PROGRESS ON ARGO BUFR DEVELOPMENTS

TESAC to BUFR migration

At ADMT#17 it was reported that during the year October 2015 to August 2016 there were 12,449 TESAC and 11,446 BUFR (Binary Universal Form for the Representation of data) messages transmitted on the WMO (World Meteorological Organization) GTS (Global Telecommunications System) each month. With 92% and 89% of TESAC and BUFR messages available to users within 24 hours of the float surfacing.

At that time China (NMDIS) and France (CLS) had ceased issuing their data in TESAC, India (INCOIS) were issuing far more data in TESAC than in BUFR, no BUFR messages had been received from Korea (KMA) since March 2016, prior to August 2016 both France (Coriolis) and Japan had issued many more TESAC messages than BUFR messages.

At present we should continue to exchange data on GTS in both formats until we can be confident that data from all operating floats are being exchanged in BUFR, at which time the legacy TESAC format can be withdrawn. This would require advance (say 3 months) notification to users through the WMO Operational Newsletter. Ideally, we should be in a position to notify intent shortly after ADMT#18 by the end of 2017.

Status of the Argo BUFR format

At present the Argo BUFR format used to exchange data on the GTS is able to handle:

(i) core Argo CTD profiles (template 3-15-003)
(ii) secondary temperature and/or temperature and salinity profiles (additional sequences 3-06-017 and 3-06-018 respectively) which map to the Argo netCDF reference table 16
(iii) dissolved oxygen profiles (additional sequence 3-06-037).

However, the JMA-provided netCDF to BUFR (Perl) conversion code, as used widely across the Argo Programme, is only able to encode the core CTD profile.

At AST#17 further enhancements (i.e. additional sequences) to the BUFR format were proposed to enable it to represent profile data for chlorophyll-A, nitrate, CDOM and pH. With some amendments post AST#17 the proposals were submitted to the WMO IPET-DRMM meeting (30 May to 3 June 2016) at which they were approved for validation. This involves two or more centres encoding BUFR messages and decoding those from the other centres in order to demonstrate compliance with and consistency of the messages. The template/ sequences for validation are for chlorophyll-A (3-06-044), nitrate (3-06-045), pH (3-06-046) and backscatter (3-06-047). It is hoped that they can be successfully validated this year and approved for operational use in 2018.

Development of Argo BUFR conversion code

Following AST#17 the Met Office started work towards the development of a new netCDF to BUFR converter that will be able to handle both secondary temperature and salinity profiles and bio-geochemical variables. The format converter software has been written in Python, a modern open source object-oriented language that can be implemented on a wide range of platforms, where the intention is to make it freely available to the wider Argo community.

Specifications for the software have been written by the Met Office and a prototype version that can handle core temperature and salinity profiles has been developed. This work has been contracted out to a software company that the Met Office has used for similar work previously. The prototype version can be used with netCDF v2 to v3.1files and has been tested by the Met Office against a random selection of netCDF files taken from the Coriolis GDAC and the resulting BUFR formatted output has been checked and validated. The prototype is now being set up to run in an automated mode taking as input real-time netCDF v3.1 files routinely generated by BODC where the system will be fully tested before being implemented operationally at the Met Office and retiring the JMA perl converter run at BODC.

Once proven for operational use the Met Office intends to release the Python code to the wider Argo community later in 2017. The software has been designed and written in such a way that it can readily be expanded to include secondary temperature and salinity profiles in the first half of 2017 and dissolved oxygen before end 2017, with the additional bio-geochemical capability to be added later and made available in 2018 (at which time it is hoped the additional sequences will have been approved for operational use).

Jon Turton
Met Office
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