

Assimilation of new radiosonde observations

ASM 2012 - Eoin Whelan

BUFR (Binary Universal Form for the Representation of meteorological data) table driven codes offer great advantages in comparison with the traditional alphanumeric codes. The main features of these codes are self-description, flexibility and expandability, which are fundamental in times of fast scientific and technical evolution. Radiosonde data is now being exchange on the GTS in BUFR format. BUFR radiosonde data now includes time and position displacement information – a vertical ascent is no longer assumed.

WMO Migration from TAC to TDCF

- In the past Traditional Alphanumeric Codes (TAC) have been used for exchange of meteorological data
- Table Driven Code Format (TDCF) data offers advantages over TAC data for the exchange of data:
 - Satisfying science requirements – higher resolution, higher accuracy, metadata
 - Benefits: self description, flexibility, expandability, data compression, quality flags
 - End to need for WMO Volume A “station catalogue”
 - Metadata should make archiving of data more straightforward
- BUFR approved by WMO in 1988
- Region VI planned to complete migration BUFR radiosonde by end 2010

GTS Radiosonde BUFR (received locally: 3rd May 2012)

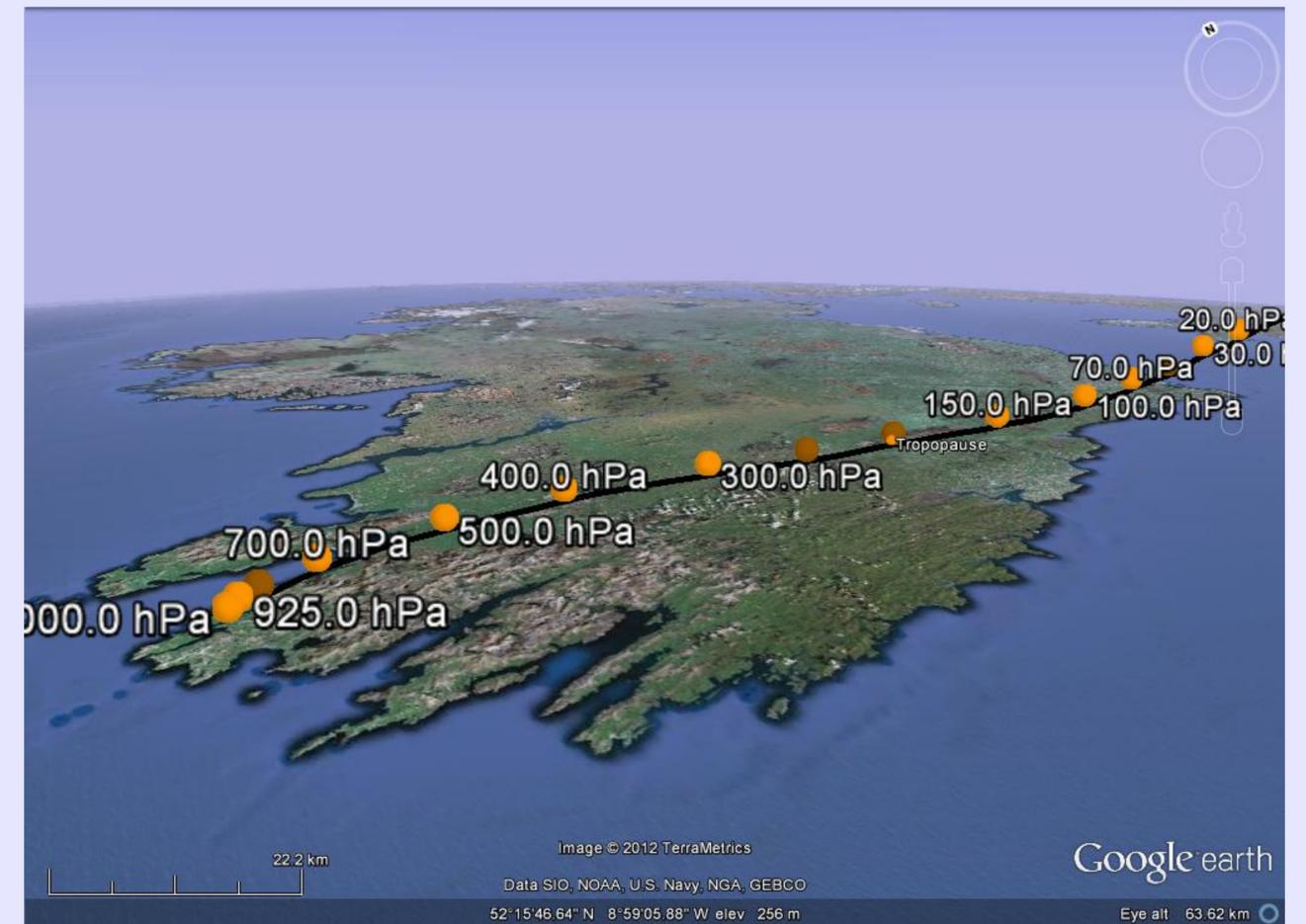
- GTS bulletins received with *TTAA=IUK/* or *TTAA=IUS/* headers

TTAA element	WMO Description
T1=I	Observational data (Binary coded) - BUFR
T2=U	Upper Air message
A1=S	Radio Sounding from fixed land station (TEMP parts A and B)
A1=K	Radio Sounding from fixed land station (TEMP parts A,B,C and D)

- Countries exchanging radiosonde BUFR shown below (based on GTS header)

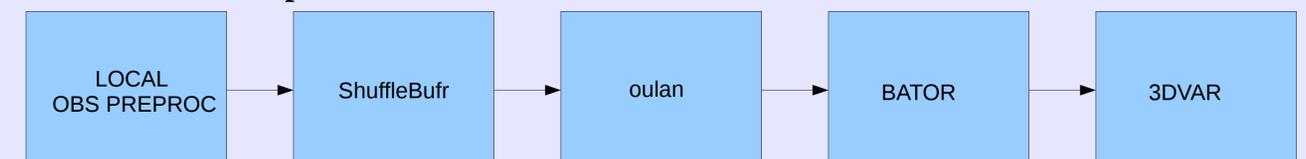


Valentia Ascent: 11th February 2010



Observation data flow

- *oulan* has been changed to output new format radiosonde BUFR levels as a separate observations
- Only *significant level* observations are written to *OBSOUL* file
- Each radiosonde observation has its own latitude, longitude and time calculated from time and displacement information in the radiosonde BUFR



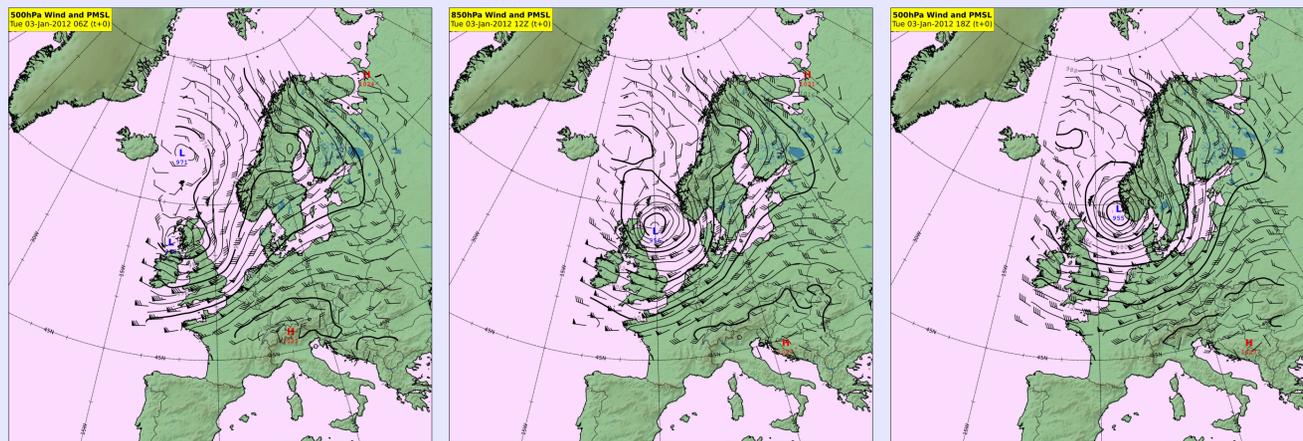
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Harmonie [cy37] has been used to test the impact of the new. The assimilation of these data has been tested using the Harmonie model over a two day period in January 2012. Examination of data has shown significant differences in availability and content in the new format radiosonde BUFR reports.

Test case: Cyclone Ulli/Emil January 2012

- A deep depression tracked across Ireland, UK, Northern Europe and then up into Norway and Finland between the 2nd and 4th of January



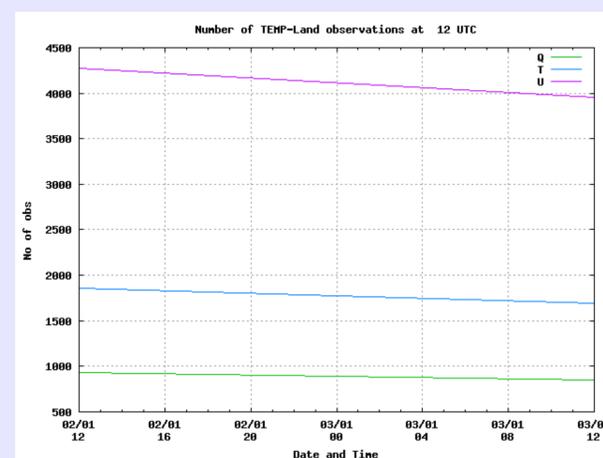
January 3rd:06z

12z

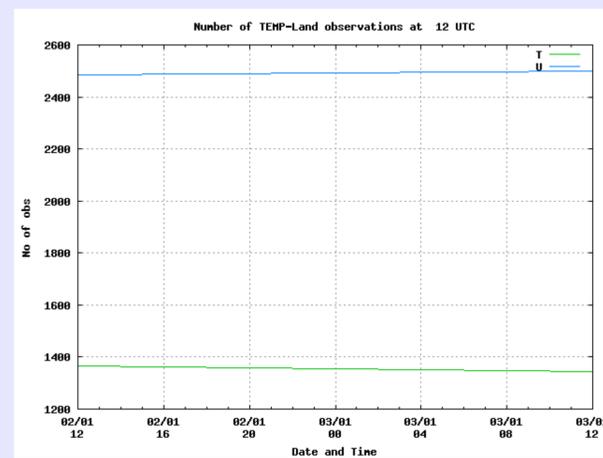
18z

Experiments

- Use old radiosonde BUFR only as input to *oulan* (A)
- Use new radiosonde BUFR only as input to *oulan* (B)
- Below are time-series of observations used in experiments A & B



(A)



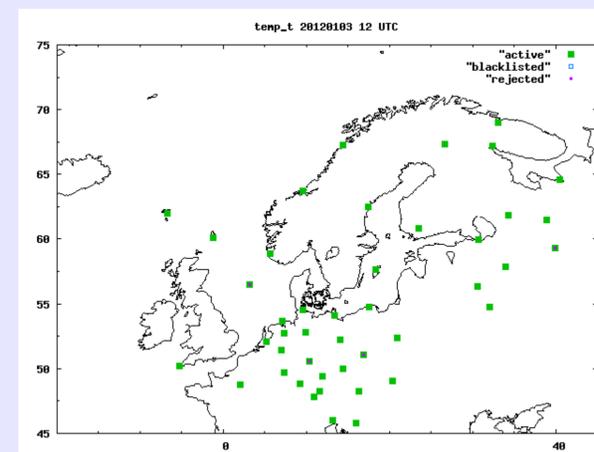
(B)

Harmonie domains tested

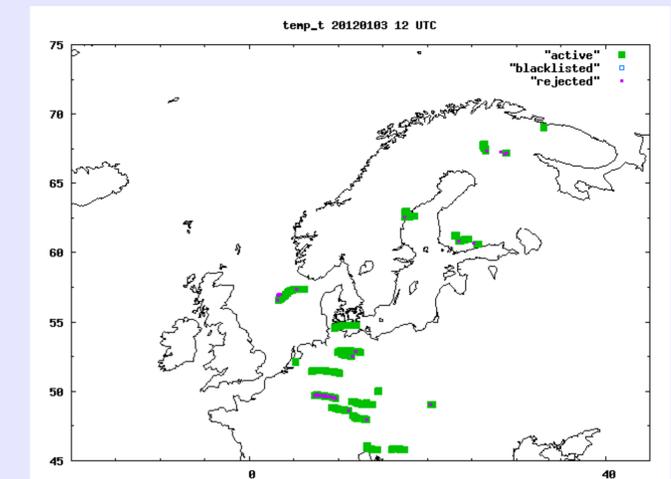
- SCANDINAVIA (11km grid, ALADIN physics) and NETHERLANDS (2.5km grid, AROME physics) domains have been used to test new radiosonde BUFR observations. NETHERLANDS domain has only been used for technical testing to date.

Radiosonde observations used by one DA cycle

- The plots below show the position of radiosonde temperature observations used by one cycle using old and new formats
- There is a noticeable difference between the number of usable observations for each experiment using the old or new formats



(A)



(B)

Results

- *oulan* has been enhanced to process new format radiosonde BUFR including time and horizontal displacement
- These new format data have been successfully tested using multiple Harmonie configurations
- Data quality and availability issues continue

Future Work

- Formulate best strategy to use old and new style observations together
- Ensure quality of new format data being received is comparable to old format data – there are still issues with some of the BUFR observations being exchanged
- Comprehensive observation impact study with the new radiosonde observations