MOAA GPV

Grid Point Value of the Monthly Objective Analysis using the Argo data

Quick instruction

Ver.2.0 : 2nd September, 2025

Japan Agency for Marine-Earth Science and Technology (JAMSTEC)

1. About MOAA GPV ver2.0

JAMSTEC produces a gridded dataset named "MOAA GPV" (**G**rid **P**oint **V**alue of the **M**onthly **O**bjective **A**nalysis using the **A**rgo data) for the global mapping of temperature and salinity in quasi-real time. The gridded data is created from January 2001 by using 3-D optimal interpolation method (e.g., White, 1995) for temperature and salinity profiles obtained from Argo float. For all used Argo float data, real-time and delayed mode quality controls are conducted following Argo data processing procedure.

Based on the temperature and salinity profiling data, monthly horizontal distributions of global temperature, salinity and those anomalies are estimated from World Ocean Atlas 2013 climatology, not only in surface layer but also subsurface and deeper layers (Locarnini et al., 2013; Zweng et al., 2013). Specifications and notice for use of MOAA GPV are listed below. Further information of MOAA GPV is needed, please refer to the technical document (Hosoda et al., 2008 and Hosoda et al. in preparation).

The differences between MOAA GPV V1.3 and MOAA GPV V2.0 are shown in the table below.

Table1. Specification summary of MOAA GPV V1.3 and V2.0

	MOAA GPV V1.3	**MOAA GPV V2.0**
Method	2-dimensional optimal interpolation on pressure surface	3-dimentional optimal interpolation on pressure surface
Parameters	Temperature (°C), salinity (psu), potential density (kg m^{-3})(*1), and geopotential height (m^2 s^{-2}) (*1)	
Area	Global Ocean without sea ice area (70.5°N-60.5°S, 0.5°-359°E) However, marginal seas such as the Sea of Japan, East and South China Seas, Sea of Okhotsk, Mediterranean Sea, and Gulf of Mexico are excluded.	Global Ocean without sea ice area (70.5°N-70.5°S, 0.5°-359°E) Major marginal seas are included.
Resolution	Horizontal: 1°x1°, 25 levels from 10 to 2000dbar (Standard pressure levels: 10, 20, 30, 50, 75, 100, 125, 150, 200, 250, 300, 400, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500,	Horizontal: 1°x1°, 66 levels from 5 to 2000dbar (Standard pressure levels of WOA13: every 5dbar from 5 to 100dbar, every 25dbar from 125 to 500dbar, every 50 dbar from 550 to 2000 dbar)

	1750, 2000 dbar)	
Data Source	Argo floats, TRITON buoys, available CTD casts (corporates with Japan Meteorological Agency, Japan Coast Guard and Japan Oceanographic Data Center)	Only Argo floats
Period	From January, 2001 – on going (monthly)	From January, 2001 – on going (every 10days and monthly)

(*1) The items of MOAA GPV V2.0 will be released later.

1-1. Filename example

The conventions of NetCDF format for MOAA GPV have been registered with Unidata as the COARDS convention. Users can be converted for Ascii, GrADS, or Ocean Data View (ODV) format using ncdump in NetCDF utilities.

MOAAv2_OI_TS_[yyyymmdd]_[period]_100deg_5-2000db.nc
MOAAv2_OI_RG_[yyyymmdd]_[period]_100deg_5-2000db.nc

- [yyyymmdd] is date.
- [period] is either 10D or MON.
- "TS" include Temperature (ITS90), Temperature interpolation error (ITS90), Salinity (PSS-78), and Salinity interpolation error (PSS-78) parameters.
- Potential density and dynamic height were calculated from the temperature and salinity.

The datasets are provided as Near Real Time (hereafter NRT) data using RTQC data and as Deleyed Mode (hereafter DM) data using Argo profile data for the past ten years most recent at the time of the update. DM uses more DMQC profile data than NRT. Both are provided in the same file name, but the version of NRT or DM is described at DATASET_TYPE variable in each NetCDF file. You can find the date file created at the history attribute of global attributes in the file.

[Types of dataset]

(i) DM (updating data files for the past ten years once a year)
(ii) NRT (providing once a month)

The dataset files can be downloaded at the following URL:

https://www.jamstec.go.jp/argo_research/dataset/moaagpv/moaa_en.html

- File header information (NetCDF header).

  As an example, MOAAv2_OI_TS_20240115_MON_100deg_5-2000db.nc is shown below. Please refer to the appendix for differences from MOAA GPV v1.3.

```
dimensions:
        N_LON = 360 ;
        N_LAT = 142 ;
        N_DEP = 66 ;
        STRING16 = 16 ;
variables:
        int PRES(N_DEP) ;
                PRES:name = "PRES" ;
        char CDATE0(STRING16) ;
                CDATE0:name = "CDATE0" ;
        char DATASET_TYPE(STRING16) ;
                DATASET_TYPE:name = "DATASET_TYPE" ;
                DATASET_TYPE:long_name = "Dataset type." ;
        float SOI_ERR(N_DEP, N_LAT, N_LON) ;
                SOI_ERR:name = "SOI_ERR" ;
                SOI_ERR:FillValue = -10000.f ;
        float TOI_ERR(N_DEP, N_LAT, N_LON) ;
                TOI_ERR:name = "TOI_ERR" ;
                TOI_ERR:FillValue = -10000.f ;
        float LATITUDE(N_LAT) ;
                LATITUDE:name = "LATITUDE" ;
        float LONGITUDE(N_LON) ;
                LONGITUDE:name = "LONGITUDE" ;
        float SOI(N_DEP, N_LAT, N_LON) ;
                SOI:name = "SOI" ;
                SOI:FillValue = -10000.f ;
```

```
        float S_CLIM(N_DEP, N_LAT, N_LON) ;
                S_CLIM:name = "S_CLIM" ;
                S_CLIM:FillValue = -10000.f ;
        float TOI(N_DEP, N_LAT, N_LON) ;
                TOI:name = "TOI" ;
                TOI:FillValue = -10000.f ;
        float T_CLIM(N_DEP, N_LAT, N_LON) ;
                T_CLIM:name = "T_CLIM" ;
                T_CLIM:FillValue = -10000.f ;
        float S_STDEV(N_DEP, N_LAT, N_LON) ;
                S_STDEV:name = "S_STDEV" ;
                S_STDEV:FillValue = -10000.f ;
        float T_STDEV(N_DEP, N_LAT, N_LON) ;
                T_STDEV:name = "T_STDEV" ;
                T_STDEV:FillValue = -10000.f ;

// global attributes:
                :title = "MOAA GPV ver2：2024/12/15" ;
                :institution = "JAMSTEC/RIGC/Global Ocean Observation
Research Center" ;
                :source = "Argo float" ;
                :history = "2025-01-23 creation" ;
                :references = "http://pubargo.jamstec.go.jp/public/MOAA_GPV_2" ;
```

2. Notice of use of MOAA GPV

- Reprint without permission, the re-distribution, the modification, and the commercial use are prohibited though JAMSTEC doesn't disturb the free use of this data in principle.

S. Hosoda, T. Ohira, T. Nakamura, 2008: A monthly mean dataset of global oceanic temperature and salinity derived from Argo float observations. JAMSTEC Rep. Res. Dev., Vol. 8, 47-59.

Hosoda,S. 2025: Observation-based seasonal change in decorrelation length of the physical parameters and corrected dataset of MOAA GPV

- Please source the above when you make the result using this data public.
- JAMSTEC doesn't assume responsibility to any damage of the user of this data.

3. References

Hosoda, S., T. Ohira, and T. Nakamura (2008): A monthly mean dataset of global oceanic temperature and salinity derived from Argo float observations. JAMSTEC Rep. Res. Dev., Vol. 8, 47-59.

Locarnini, R. A., A. V. Mishonov, J. I. Antonov, T. P. Boyer, H. E. Garcia, O. K. Baranova, M. M. Zweng, C. R. Paver, J. R. Reagan, D. R. Johnson, M. Hamilton, and D. Seidov, 2013. World Ocean Atlas 2013, Volume 1: Temperature. S. Levitus, Ed., A. Mishonov Technical Ed.; NOAA Atlas NESDIS 73, 40 pp.

Zweng, M.M, J.R. Reagan, J.I. Antonov, R.A. Locarnini, A.V. Mishonov, T.P. Boyer, H.E. Garcia, O.K. Baranova, D.R. Johnson, D.Seidov, M.M. Biddle, 2013. World Ocean Atlas 2013, Volume 2: Salinity. S. Levitus, Ed., A. Mishonov Technical Ed.; NOAA Atlas NESDIS 74, 39 pp.

White, W. B. (1995), Design of a global observing system for gyre-scale upper ocean temperature variability, *Prog. Oceanogr., 36*, 169-217.

○Appendix　Comparison table for variables: MOAA GPV V1.3 vs. V2.0

MOAA V1.3	MOAA V2.0
dimensions:	
LONGITUDE = 360 ; LATITUDE = 132 ; PRES = 25 ; STRING8 = 8 ; STRING4 = 4 ;	N_LON = 360 ; N_LAT = 142 ; N_DEP = 66 ; STRING16 = 16 ;
variables:	
float LONGITUDE(LONGITUDE) ; LONGITUDE:name = "LONGITUDE" ; LONGITUDE:units = "degrees_east" ;	float LONGITUDE(N_LON) ; LONGITUDE:name = "LONGITUDE" ;
float LATITUDE(LATITUDE) ; LATITUDE:name = "LATITUDE" ; LATITUDE:units = "degrees_north" ;	float LATITUDE(N_LAT) ; LATITUDE:name = "LATITUDE" ;
float PRES(PRES) ; PRES:name = "PRES" ; PRES:long_name = "Pressure" ; PRES:positive = "down" PRES:units = "decibar" ;	int PRES(N_DEP) ; PRES:name = "PRES" ;
float TOI(PRES, LATITUDE, LONGITUDE) ; TOI:name = "TOI" ; TOI:long_name = "Temperature.(ITS90)" ; TOI:_FillValue = 99999.f ;	float TOI(N_DEP, N_LAT, N_LON) ; TOI:name = "TOI" ; TOI:FillValue = -10000.f ;

TOI:units = "degree_Celsius" ;	
float TOI_ERR(PRES, LATITUDE, LONGITUDE) ; TOI_ERR:name = "TOI_ERR" ; TOI_ERR:long_name = "Temperature Interpolation Error." ; TOI_ERR:_FillValue = 99999.f ; TOI_ERR:units = "degree_Celsius" ;	float TOI_ERR(N_DEP, N_LAT, N_LON) ; TOI_ERR:name = "TOI_ERR" ; TOI_ERR:FillValue = -10000.f ;
float SOI(PRES, LATITUDE, LONGITUDE) ; SOI:name = "SOI" ; SOI:long_name = "Salinity.(PSS-78)" ; SOI:_FillValue = 99999.f ; SOI:units = "psu" ;	float SOI(N_DEP, N_LAT, N_LON) ; SOI:name = "SOI" ;
float SOI_ERR(PRES, LATITUDE, LONGITUDE) ; SOI_ERR:name = "SOI_ERR" ; SOI_ERR:long_name = "Salinity Interpolation Error." ; SOI_ERR:_FillValue = 99999.f ; SOI_ERR:units = "psu" ;	float SOI_ERR(N_DEP, N_LAT, N_LON) ; SOI_ERR:name = "SOI_ERR" ; SOI_ERR:FillValue = -10000.f ;
char DATE_GDAC_DOWNLOAD(STRING8) ; DATE_GDAC_DOWNLOAD:name = "DATE_GDAC_DOWNLOAD" ; DATE_GDAC_DOWNLOAD:long_name = "Date of GDAC data." ; DATE_GDAC_DOWNLOAD:units = "YYYYMMDD(UTC)" ; DATE_GDAC_DOWNLOAD:_FillValue = 99999.f ;	-
char DATE_UPDATE(STRING8) ; DATE_UPDATE:name = "DATE_UPDATE" ;	char CDATE0(STRING16) ; CDATE0:name = "CDATE0" ;

DATE_UPDATE:long_name = "Date of MOAA." ; DATE_UPDATE:units = "YYYYMMDD(UTC)" ; DATE_UPDATE:_FillValue = 99999.f ;	
char DATASET_TYPE(STRING4) ; DATASET_TYPE:name = "DATASET_TYPE" ; DATASET_TYPE:long_name = "Dataset type." ; DATASET_TYPE:_FillValue = 99999.f ;	char DATASET_TYPE(STRING16) ; DATASET_TYPE:name = "DATASET_TYPE" ;
-	float T_CLIM(N_DEP, N_LAT, N_LON) ; T_CLIM:name = "T_CLIM" ; T_CLIM:FillValue = -10000.f ;
-	float S_CLIM(N_DEP, N_LAT, N_LON) ; S_CLIM:name = "S_CLIM" ; S_CLIM:FillValue = -10000.f ;
-	float T_STDEV(N_DEP, N_LAT, N_LON) ; T_STDEV:name = "T_STDEV" ; T_STDEV:FillValue = -10000.f ;
-	float S_STDEV(N_DEP, N_LAT, N_LON) ; S_STDEV:name = "S_STDEV" ; S_STDEV:FillValue = -10000.f ;
// global attributes: :Conventions = "COARDS" ; :Title = "Argo OI TS 2012AUG Global ocean" ; :Version = "Created May.09,2022 by JAMSTEC/ArgoGroup" ;	// global attributes: :title = "MOAA GPV ver2 : 2024/12/15" ; :institution = "JAMSTEC/RIGC/Global Ocean Observation Research Center" ; :source = "Argo float" ;

	:history = "2025-01-23 creation" ; :references = "http://pubargo.jamstec.go.jp/public/MOAA_GPV_2" ; :comment = "free text" ; :conventions = "CF-1.6" ;