

# Argo National Data Management Report (2017) – India

## 1. Status

- **Data acquired from floats**

India has deployed 37 new floats (including 6 Apex-BioArgo, 8 Provor-Bio Argo floats and 1 with EM software) between October 2016 and November 2017 in the Indian Ocean taking its tally to 435 floats so far. Out of these 143 floats are active. All the active floats data are processed and sent to GDAC.

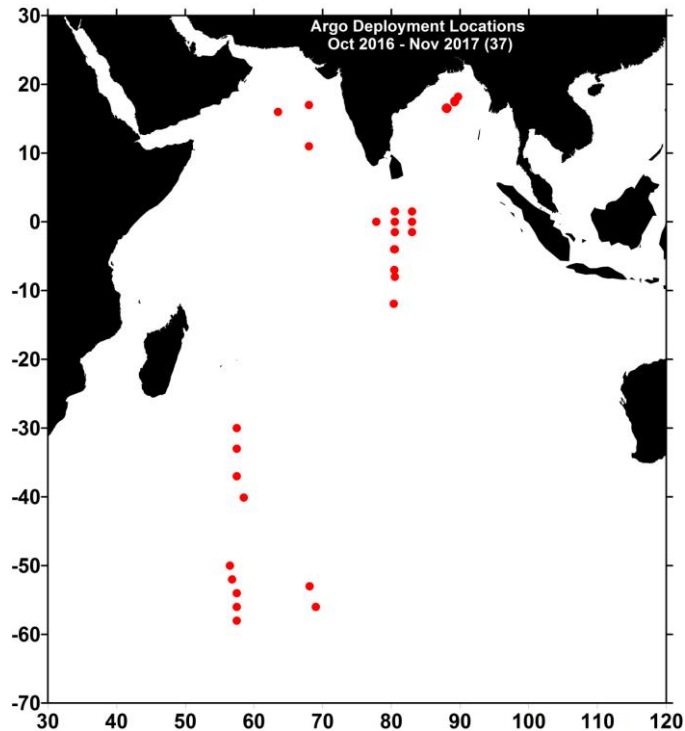


Fig. Location of Argo floats deployed by India

- **Data issued to GTS**

All the active floats data is being distributed via RTH New Delhi. However there seems to be a problem in the BUFR messages being received. Also the BUFR count is found to be less than TESAC messages. Following up this issue with RTH New Delhi.

- **Data issued to GDACs after real-time QC**

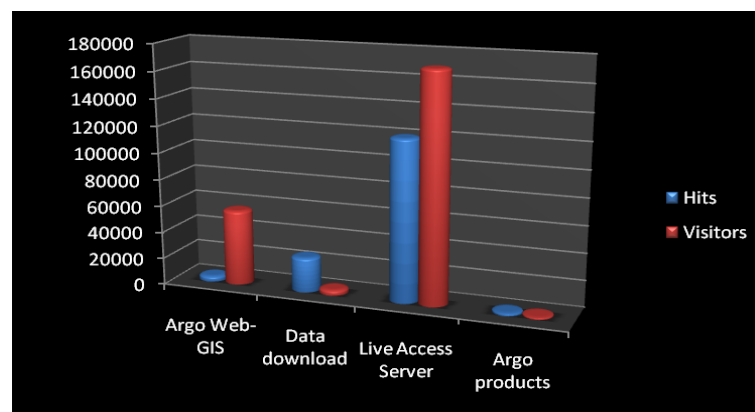
All the active floats (140) data are subject to real time quality control and are being successfully uploaded to GDAC. Also the some of the old floats whose life had ended are also converted to Ver 3.1 and uploaded to GDAC.

- **Data issued for delayed QC**

In total 51% of the eligible profiles for DMQC are generated and uploaded to GDAC. Old DMQCed floats with old version 2.3 are converted to V 3.1 and uploaded to GDAC.

- **Web pages**

- INCOIS is maintaining Web-GIS based site for Indian Argo Program. It contains entire Indian Ocean floats data along with trajectories. Further details can be obtained by following the link [http://www.incois.gov.in/Incois/argo/argo\\_home.jsp](http://www.incois.gov.in/Incois/argo/argo_home.jsp). Apart from the floats deployed by India, data from floats deployed by other nations in the Indian Ocean are received from the Argo Mirror and made available in the INCOIS website. User can download the data based on his requirement.
  - Statistics of Indian and Indian Ocean floats are generated and maintained in INCOIS web site. The density maps for aiding people for new deployments are made available on a monthly basis. For full details visit [http://www.incois.gov.in/Incois/argo/argostats\\_index.jsp](http://www.incois.gov.in/Incois/argo/argostats_index.jsp).
- **Trajectory**  
INCOIS started generating Ver 3.1 trajectory files for all APEX float and uploading them to GDAC. Iridium and Provor, Arvor floats data will be uploaded shortly.
- **Statistics of Argo data usage**  
Argo data is widely put to use by various Organisations/ Universities/ Departments. Indian Meteorological Department (IMD) is using Argo data for their operational purpose. Scientists, Students and Researchers from INCOIS, NIO, SAC, C-MMACS, NRSA, IITM, NCMRWF, IISc etc are using Argo data in various analysis. Many paper based on Argo data were also published in reputed journals. See the references below.
  - The demand for Bio-Argo data is increasing and the same is being supplied for research interest by various research institutes and universities. More and more BioArgo floats are being deployed in the Indian Ocean. Simultaneous cruises are also being planned.
  - This data is continued to be used for validation of Biogeochemical model outputs like ROMS with Fennel module.



INCOIS Argo web page statistics (for the past one year) are as shown below

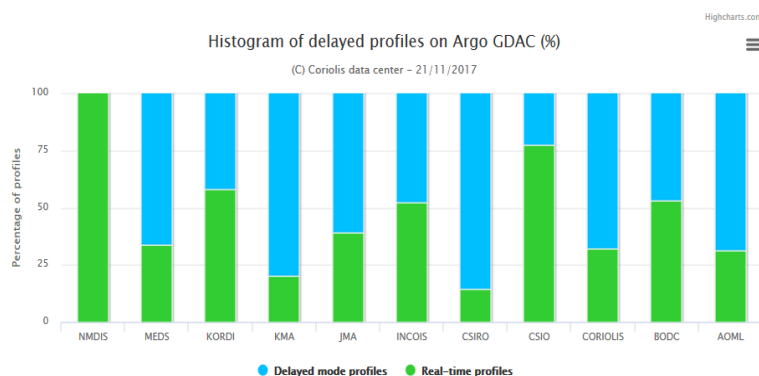
Page	Hits	Visitors
Argo Web-GIS	4011	56789
Data download	26196	3917
Live Access Server	120529	169906
Argo products	2018	1572

- **Products generated from Argo data**

1. Value added products obtained from Argo data are continued. Continued to variational analysis method while generating value added products. Many products are generated using Argo temperature and salinity data. The Argo T/S data are first objectively analysed and this gridded output is used in deriving value added products. More on this can be see in the RDAC functions.
2. Version 2.2 of DVD on “Argo data and products for the Indian Ocean” is released to public for use with data corresponding to August 2017 updated. This DVD consists of ~ 3,00,000 profiles and products based on the Argo T/S. A GUI is provided for user to have easy access to the data. DVD product is discontinued and it is being made available via INCOIS and UCSD web sites.
3. To cater to many users of INCOIS LAS, it is enhanced in term of capacity. New Server is procured and new products viz., model outputs, new wind products (OSCAT), fluxes are made available. New products as per the request received from the users in future are being made available. For further details visit <http://las.incois.gov.in>.

## 2. Delayed Mode QC

- INCOIS started generating and uploading D files to GDAC form July 2006, and as of today, profiles belonging to all eligible floats have been subjected to DMQC.
- Advanced Delayed Mode Quality Control s/w developed by CSIRO is being put to use successfully. Using this s/w all the eligible floats are reprocessed to tackle pressure sensor offset problems, salinity hooks, thermal lag corrections, salinity drifts.
- Under the data search and archeology data from our own sister concerns is being obtained and put to use in the delayed mode processing.
- About 51% of the eligible profiles are subjected to DMQC and the delayed mode profiles are uploaded on to GDAC. Majority of the old dead float which are passed through DMQC are converted to Ver 3.1 and uploaded to GDAC.

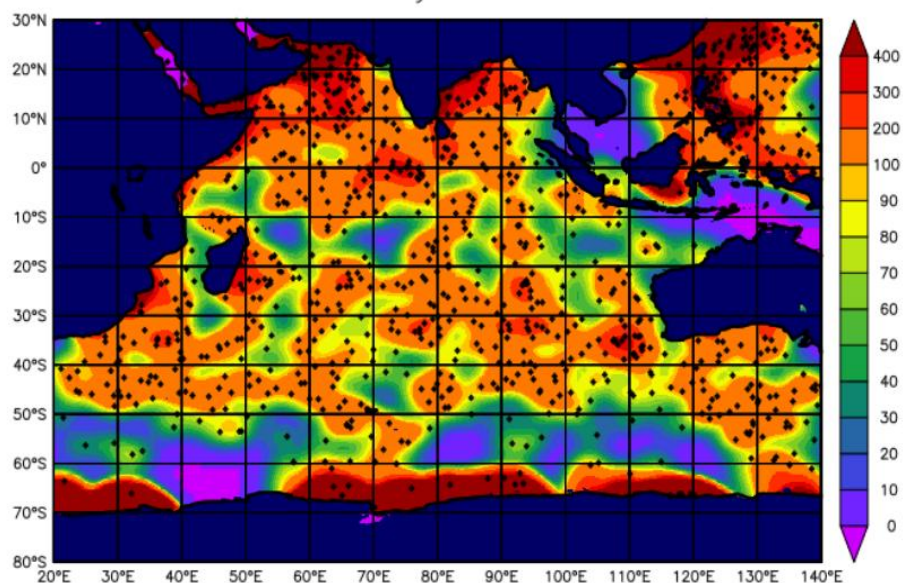


## 3. GDAC Functions

INCOIS is not operating as a GDAC.

## 4. Regional Centre Functions

- Acquisition of Argo data from GDAC corresponding to floats other than deployed by India and made them available on INCOIS web site.
- All these data sets are made available to the user through a s/w developed with all GUI facilities. This s/w is made available through FTP at INCOIS and UCSC web sites.
- Delayed Mode Quality Control (Refer 2.0 above)
- Data from the Indian Ocean regions are gridded into 1x1 box for monthly and 10 days and monthly intervals. These gridded data sets are made available through INCOIS Live Access Server (ILAS). Users can view and download data/images in their desired format.
- Efforts are underway to setup ERDDAP for the data and data products from Argo floats.
- Additionally SST from TMI, AMSRE and Wind from ASCAT, Chla from MODIS and OCM-2 are also made available on daily and monthly basis.
- Global wind products from OSCAT is also generated and made available on LAS along with TROP flux data sets.
- Data Sets (CTD, XBT, Subsurface Moorings) are being acquired from many principle investigators. These data are being utilized for quality control of Argo profiles.
- Value added products:  
Two types of products are currently being made available to various user from INCOIS web site. They are:
  - (i) Time series plots corresponding to each float (only for Indian floats).
  - (ii) Spatial plots using the objectively analysed from all the Argo floats data deployed in the Indian Ocean.
 These valued added products can be obtained from the following link [http://www.incois.gov.in/Incois/argo/products/argo\\_frames.html](http://www.incois.gov.in/Incois/argo/products/argo_frames.html)
- Regional Co-ordination for Argo floats deployment plan for Indian Ocean. The float density in Indian Ocean as on 21 Nov, 2017 is shown below.



## **Publications:**

INCOIS is actively involved in utilization of Argo data in various studies pertaining to Indian Ocean. Also INCOIS is encouraging utilization of Argo data by various universities by funding them. Some of the publications resulted from Argo data which includes scientists from INCOIS are given below:

1. Quality control of oceanographic in situ data from Argo floats using climatological convex hulls, TVS Udaya Bhaskar, R Venkat Shesu, Timothy P Boyer, E Pattabhi Rama Rao, *MethodX*, Vol 4, 469 - 479, doi: 10.1016/j.mex.2017.11.007
2. Chacko, N., 2017: Chlorophyll bloom in response to tropical cyclone Hudhud in the Bay of Bengal: Bio-Argo subsurface observations. *Deep Sea Research Part I: Oceanographic Research Papers*, 124, 66-72, <http://dx.doi.org/10.1016/j.dsr.2017.04.010>.
3. Chakraborty, K., N. Kumar, and G. V. M. Gupta, 2017: Getting the right wind-forcing for an ecosystem model: A case study from the eastern Arabian Sea. *Journal of Operational Oceanography*, 10, 176-190, <http://dx.doi.org/10.1080/1755876X.2017.1354686>
4. Chand, C. P., M. V. Rao, B. Prasad Kumar, and K. H. Rao, 2017: Influence of cyclone Phailin on the Upper Ocean over Bay of Bengal. *International Journal of Applied Environmental Sciences*, 12, 717-729, [http://www.ripublication.com/ijaes17/ijaesv12n5\\_01.pdf](http://www.ripublication.com/ijaes17/ijaesv12n5_01.pdf)
5. Ghosh, S., S. Hazra, S. Nandy, P. P. Mondal, T. Watham, and S. P. S. Kushwaha, 2017: Trends of sea level in the Bay of Bengal using altimetry and other complementary techniques. *Journal of Spatial Science*, 1-14, <http://dx.doi.org/10.1080/14498596.2017.1348309>.
6. Gordon, A. L., E. Shroyer, and V. S. N. Murty, 2017: An Intrathermocline Eddy and a tropical cyclone in the Bay of Bengal. *Scientific Reports*, 7, 46218, <http://dx.doi.org/10.1038/srep46218>
7. Jain, V., D. Shankar, P. N. Vinayachandran, A. Kankonkar, A. Chatterjee, P. Amol, A. M. Almeida, G. S. Michael, A. Mukherjee, M. Chatterjee, R. Fernandes, R. Luis, A. Kamble, A. K. Hegde, S. Chatterjee, U. Das, and C. P. Neema, 2017: Evidence for the existence of Persian Gulf Water and Red Sea Water in the Bay of Bengal. *Climate Dynamics*, 48, 3207-3226, <https://doi.org/10.1007/s00382-016-3259-4>.
8. Narvekar, J., J. R. D'Mello, S. Prasanna Kumar, P. Banerjee, V. Sharma, and P. Shenai-Tirodkar, 2017: Winter-time variability of the eastern Arabian Sea: A comparison between 2003 and 2013. *Geophysical Research Letters*, 44, 6269-6277, <http://dx.doi.org/10.1002/2017GL072965>