



Project no. GOCE-CT-2003-505539

Project acronym: ENSEMBLES

Project title: ENSEMBLE-based Predictions of Climate Changes and their Impacts

Instrument: Integrated Project

Thematic Priority: Global Change and Ecosystems

**WP1 Milestone M1.4, "Updated quality-controlled oceanographic database"**

Due date of deliverable: April 2006  
Actual submission date: January 2007

Start date of project: 1 September 2004

Duration: 60 Months

Organisation name of lead contractor for this deliverable

Version 1, 26 January 2007, Bruce Ingleby

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
<b>PU</b>	Public	X
<b>PP</b>	Restricted to other programme participants (including the Commission Services)	
<b>RE</b>	Restricted to a group specified by the consortium (including the Commission Services)	
<b>CO</b>	Confidential, only for members of the Consortium (including the Commission Services)	

### EN3: quality controlled in situ ocean temperature/salinity profiles

The EN3 data set contains global, sub-surface ocean profiles of temperature and salinity for 1950-2005 inclusive. They were quality controlled using a comprehensive set of objective checks developed at the Met Office Hadley Centre - drawing on documented procedures from other centres where appropriate. The quality control was applied consistently over the whole period, and the checked profiles were output in a uniform format (NetCDF). The processed observations and further documentation are available via <http://www.hadobs.com>.

The profiles were obtained primarily from the WORLD OCEAN DATABASE 2005 (WOD05), but this was supplemented using data from other sources: GTSP for 1990 onwards and the US-GODAE Argo Global Data Assembly Center (GDAC) for Argo data from 1999 onwards. Reformatting was necessary.

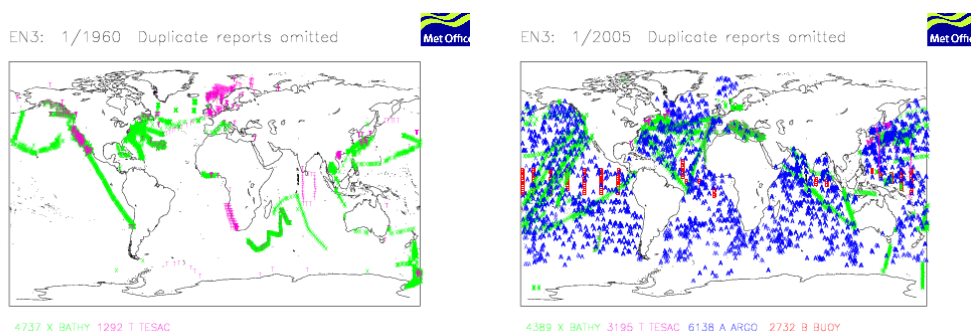
The processing and quality control applied is aimed primarily at data assimilation, for the seasonal and decadal prediction experiments in ENSEMBLES. This is particularly reflected in the data thinning used (1 hour in time, +/- 0.2 degrees latitude/longitude) and the "superobbing", to form daily averages, of some buoy data. As with any quality control system there are some errors of both types (flagging of some "good" values, omitting to flag some "bad" values) and there are some grey areas where the reported values may sample real oceanic features that are too small to be resolved by current global ocean models.

The quality control system was first developed for the EU-supported ENACT project, with some further changes for ENSEMBLES stage 1 and ENSEMBLES stage 2. The version used for ENSEMBLES stage 1 is labelled EN2 and is documented in Ingleby and Huddleston (2007). A useful by-product of the system is a "model-free" monthly objective analysis, see section 4.6 of Ingleby and Huddleston.

The main changes for the EN3 release are:

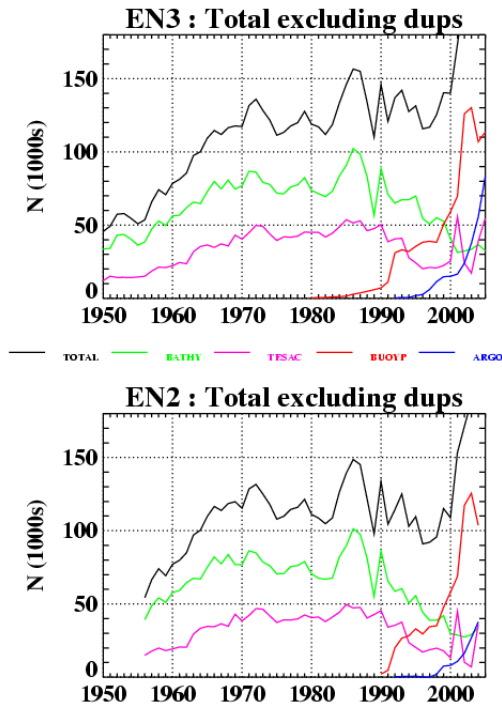
- a) updated input data sources
- b) a revised climatology is used for initial conditions and relaxation
- c) more effort on "reject-lists"

The input dataset WOD05 was delayed until May 2006 causing part of the delay to this deliverable. Also more effort than expected was needed for processing and checking the Argo data.

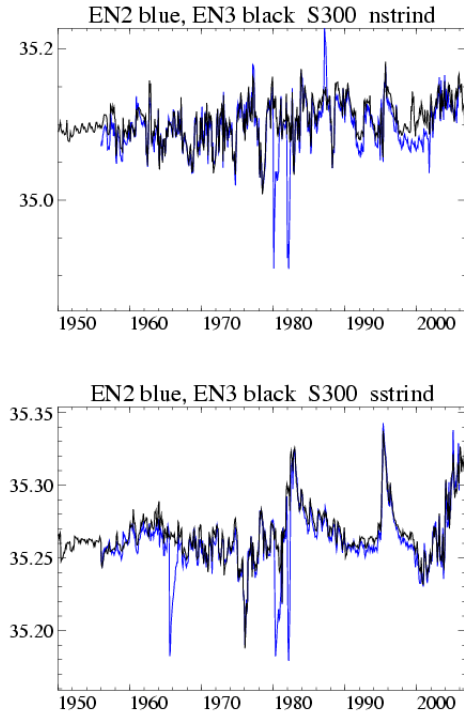


**Figure 1.** Data coverage in January 1960 and January 2005  
Green – bathythermographs, Purple – research casts, Red – moored buoys,  
Blue- Argo

Figure 1 shows snapshots of monthly data coverage near the start and end of the years processed, and shows how the observing systems have changed over the period. Note the introduction of deep-sea moored buoys (shown in red) and profiling buoys (shown in blue) - mostly Argo buoys. Figure 2 shows that EN3 contains significantly more data of these two types than the previous version EN2.



**Figure 2.** Number of reports per month



**Figure 3.** See text

Figure 3 shows salinity averaged over the top 300 m from the monthly EN2 (blue) and EN3 (black) analyses for the northern and southern subtropical Indian Ocean. Several spikes are apparent in the EN2 time-series that are absent from EN3. These are due to suspect cruises being placed on the EN3 reject-list. There are some remaining spikes - in some cases these are due to occasional (good) cruises through otherwise very data sparse regions (eg in the Southern Indian ocean in mid-1995).

### Reference

Ingleby, B., and M. Huddleston, 2007: Quality control of ocean temperature and salinity profiles - historical and real-time data. To appear in *Journal of Marine Systems*.