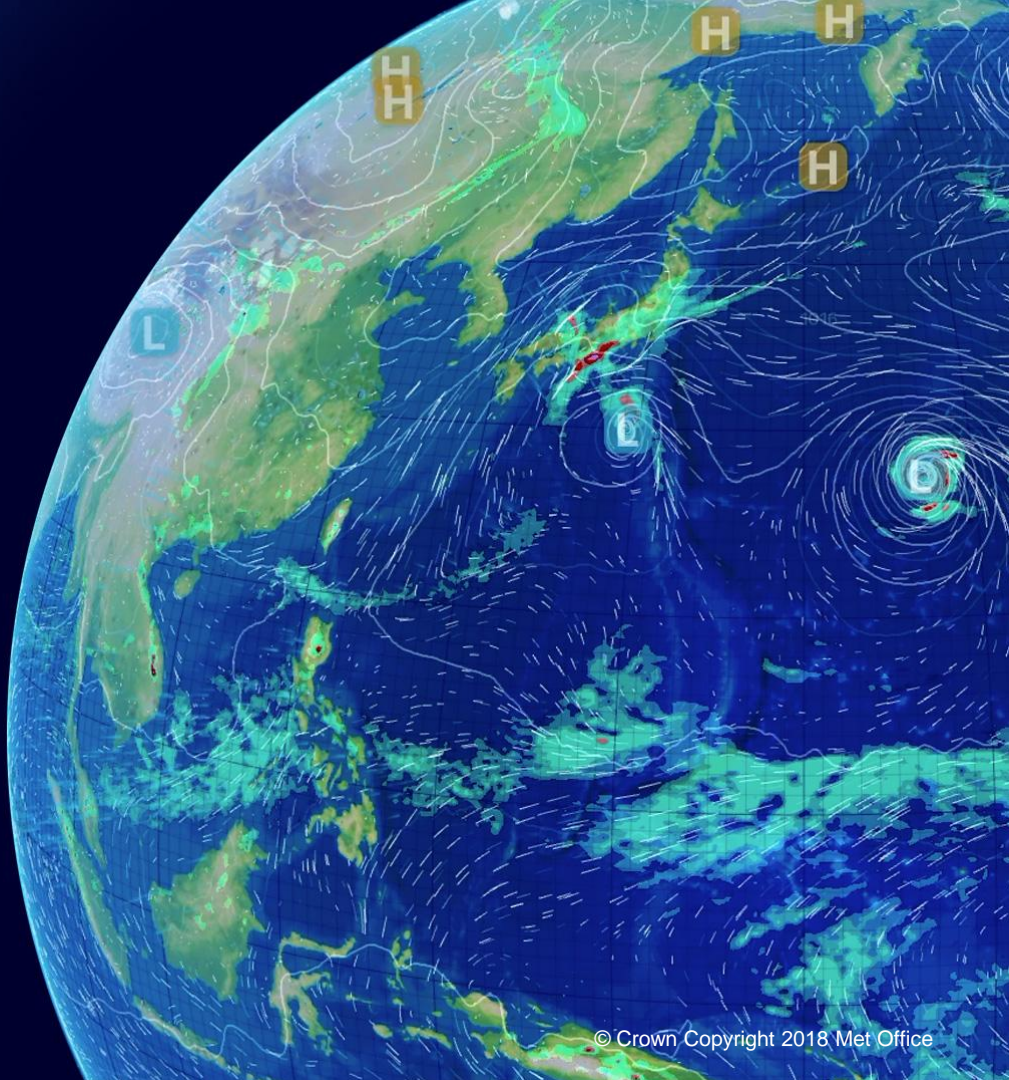


GTS Update: BUFR and TESAC

Fiona Carse & Jon Turton



TESAC (FM-64) Format will cease on 1st July 2018

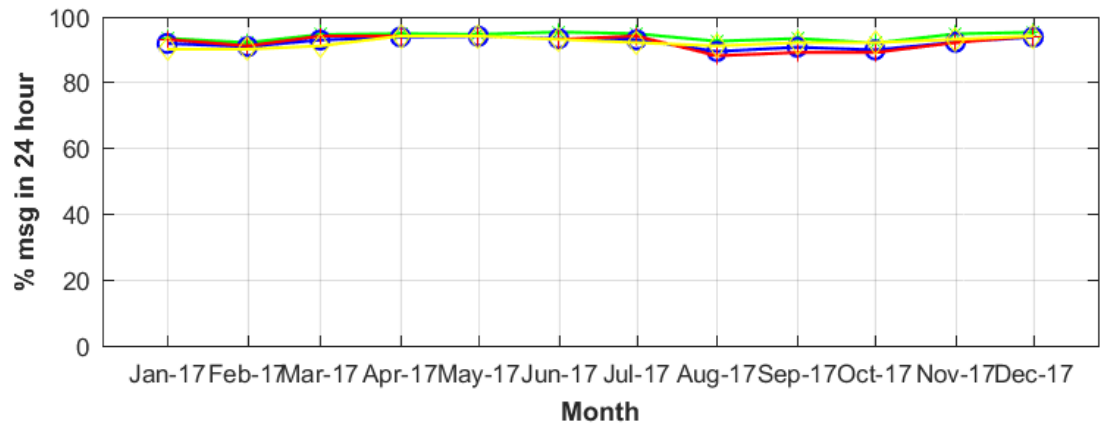
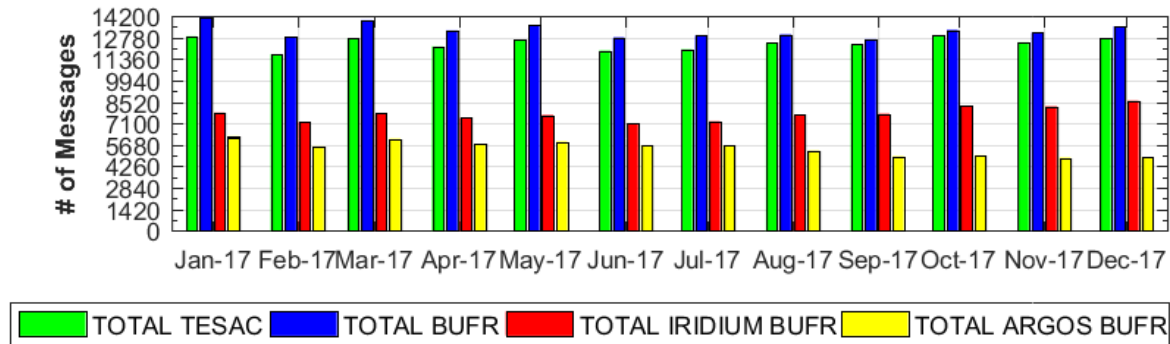
- WMO notification, published 11 January 2018:

Notification from the international Argo Programme

Following the recent Argo Data Management Team meeting, it has been decided that the issuing of real-time Argo float profile data to the GTS in FM-64 TESAC format will cease on 1 July 2018. Thereafter the float profile data will only be available on the GTS in BUFR TM3-15-003 format (but will still be available in netCDF through the two Argo Global Data Assembly Centres). Note that this change only refers to Argo float data and that profile data from marine mammals and ships will continue to be available on GTS in TESAC format.

Global BUFR and TESAC outputs

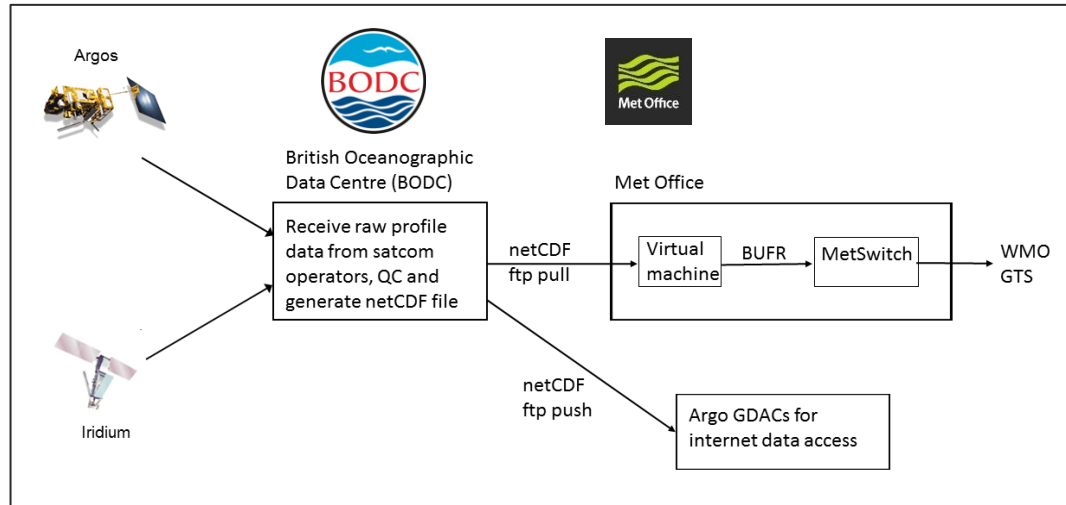
(from Anh
Tran,
MEDS)



Current status (at 6 March 2018)

- BODC currently generates both TESAC and BUFR messages for the GTS.
- Parallel running to generate BUFR TM3-15-003:
 - JMA-provided Perl software at BODC
 - Python2.7 software at Met Office
- Only temperature and salinity profiles from core floats netCDF v3.1 are handled.
- Testing of MO system is nearly complete:
 - MO system generates between 20 and 40 BUFR messages per day
 - BODC and MO files identical in terms of data content ☺
 - Finalise how to handle 'duplicates' (re-issued netCDF files lead to repeat BUFR messages)
- Switch routing so that Met Office becomes the source of UK Argo real-time data to the GTS (aim for April 2018).

Met Office netCDF to BUFR conversion (April)



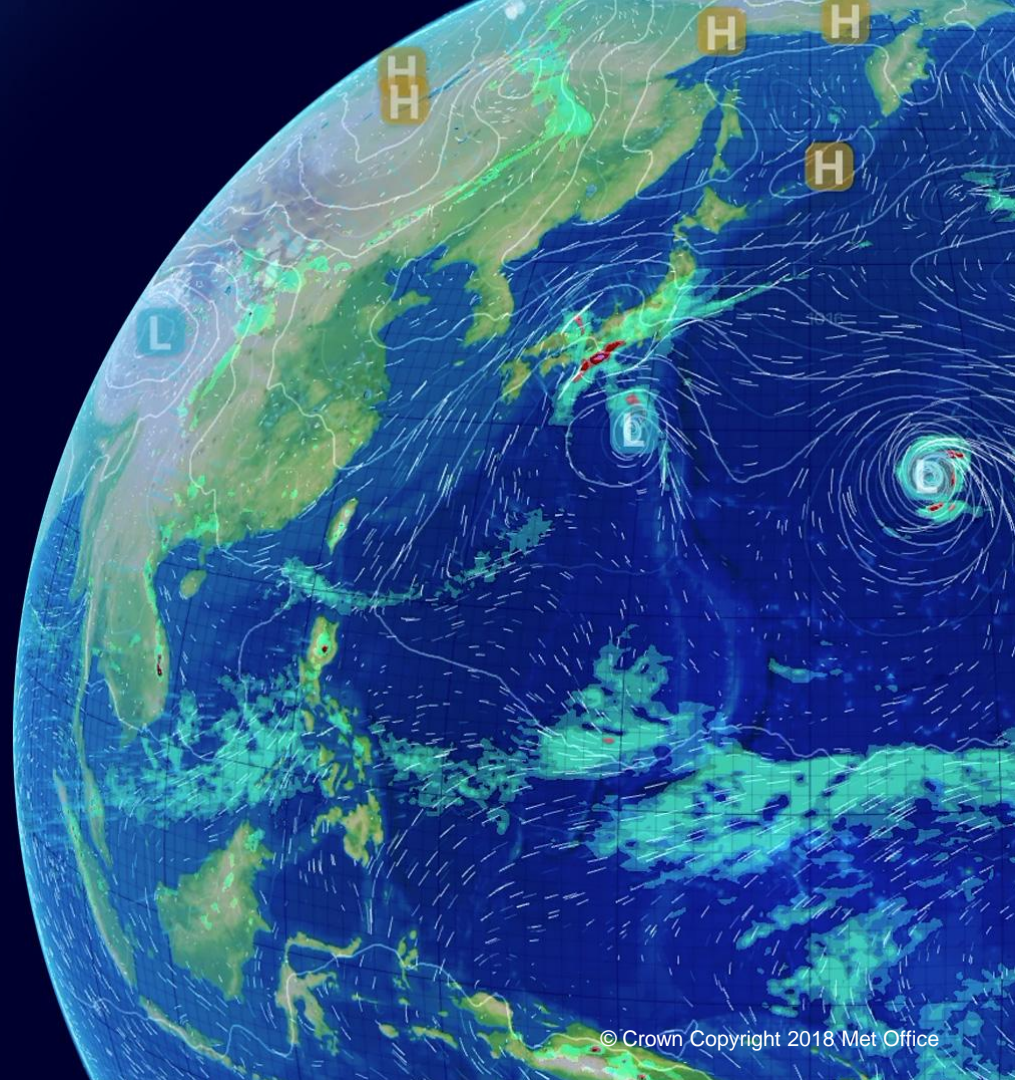
Future developments for 2018

- Extend the Python2.7 software to extract additional data that is present in netCDF v3 files and incorporate this into TM3-15-003 message:
 - Secondary temperature and/or salinity profiles from, for example, auxiliary sensors, near-surface sampling, bounce sampling (vertical sampling schemes listed in reference table 16 of Argo Users Manual).
 - **Temperature only** data will use additional sequence **3-06-017**
 - **Temperature and salinity** data will use additional sequence **3-06-018**
 - Include real-time BGC data from b-files
 - **dissolved oxygen** is the only WMO-approved BGC parameter (additional sequence **3-06-037**).
- Share Met Office Python2.7 conversion software with the Argo community.
- Develop BGC BUFR beyond dissolved oxygen ...

Status of BGC BUFR

- The following profile sequences were “approved for validation” at WMO IPET-DRMM meeting during 2016:
 - Chlorophyll-A: 3-06-044
 - Nitrate: 3-06-045
 - pH: 3-06-046
 - Backscattering: 3-06-047
- UK is ready to carry out validation of these sequences.
- Seeking partners for ‘buddy’ check.
- This entails several (at least two) centres demonstrating that they can encode the BUFR file and decode a BUFR file created by the other centre(s).
- Met Office and MEDS did this for secondary T/S profiles in 2015.

Any questions?



Extra Info 1: supplementary T profiles

3 06 017: Supplementary depth (pressure) and temperature profile from floats

Table Reference			Table References			Element Name	
F	X	Y					
						(Sub-surface temperature profile (high accuracy/precision) with quality flags)	
3 06 017			0	02	032	Indicator for digitization	= 0 Fixed sensor depths
			0	08	034	Type of temperature/salinity measurement	
			1	06	000	Delayed replication of 6 descriptors	
			0	31	002	Delayed descriptor replication factor	Number of depths
			0	07	065	Water pressure	In Pa
			0	08	080	Qualifier for GTSP quality flag	
			0	33	050	Global GTSP quality flag	
			0	22	043	Sea/water temperature	In K to 2 decimal places
			0	08	080	Qualifier for GTSP quality flag	
			0	33	050	Global GTSP quality flag	
			0	08	034	Type of temperature/salinity measurement	Set to missing (cancel)

Extra Info 2: supplementary T & S profiles

3 06 018: Supplementary depth (pressure), temperature and salinity profile from floats

Table Reference			Table References			Element Name	
F	X	Y					
						(Sub-surface temperature profile (high accuracy/precision) with quality flags)	
3 06 018			0	02	032	Indicator for digitization	= 0 Fixed sensor depths
			0	08	034	Type of temperature/salinity measurement	
			1	09	000	Delayed replication of 9 descriptors	
			0	31	002	Delayed descriptor replication factor	Number of depths
			0	07	065	Water pressure	In Pa
			0	08	080	Qualifier for GTSPQ quality flag	
			0	33	050	Global GTSPQ quality flag	
			0	22	043	Sea/water temperature	In K to 2 decimal places
			0	08	080	Qualifier for GTSPQ quality flag	
			0	33	050	Global GTSPQ quality flag	
			0	22	064	Salinity	
			0	08	080	Qualifier for GTSPQ quality flag	
			0	33	050	Global GTSPQ quality flag	
			0	08	034	Type of temperature/salinity measurement	Set to missing (cancel)

Extra Info 3: T & S measurement qualifier

0 08 034: Temperature / salinity measurement qualifier

Code figure	Meaning
0	Un-pumped float temperature and salinity data
1	Auxiliary STS sensor data
2	Spot sampled measurements from core CTD sensor
3 – 14	Reserved
15	Missing value

Extra Info 4: Dissolved oxygen

3 06 037: Dissolved oxygen profile data

Table Reference			Table References			Element Name	
F	X	Y					
3	06	037				Dissolved oxygen profile data	
			1	09	000	Delayed replication of 9 descriptors	
			0	31	002	Extended delayed descriptor replication factor	Gives number of depths
			0	07	062	Depth below sea / water surface	Code as missing
			0	08	080	Qualifier for quality class	Code as missing
			0	33	050	GTSP quality class	Code as missing
			0	07	065	Water pressure	
			0	08	080	Qualifier for quality class (set to 10, indicates pressure at a level)	
			0	33	050	GTSP quality class	
			0	22	188	Dissolved oxygen	New entry - in $\mu\text{mol kg}^{-1}$
			0	08	080	Qualifier for quality class (set to 16, dissolved oxygen at a level)	
			0	33	050	GTSP quality class	

Code depth related descriptors as missing as water pressure is used as the vertical axis.

BGC (1) New elements created

Add to BUFR/CREX table B:

Class 13 – Hydrographic and hydrological elements

Table reference			Element name	BUFR				CREX		
F	XX	YYY		Unit	Scale	Ref. value	Data width (bits)	Units	Scale	Data width (characters)
0	13	161	pH scale	Code table	0	0	3	Code table	0	1

Class 41 – Marine bio-geochemical data

Table reference			Element name	BUFR				CREX		
F	XX	YYY		Unit	Scale	Ref. value	Data width (bits)	Units	Scale	Data width (characters)
0	41	006	Backscattering	m ⁻¹	5	0	19	m ⁻¹	5	6

BGC (2) chlorophyll-A (requires validation)

Sequence 3-06-044 for chlorophyll-A profile data

Table Reference			Table References			Element Name	
F	X	Y					
3	06	044				(Chlorophyll-A (fluorescence) profile data)	
			1	09	000	Delayed replication of 9 descriptors	
			0	31	002	Extended delayed descriptor replication factor	Gives number of depths
			0	07	062	Depth below sea / water surface	Code as missing
			0	08	080	Qualifier for quality class	Code as missing
			0	33	050	GTSP quality class	Code as missing
			0	07	065	Water pressure	
			0	08	080	Qualifier for quality class (set to 10, indicates pressure at a level)	
			0	33	050	GTSP quality class	
			0	41	002	Chlorophyll-A (fluorescence)	In kg l ⁻¹ (= 10 ⁹ mg m ⁻³)
			0	08	080	Qualifier for quality class (set to 21, chlorophyll-A at a level)	
			0	33	050	GTSP quality class	

Code depth related descriptors as missing as water pressure is used as the vertical axis.

Chlorophyll-A specified in range 0 to 65.535 mg m⁻³ with a resolution of 0.001 mg m⁻³.

BGC (3) nitrate (requires validation)

Sequence 3-06-045 for dissolved nitrate profile data

Table Reference			Table References			Element Name	
F	X	Y					
3	06	045				(Dissolved nitrate profile data)	
			1	09	000	Delayed replication of 9 descriptors	
			0	31	002	Extended delayed descriptor replication factor	Gives number of depths
			0	07	062	Depth below sea / water surface	Code as missing
			0	08	080	Qualifier for quality class	Code as missing
			0	33	050	GTSP quality class	Code as missing
			0	07	065	Water pressure	
			0	08	080	Qualifier for quality class (set to 10, indicates pressure at a level)	
			0	33	050	GTSP quality class	
			0	41	003	Dissolved nitrate	In $\mu\text{mol kg}^{-1}$
			0	08	080	Qualifier for quality class (set to 22, nitrate at a level)	
			0	33	050	GTSP quality class	

Code depth related descriptors as missing as water pressure is used as the vertical axis.

BGC (4) pH (requires validation)

Sequence 3-06-046 for pH profile data

Table Reference			Table References			Element Name	
F	X	Y					
3	06	046				(pH profile data)	
			1	09	000	Delayed replication of 9 descriptors	
			0	31	002	Extended delayed descriptor replication factor	Gives number of depths
			0	07	062	Depth below sea / water surface	Code as missing
			0	08	080	Qualifier for quality class	Code as missing
			0	33	050	GTSP quality class	Code as missing
			0	07	065	Water pressure	
			0	08	080	Qualifier for quality class (set to 10, indicates pressure at a level)	
			0	33	050	GTSP quality class	
			0	13	161	pH scale	
			0	13	080	pH	dimensionless
			0	08	080	Qualifier for quality class (set to 23, pH at a level)	
			0	33	050	GTSP quality class	

Code depth related descriptors as missing as water pressure is used as the vertical axis.

BGC (5) backscattering (requires validation)

Sequence 3-06-046 for pH profile data

Table Reference			Table References			Element Name	
F	X	Y					
3	06	047				(Backscatter profile data)	
			0	02	071	(Spectrographic) wavelength	m
			1	09	000	Delayed replication of 9 descriptors	
			0	31	002	Extended delayed descriptor replication factor	Gives number of depths
			0	07	062	Depth below sea / water surface	Code as missing
			0	08	080	Qualifier for quality class	Code as missing
			0	33	050	GTSP quality class	Code as missing
			0	07	065	Water pressure	
			0	08	080	Qualifier for quality class (set to 10, indicates pressure at a level)	
			0	33	050	GTSP quality class	
			0	41	006	Backscattering	m ⁻¹
			0	08	080	Qualifier for quality class (set to 24, backscatter at a level)	
			0	33	050	GTSP quality class	

Code depth related descriptors as missing as water pressure is used as the vertical axis.

BGC (6) Additions required to code tables

0 02 149

Type of data buoy

Code figure	Meaning
31	Coastal sub-surface float
32	Deep sub-surface float

0 08 080

Qualifier for GTSPP Quality Flag

Code figure	Meaning
21	Chlorophyll-A at a level
22	Nitrate at a level
23	pH at a level
24	Backscattering at a level

0 22 067

Instrument type for water temperature/ salinity profile measurement

Code figure	Meaning
836	PROVOR III
872	S2X
869	DOVA
870	NAMI
871	HM2000

BGC (7) New code table required

0 13 161
pH scale

Code figure	Meaning
0	Seawater scale
1	Freescall
2	Total scale
3-6	Reserved
7	missing