Transect: 4 Transect: 3 Transect: 2 Transect: 26 26.50 -0.467 -0.467 26.75 26.75 27.00 27.00 -0.733 27.25 27.25 -0.733 27.50 27.50 27.75 27.75 -1.000 -1.0001.25 1.50 1.25 1 25 1 50 1.50 1.50 1.25 1.50 1.25 1.25 1.50 1.25 1.50

Dynamic height (m)

Dynamic height (m)



Mixing and front separation



- Upper water column (<27.2)
- Lower water column (>27.2)
- Mixing upper and lower water column
- Front separation in upper and lower water column



Horizontal kinematics



Geostrophic balance:



Horizontal velocity structure





Conclusions

- Water transformations in upper/ lower layer
- Heaving important in trough and crest
- Mixing in between trough and crest
- Front separation in crest, when flow accelerates
- Increase in velocities <-> isopycnal tilt/ gradient velocity
- Upwelling/ downwelling?
- Heat transport across front?

Thank you for listening!



