Dynamics of the Sea Surface Salinity Maximum Pool in the Indian Ocean

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SIO GEOSTROPHIC UPPER-LAYER CIRCULATION
Mean SSS 2004-2014 from Argo RG atlas
ITF-STW SALINITY FRONT IMPACTS THE SIO CIRCULATION

Eastern Gyral Current (EGC): Upstream Source for the Leeuwin Current

Menezes et al, 2013
EASTERN GYRAL CURRENT

90° E - 120° E; 20° S - 12° S

Menezes et al, 2013
To Characterize the variability of the SIO S-MAX pool through the analysis of multi-source datasets (Satellites, ARGO & ECCO Ocean State Estimate)

To Determine the physical mechanisms controlling the SIO S-MAX variability
WAVELET SIO S-MAX AREA

Annual cycle with interannual modulations
Possible decadal peak
## TIME SCALES OF VARIABILITY

**SIO S-MAX AREA**

<table>
<thead>
<tr>
<th></th>
<th>SMAP</th>
<th>Aquarius</th>
<th>SMOS</th>
<th>RG</th>
<th>ECCO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual</td>
<td>65.3%</td>
<td>69.5%</td>
<td>55.33%</td>
<td>50.4%</td>
<td>28.6%</td>
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<tr>
<td>Inter-annual</td>
<td></td>
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<tr>
<td></td>
<td>4.9%</td>
<td>4.9%</td>
<td>42.7%</td>
<td>64.4%</td>
<td></td>
</tr>
</tbody>
</table>
SIO S-MAX AREA: SEASONAL

April

Oct

area (x 10^6 km^2)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Aquarius (2012-2014)
SMOS (2011-2014)
SMOS (2012-2014)
RG (2004-2014)
RG (2012-2014)
SIO S-MAX AREA: SEASONAL

NEAR WESTERN AUSTRALIA

Westward
\[ \frac{\partial S}{\partial t} = h^{-1}(E - P)S - \left( U \frac{\partial S}{\partial x} \right) - \left( V \frac{\partial S}{\partial y} \right) - W_e(S - S_{z=h})h^{-1} + R, \]

\[ W_e = \left( \frac{\partial h}{\partial t} + \nabla \cdot hv \right) \]

- **h**: MLD
- **We**: Entrainment Velocity
- **S**: Salinity MLD
- **R**: Other terms
April (Max Area)  

October (Min Area)  

AUSTRAL WINTER  

AUSTRAL SUMMER
SALINITY TENDENCY EQ TERMS

32°S-35°S; 70° E-100° E

-0.075 MER-ADV
10-YR CHANGE FROM ARGO

NON-LINEAR TREND SSA-FILTERED
SUMMARY

- Strong Seasonal Cycle: Contraction/Expansion
- Decadal Variability
- Seasonal
  Contraction $\rightarrow$ ADV and ENTR
  Expansion $\rightarrow$ E-P