Oceanic Circulation Analysis Over the Patagonian Continental Shelf from In Situ and Satellite Data, and its Relation to Local Fishery Resources

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**MOTIVATION**

- It is one of the most productive biological areas of the world oceans that harbors many species of commercial importance:
  - Argentinian hake
  - Squid
  - Hake
  - Yellowfin
- Sustainable marine fishery management can be improved with validated satellite altimetry data:
  - The scarce amount of in situ data makes satellite currents essential to further understand regional circulation.
  - Validated satellite currents can help better understand the behavior of species.

**OBJECTIVES**

In general:
- Improvement our knowledge of oceanic circulation over the Patagonian Continental Shelf.
- Determination of oceanic conditions and its influence over the recruitment processes in the Patagonian Continental Shelf.

In particular:
- Determination of the spatio-temporal scales in which satellite altimetry data represents accurately in situ time series.
- Characterization of the variability of oceanic conditions from in situ and satellite data.
- Analysis of the link between oceanographic features with local fishery resources.

**DATA**

- **In situ data:**
  - Within the French-Argentine CASSIS project
- **Satellite data:**
  - Currents from Level-4 multi-mission daily data (1/4º resolution) from http://marine.copernicus.eu
  - Currents from regional product from CLS (CLSO version, 1/8º resolution). Daily data that includes the Ekman component.
- **RESULTS**

**RESULTS**

- Analysis of in situ north deployments (A1 and A2):
  - Velocities present a bathymetry restraint.
  - Variance ellipses are more elongated along isobaths in A1 than in A2, because the bathymetry gradient is stronger.
  - The along bathymetry component is higher than the across bathymetry one, at all depths.
  - Magnitude of in situ currents decreases with depth.
  - Winds in this area mostly come from the NW and are moderate (mean of 5m.s⁻¹).
  - Variability of in situ currents is coherent with the wind variations, for all levels.
  - Correlation between in situ currents and wind is significant (95% confidence level). Highest correlation is found in the shallowest level.
  - An EOF analysis of in situ currents (not shown) indicates the 1st mode agrees with 1 barotropic component (86.4% of the variance).
  - The barotropic behavior in both in both deployments is similar.

**Comparison with Satellite Altimetry**

<table>
<thead>
<tr>
<th>Component</th>
<th>Correlation value</th>
<th>Correlation angle [°]</th>
<th>RMSD [cm.s⁻¹]</th>
</tr>
</thead>
<tbody>
<tr>
<td>L4</td>
<td>0.23</td>
<td>1.2</td>
<td>12.8</td>
</tr>
<tr>
<td>CLSO (Ekman)</td>
<td>0.31</td>
<td>-31.1</td>
<td>6.03</td>
</tr>
</tbody>
</table>

Comparison of in situ currents with satellite gridded data was not successful.
- Correlation coefficients are significant but low, with a small improvement using the product that includes the Ekman component.
- Comparing in situ SSH to satellite data before applying the corrections needed (not shown) the agreement is excellent (correlation above 0.9 and RMSD below 10cm).
- The same analysis adding each correction one by one shows worsened results in particular with:
  - The ocean tide correction.
  - The atmospheric high frequency fluctuations correction.

**CONCLUSIONS**

Circulation in this area is mainly barotropic (86.4% of the variance) and similar in both north deployments. It is restrained by local bathymetry, maximum variance is found along bathymetry contours. Winds affect currents at all depths.

Comparison with currents inferred by satellite altimetry measurements did not throw successful results. A small improvement was achieved considering the product from CLS that includes the wind effect by adding the Ekman component. Other results (not shown) indicate that to better represent in situ data some satellite corrections, applied to sea level satellite measurements, need to be more accurate. In particular, the ocean tide correction and the atmospheric high frequency fluctuations correction.