



Gayana (Concepción)  
ISSN 0717-6538 *versión on-line*

Gayana (Concepc.) v.68 n.2 supl.TIIProc Concepción 2004

Como citar este artículo

Gayana 68(2): 456-458, 2004

## VALIDATION OF ARGO DATA IN THE INDIAN OCEAN

**Pankajakshan Thadathil, P.M. Muraleedharan, V.V. Gopalakrishna, G. V. Reddy, Lasitha Ratnakaran, C. Revichandran & V.S.N. Murthy**

\*National Institute of Oceanography, India

### ABSTRACT

ARGO-salinity data from the Indian Ocean are validated using salinity from float-versus-float match-ups and also using CTD observations from three cruises. Validation data sets are selected in such a way that the float and the match-up data are collocated with tolerable space-time difference. For validation a time difference of less than 10 days and space difference less than 100 Km have been considered. The evaluation is done using salinity data on theta (potential temperature) surfaces from deeper observations. One of the significant observation of float-versus-float validation is the large random error observed in the initial profiles of the float-salinity compared to later profiles. While the float salinity data is found to be largely in good agreement with the ship based CTD observations, there are cases where the salinity error exceeds the desired 0.01 PSU.

### INTRODUCTION

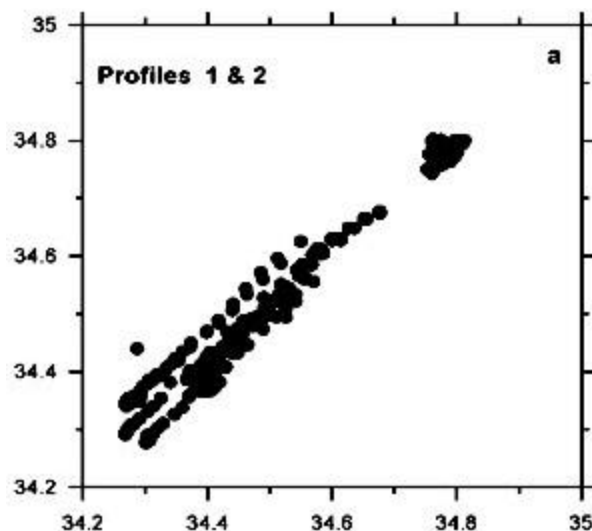
Under the international Argo program, nearly 2400 Argo floats have been deployed globally and by the year 2006, the total number of floats are expected to reach 3000. In the Indian Ocean, at present, there are nearly 300 Argo floats, deployed by national and international agencies. Each float observes temperature and salinity between the ocean surface and a pre-determined depth at intervals of 5 -10 days. The expected accuracies of temperature and salinity from the ARGO floats are 0.005 °C and 0.01 PSU, respectively (Argo Science Report, 2000). Since it is unattended for years together (4 years), the sensors may get drifted during their unattended years in the ocean. Compared to temperature sensor, the conductivity cell is more

susceptible to fouling and associated drift because of the possible change in the dimension of the conductivity cell due to fouling. Sensor manufacturers have improved the anti-fouling measures with biocide rings and anti-fouling paint (Tri-Butyl Tin Oxide, TBTO). However, since the Argo floats remain in the waters for years together, it is uncertain about the effectiveness of such anti-fouling measures till the completion of the mission of each floats (~4 years). Therefore, it is important to undertake some post deployment validation of the ARGO data.

[Bacon et al., 2001](#) have reported post deployment validation of salinity observations from PALACE profiling floats using collocated ship-board CTD observations. The delayed mode calibration for ARGO CTD data suggested by Wong et al. 2003 is an efficient way to know about the long term drift in the conductivity/salinity. However, the efficiency of this method degrades where climatological data is sparse. In the present study, float-versus-float match-ups of Argo data itself and match-ups CTD data from ship observations have been used for the validation purpose.

## 2. Float - versus - Float salinity

The trajectories of available floats in the Indian Ocean have been examined to find float-versus-float match-ups. For this purpose, the float trajectory data and metadata available from the date of commencement of the ARGO programs were screened. Since the floats are passive drifters, it is likely that two floats observe collocated (in space and time) temperature and salinity, facilitating inter-comparisons. The space-time limits are taken as 100 km and 10 days. From the Indian Ocean, 38 collocated match-ups have been identified for float-versus-float salinity. [Figure-1a](#) represent float-versus-float salinity at potential temperature surfaces varying from 2 to 5 °C for 9 match-ups involving initial profiles (profiles 1 and 2). [Figure-1b](#) represents the same as that in [figure-1a](#), but for 29 match-ups involving profile numbers 5 and above.



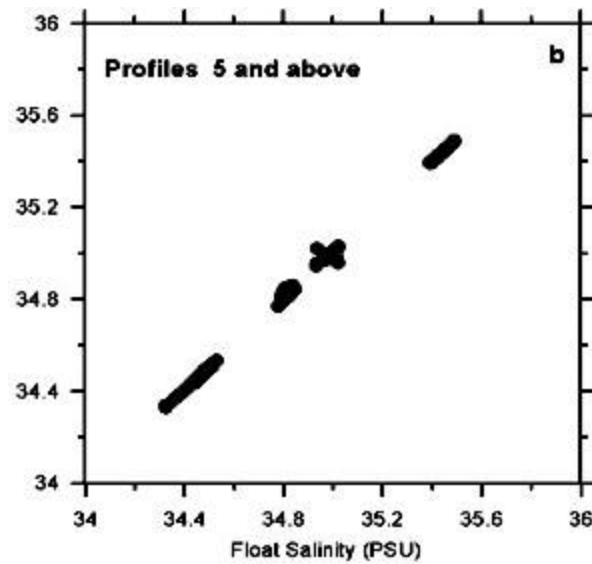


Figure-1a: Scatter plot of float-versus-float salinity involving initial profiles (1 & 2) of the floats.

Figure-1b: Same as in figure-1a, but for float profiles involving above 5.

The scatter is very high in [figure-1a](#) that involves initial profiles 1 and 2. In [figure-1b](#) that involves profiles 5 and above, the scatter is very less. This implies that in the initial profiles the random error caused by initial instability of the float salinity sensor is significant. [Figure-2](#) represents the mean and standard deviation of the difference between float-versus-float salinity for the 38 match-ups. The graph with circles represents the mean and standard deviation of the salinity difference for 9 match-ups of initial profiles 1 and 2. Whereas, for the match-ups involving profiles 5 and above the error curve is represented with triangles. As seen from [figure-2](#), the random error for match-ups involving initial profiles are significantly higher than that of match-ups involving profiles 5 and above.

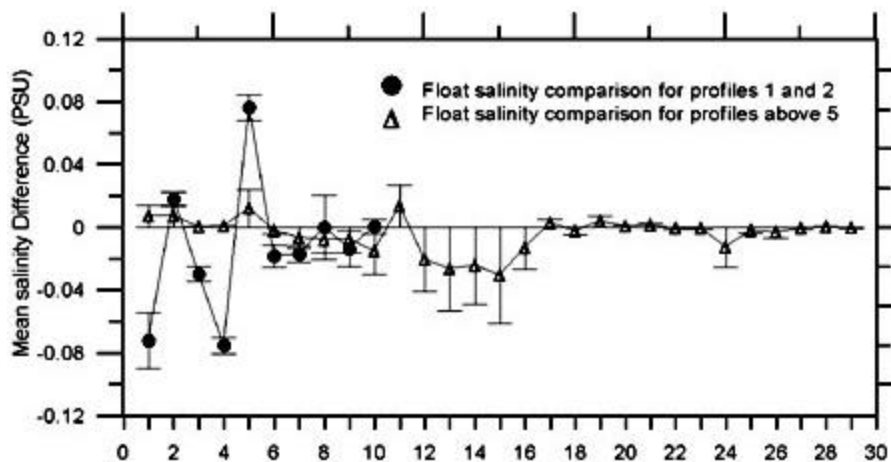


Figure 2: Flaot-versus-float salinity comparisons for initial profiles

(1 & 2) of the floats (circles) and for profiles above 5 (Triangles).

**Float versus Ship-CTD Salinity**

CTD observations from one cruise of ORV Sagar Kannya (SK183) and two cruises of ORV Sagar Sampatha (SS-215 & SS 209) have been used to validate the collocated observations of float 2900228 and 2900093. The floats salinity and the salinity observed during the cruises are given in [figure-3](#). The comparisons are made at theta surfaces varying from 5-10 °C, depending on the deepest available observations. [Figure-4](#) represents the mean and standard deviation of the difference between float-CTD and ship-CTD salinity. Except for one pair, all the comparisons show mean error less than 0.02 PSU. Though the desired accuracy of the ARGO is 0.01 PSU, the ~ 0.02 PSU mean error observed in the float-ship CTD match-ups are expected to have some natural variability of salinity at deeper depths due to the space-time lag.

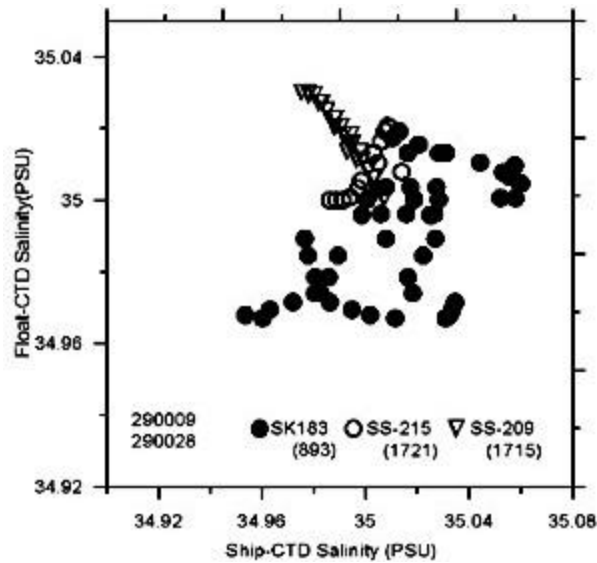


Figure 3: Scatter plot of salinity from float-CTD versus salinity observations from ship-CTD. The salinity comparisons are made at theta surfaces varying from 5 to 10 °C, depending on the deepest observations.

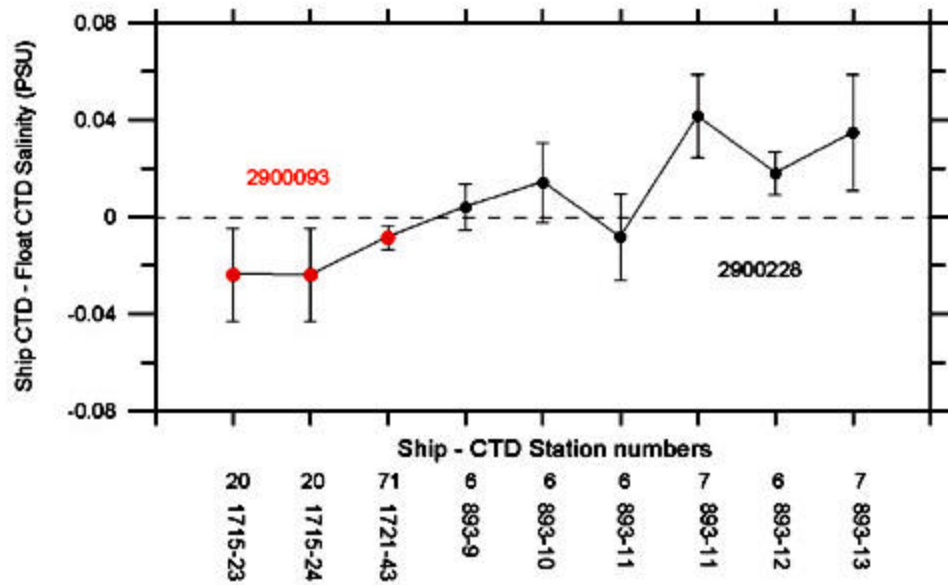


Figure 4: Mean and standard deviation of the float salinity error based on ship-CTD observations from three cruises.

## REFERENCES

Bacon, S., L. Centurioni & W. Gould, 2001: The evaluation of salinity measurements from PALACE floats. *J. Atmos. Oceanic. Technol.*, 18, 1258-1266. [1]

Wong, A. P. S., G. C. Johnson, & W. B. Owens, 2003: Delayed-mode calibration of autonomous CTD profiling float salinity data by theta-S climatology. *J. Atmos. Oceanic tecnol.*, 20, 308-318. [2]

© 2006 Universidad de Concepción.  
 Facultad de Ciencias Naturales y Oceanográficas.

Casilla 160-C  
 Concepción

Teléfono: 56-41-203059, Fax: 56-41-244805



[gayana@udec.cl](mailto:gayana@udec.cl), [aangulo@udec.cl](mailto:aangulo@udec.cl)