**Anthropogenic CO$_2$ estimates in the Southern Ocean: storage partitioning in the different water masses.**

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**Abstract:**

CO$_2$ air-sea disequilibrium at pre-industrial times (A$_{0}$) was also obtained from this sub-surface based estimates of AC$_{dis}$ for SO. Results from an ocean biogeochemical model evidence substantial changes in AC$_{dis}$ since preindustrial times, therefore this difference should be taken into account in the AC$_{dis}$ term.

**Introduction:**

The results (mixing coefficients and volume composition of the main WM of an extended Optimum Multi-Parametric (OMAP) analysis (r) compared. WM developed for the SO grid allow to extend A$_{0}$ and AC$_{dis}$ to the rest of the SO database (SST92 data measurements downloaded from GLODAP$^{12}$ and CARINA$^{13}$ databases).

CO$_2$ estimates were interpolated to a 1-Mb $^{3}$ grid using the WAM interpolation method$^{10}$ and then vertically integrated in order to estimate the inventory for the SO and also in each WM. Results of the estimated CO$_2$ inventories were compared with results using different methodologies.

**Main WM in the SO**

<table>
<thead>
<tr>
<th>STCW</th>
<th>SAMW1</th>
<th>SAMW2</th>
<th>HSSW</th>
<th>AASW</th>
<th>AAIW</th>
<th>NADW</th>
<th>CDW</th>
<th>AABW</th>
</tr>
</thead>
<tbody>
<tr>
<td>2326±s</td>
<td>2279±s</td>
<td>2264±s</td>
<td>2359±s</td>
<td>2228±s</td>
<td>2532±s</td>
<td>2312±s</td>
<td>2326±s</td>
<td>2336±s</td>
</tr>
</tbody>
</table>

A$_{0}$ and AC$_{dis}$ properties for AABW and CDW are obtained through an iterative process based on volume composition.

**Results:**

CO$_2$, inventories were also estimated for the SO Atlantic region (67.5° W 30° E). Considering the rate of increase of 1.89% y$^{-1}$ in the surface concentration of CO$_2$, a storage rate of 0.12 mmol kg$^{-1}$ for AABW can be computed. This quantity is very similar to that found by other authors$^{11}$.