NOAA/AOML TSG Operations: BUFR and metadata plans

GTS Ocean Data Formats

FM 62 VIII Ext. TRACKOB
Limited Metadata
ASCII Format
Human Readable

BATHY, TESAC, BUOY, TRACKOB

JJVV 26108 1310/ 70626 13838 22408 40230 88888 05205 02269 32267^M^M
45256 64249 99238 99901 21223 28218 35215 40203 43199 48187 50184^M^M
52177 56174 60163 63154 69147 80136 99902 03121 31117 73109 99904^M^M
58901 99906 91066 99907 60061 66666 14710 30910 D5NZ= ^M^M

KKXX 24108 1547/ 70213 02536 88870 20003 32822 20008 32821 20014 ^M^M
32821 20019 32821 20025 32821 20030 32820 20035 32820 20041 32814 ^M^M
99999 13859=

ZZYY 44834 05038 1727/ 737010 034401 6111/^M^M
444 20110 05038 1724/ 50101 80010 80071 9/015= ^M^M

NNXX 04118 2300/ 50053 16151 41199 60257 83526 WTEU=
TRACKOB
Low bandwidth legacy systems favoured the implementation of fixed ASCII formats (e.g. FM 62 VIII Ext. TRACKOB) and the usage of abbreviated coding.

Nowadays:
- data volumes, accuracy needs, temporal and spatial resolutions are higher, there are new parameters. TACs cannot manage this.

WMO-mandated decision to move to TDFs by 2012. TDFs support higher resolution and accuracy, provide higher performance and automation, flexibility, compression (BUFR, GRIB) and self description.

TDFs: **BUFR**, CREX, GRIB1, GRIB2.
Binary Universal Format for the Representation of data

WMO standard (binary) format for observational data for transmission on GTS/RMDCN.

Often used for archiving and interface to NWP assimilation systems

Self-defining data stream by use of common tables

Dynamic replication

Local descriptors

JCOMM/SOT 4th session  AOML testbed for BUFR

XBT&TSG
A BUFR message consists of 6 sections:


1) Header - IDs, Date/Time, table version number, ...

2) Optional data (not often used). E.g. Data using local descriptors, XML metadata, ...

3) List of descriptors

4) User data (bit stream)

5) “7777”

Self-description! Descriptors listed in predefined standard TABLES (units, scales, Ref. Value, data width-bits-, etc)
Specific BUFR templates and common sequences have been defined for different observation systems, improving data processing, preventing encoding errors and adding concision to the data description section.

Template modification is made through the CBS Expert Team on Data Representation and Codes. The whole process can take 2 years.

Operational community do care about the data origin, processing history and quality of the data. There are metadata requirements impossible to meet with TACs.

Need to establish and define QC steps for the salinity measurements and associated metadata to be transmitted on the GTS.

Urgent effort to include bio-chemical data, specially pCO2sw observations made under the umbrella of the Carbon Cycle Monitoring?
SEAS DATA FLOW
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NOAA FLEET-SCS

Metadata

$AOML:001
WMOID:WTEX
SHIPN:TEST
TSGTECM:test@noaa.gov
IMONO:IMONO Value
TSGMOD:Seabird 45
TSGSN:tsg-45-12345
IDP:4.5678
DCAL:1/1/2007
COTG:123
COTH:234
COTI:345

COTJ:456
COTF0:567
COCG:678
COCH:789
COCI:890
COCJ:901
COCPR:111
COCTR:222
COA0:333
COA1:999
COA2:888
COA3:444

COSL:555
COTO:666
EXTMOD:SBE38 ext temp model
EXTSN:SBE38 S/N Value
EXTTD:777
EXTDCAL:2/2/2002
SSTMOD:SST Model
SSTSN:SST Ser Num
SSTD:11.1
SSTDCAL:3/3/2003

$AOML:002, YMD:20070406, HMS:173544, LAT:56.46385, LON:-157.62350,
SAL:31.184, COND:3.00, INT:5.437, SST:5.58

The flags generated during the QC process are:
possible datetime, possible location, at sea point, possible speed, global range
(T,S), not spike (T,S), not gradient (T,S), climatology(T,S), buddy check (T,S), bottle_check

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TSG BUFR

BUFR TEMPLATE FOR TR ACKOB DATA
(Approved by CBS Ext. 6)

**BUFR template**

```
3 08 010 0 01 011 Ship or mobile land station identifier  
1 13 000 Delayed replication of 13 descriptors  
0 31 001 Delayed descriptor replication factor  
3 01 011 Date  
3 01 012 Time  
3 01 021 Latitude/Longitude (high accuracy)  
0 04 080 Averaging period for following value  
0 22 049 Sea surface temperature  
0 04 080 Averaging period for following value  
0 22 059 Sea surface salinity  
0 04 080 Averaging period for following value  
0 22 005 Direction of sea surface current  
0 02 042 Speed of sea surface current  
0 02 042 Indicator for sea surface current speed (cancel)  
0 04 080 Averaging period for following value (cancel)
```

**Literal Translation of the FM 62 TRACKOB format**
- No QC information included
- Limited metadata

AOML is implementing procedures to encode BUFR bulletins from TSG measurements, using ad-hoc TSG templates.
Encoding takes place after QC.

Proposed descriptors
- Intake Depth
- Instrument type, flow rate, water sample
- External ref SST (with depth & instrument type)
- Date last biofouling removal
- Calibration date
- QC flags
- Bio-chemical parameters?
- waves? ...

The procedures to encode BUFR messages are fast and don’t interfere with the general operational processing for this data stream. For example, encoding 500 salinity measurements using the TRACKOB template 308010, take around 8 seconds.
DATA DISTRIBUTION MONITORING

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DATA COLLECTION MONITORING
AOML has the capability to encode BUFR messages for XBT and TRACKOB observations.

Single- and multi-observation bulletins

Tested successfully with decoders

Initial distribution to NCEP for testing before transmission to the GTS

Developing and testing templates

Efficient code, easy to modify and adapt to new templates

Creation of local descriptors for data and metadata not included in the template

Testing NWSG for BUFR capabilities

Next meeting of the ET/D&RC. September (1st-5th at WMO). Finalize the revised template for VOS (and perhaps the XBT and TSG templates too).