Validation of Aquarius data using a Regional Oceanographic Data Base in the Southwest Atlantic

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Validation exercise of SSSaq

- Grid SSS field from L2 (we use V1.2.2)
- Compare it to L3 from Aq WEB
- Calculate SSSaq error by comparing to a Regional climatology
- Evaluate the error in TS space
- Zoom into Rio de la Plata plume using SSSaq
Following Lilly and Lagerloef (2008) we explored

**Method**: Local Polynomial (order 1 to 3)

**Gridding size**: 1°x1° (lat-long)
Kernel estimator for smoothing/noise reduction (recommended for \( P < 3 \))

It uses the probability density function \( w(x) = \frac{k(x/h)}{h} \)

- \( w \): Kernel weighting function
- \( h \): Bandwidth
- \( k \): Weigthing factor

**Definition of the Bandwidth:**

\[
    h = 1.06sn^{-0.2} \quad \quad h = 0.79(Q_3 - Q_1)n^{-0.2}
\]

<table>
<thead>
<tr>
<th>Period</th>
<th>Bandwidth (Km)</th>
<th>Error</th>
<th>N° Obs (n)</th>
<th>SD (S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly</td>
<td>76</td>
<td>0.024</td>
<td>122121</td>
<td>1.119</td>
</tr>
<tr>
<td>3 Month</td>
<td>52</td>
<td>0.017</td>
<td>376591</td>
<td>1.126</td>
</tr>
<tr>
<td>6 Month</td>
<td>44</td>
<td>0.013</td>
<td>708264</td>
<td>1.169</td>
</tr>
</tbody>
</table>
Guassian Kernel function was the one that better compared to our observations

Method: LOCAL POLYNOMIAL
Polynomial order: 1
Grid size: 1° x 1° (Lat; Long)
Gaussian Kernel smoothing
Power: 0.001 (closest to a constant)
Bandwidth: function of the NObs. (period length)
(e.g. 75 km → 1 month)

As an example we present Level 2 Gridded SSS data with Local Polynomial
BARDO: Regional Oceanographic Data Base

Error Evaluation

TSG data set
145 cruises
(since 1995)
TSG data set processing: TSGqc - IRD, France
BARDO: Regional Oc. DBase

- Define in BARDO areas of low SSS variability (to distinguish from instrumental noise)

- Estimate, for those areas, the error or noise level on the aquarius SSS observations
2 oceanographic ZONES in TS space: (SSS modes)
Comparison BARDO-SSSaq

- BARDO vs SSSaq (L3 download from Aquarius WEB portal)
- BARDO vs SSSgauss (gridded L2 with LP GaussK)
  - January and Spring 2011 (19 Oct to 18 Dic)
  - Calculate the difference on a 1°x 1° grid for ST and SA
  - Estimate MeanDiff, StandDev, filter outliers (mean ± 1.5 SD), RMS and error distribution for each regime.
  - Error SSSgauss vs error SSSaq.
SubTropical QC
Outliers:
After 1st Iteration
It reaches Aq specs of 0.2 in the mean error

SubAntarctic QC
Outliers:
Needed 2 Iteration
to reach Aq specs 0.2
L2 V1.2.2. gridded with LP-GKernel 75km

Bs. Aires, April 2012
7th. SAC-D/Aquarius Sc.Metting
### Error statistic

<table>
<thead>
<tr>
<th>Sub-Tropic</th>
<th>Jan</th>
<th>MeanErr</th>
<th>SDev</th>
<th>RMS</th>
<th>NObs</th>
<th>% Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Antarct</td>
<td>Jan</td>
<td>MeanErr</td>
<td>SDev</td>
<td>RMS</td>
<td>NObs</td>
<td>% Use</td>
</tr>
<tr>
<td>------------</td>
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<td>RMS</td>
<td>NObs</td>
<td>% Use</td>
</tr>
<tr>
<td>L3aq</td>
<td>0.04</td>
<td>0.23</td>
<td>0.23</td>
<td>96</td>
<td>90.57</td>
<td></td>
</tr>
<tr>
<td>Gauss K(*)</td>
<td>0.04</td>
<td>0.21</td>
<td>0.21</td>
<td>94</td>
<td>88.68</td>
<td></td>
</tr>
<tr>
<td>L3aq</td>
<td>-0.24</td>
<td>0.21</td>
<td>0.32</td>
<td>327</td>
<td>84.06</td>
<td></td>
</tr>
<tr>
<td>Gauss K(*)</td>
<td>-0.22</td>
<td>0.23</td>
<td>0.32</td>
<td>320</td>
<td>81.22</td>
<td></td>
</tr>
</tbody>
</table>

The **SubAntartic regime** required 2 iteration to reach the Aquarius specification error level.

(*) L2 was previously filtered to the range 30 to 40 SSS.
Frequency distribution of the error

Histogram BARDO - LP KGauss Sub Antarctic

January

Normal Distribution
SSSgauss by month, 3month and 6month

Local Poly Kernel Gauss75

SEP to FEB 2011/12
ERROR by month

FEBRUARY 2012

Local Poly Kernel Gauss75

-2 to -1
-1 to -0.5
-0.5 to -0.2
-0.2 to 0.2
0.2 to 0.5
0.5 to 1
1 to 2
Error by Month - 3Month - 6Month

Subantarctic

Mean error
RMS
% use

Error by Month - 3Month - 6Month

Subtropical

Mean error
RMS
% use

Time Period

Period

% of points used

0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8

-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8

E/RS

E/RS

Sep.
Oct.
Nov.
Dec.
Jan.
Feb.

Sep./Oct.
Nov./Dec.
Dec./Jan.
Jan./Feb.
Feb./Mar.

Bs. Aires, April 2012
7th. SAC-D/Aquarius Sc.Metting
ERROR vs temperature for Oct, Jan and February

Temperature vs. Error (BARDO - KGauss) Febrero 2012

- Sub Tropical
- Sub Antarctic
Looking at the Rio de la Plata Outflow

Rio de la Plata shows, from the historical data:

**Autumn-Winter** (April to August):
The Low Salinity water discharging to the north in a tied envelope lying on the coast line.

**Spring-Summer** (October to March):
RdP water discharge to the south force by dominant SE wind. Water then relax and move eastward to the shelf brake and it also dragged into the Brazil-Malvinas confluence region.
Thanks for your attention!!