Summary of RAPID workshop on comparison of heat storage data sets

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Present

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Presentations and discussions

The workshop discussion focussed on three products presented, Tamara, EN3 and the BAK/BAP product being developed by Brian King. The three data sets are mapped onto different climatologies, and use different time scales; EN3 and Tamara are monthly products; BAK/BAP are produced on a 10-day (Argo) time scale. Spatial resolutions are: Tamara - 10deg, BAK/BAP -,2.5 deg, EN3 - 1 deg. for EN3). The methodology used to produce Tamara and EN3 are well documented in the scientific literature.

A key aim of the workshop was to explore potential reasons for the differences between Tamara and EN3 heat storage at 1000-2000m. Discussions explored possible effects of differences in spatial and temporal resolution of the products, the choice of climatologies used to calculate the anomalies, differences in the in-situ data used to develop the product (EN3 does not use just Argo), the interpolation scheme used. The impact of differences in interpolation schemes is likely to be greatest in data sparse regions, where a lack of actual data gives the cooler climatology a much greater influence.

The products agree reasonably well on heat storage variability, but there are offsets in the absolute values. Overall there is a clear warming trend. Agreement is better for the latter period, when more data is available. In the earlier period, when data was more sparse, the effect of the cooler climatology may be responsible for the behaviour seen, particularly in Tamara. All three products show clearly the cooling in 2010-11 and subsequent increase.

The reasons for the difference between the products can only be resolved by further analysis of the differences and similarities between them.

Suggestions for potential future work

- Place all the data fields from the different products together, to look at agreements and discrepancies, and what questions may arise from these. Analysis could focus on regions where there are discrepancies. This could for example be done by mapping the mean offset between the EN3 and BAK/BAP time series, to see where the greatest discrepancies occur. A potential issue is here is that Tamara only reconstructs anomalies from the monthly mean climatology, not the actual monthly temperature fields.
- Further exploration of the discrepancies in the anomalies and statistics of EN3 and Tamara, could find the main causes of the differences.
- Attempt to discriminate between EN3 and BAK/BAP by bringing in additional data, or by comparing the products to yet another data set. It is likely that there will be differences at individual grid points, but if these are generally large and found in many areas, this would be a cause for worry.
- Check how the original in situ data compare to the gridded product at each data point (e.g. for a year). This should make it possible to detect if there a systematic bias in the product. To do this for the whole globe may be too much effort, but it should be possible to pick some regions where there are discrepancies. Histograms of offsets between floats and the gridded product should be able to detect any biases. Any such bias would have to be analysed carefully to determine its cause.

- Comparison of the in-situ OI gridded products with model-based analysis products.
- Explore the latitudinal dependence of the discrepancy between the products. (BAK)
- Follow up on transport changes across 26 and 41 N, and relate this to surface heat flux data. 41N is the peak of eddy transport, and this could be an issue. Met Office is working on this.
- Explore potential impacts of Mediterranean outflow, which effectively takes surface heat and transports it to 1000m. Floats in Meddy water may have impact over a wider area because of the OI scheme used, or may be disregarded (e.g. in Tamara QC) because it is too different from nearby floats).
- Further analysis of the 2009-2011 cooling event, and how this is represented in the different products. This anomaly is similar in EN3 and BAK, but Tamara's anomaly is app. 70% of these. A closer look at potential causes and mechanisms of this event would be interesting.
- It was decided to not hold another workshop but to communicate through other UK and International meetings (eg. EGU, Euro Argo, Int. RAPID Baltimore, IAPSO Gothenburg).

Actions

1. If anyone finds further explanations or a solution to the problem, please e-mail the whole group (all).

2. E-mail Val with citations for the papers that document EN3 and Tamara (Neil Wells, Chris Roberts).