BUFR descriptors for dual-polarization radar data

1. Responsible Organization

U.S. NOAA/NWS/NCEP

2. Requirements and Purposes

New BUFR Table B descriptors were requested for use in representing data from dual-polarization radars from the U.S. WSR-88D network.

3. Description of Proposal

|  |  |  |  |
| --- | --- | --- | --- |
|  | Element name | BUFR | CREX |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| F X Y |  | Unit | Scale | Ref. value | Data width | Unit | Scale | Data width |
| 0 21 004 | Differential reflectivity | dB | 2 | -800 | 11 | dB | 2 | 4 |
| 0 21 028 | Differential phase | Degree | 1 | 0 | 12 | Degree | 1 | 4 |
| 0 21 029 | Cross-polarization correlation coefficient  | Numeric | 2 | -100 | 8 | Numeric | 2 | 3 |

4. Declaration of validation complete

The proposal was validated with kind assistance from IBL (Slovakia), ECMWF and Roshydromet (Russia). Validation is complete per the attached email correspondence (see #7 below).

5. Result of Discussions

The proposal as shown above is agreed, including a suggested name change for 0-21-029 to clarify the particulars of the radar correlation coefficient. Also note that the new descriptor 0-21-004 is similar to existing descriptor 0-21-003; however, it would require application of the 2-03-YYY operator to 0-21-003 in order to achieve the same result, and it has been the long-standing practice of the IPET-DRMM to avoid the use of 2-03-YYY where possible.

6. Proposed Implementation Date and Procedure for Formality

November 2015 (Fast Track 2015-2)

7. Summary of Discussions

Jeff Ator - NOAA Federal <jeff.ator@noaa.gov>

dual polarization radar data for validation

Jeff Ator - NOAA Federal <jeff.ator@noaa.gov> Thu, Jun 18, 2015 at 10:14 AM

To: Alexander Kats <to.alkats@gmail.com>

Cc: "cbs-ipet-drmm@wmo.int" <cbs-ipet-drmm@wmo.int>

Thanks again to Marian, Alexander and Enrico for your help to complete this validation! Per the comments received, we will move the proposed 0-33-029 (correlation coefficient) to Class 21 as 0-21-029 (cross-polarization correlation coefficient) and submit the final document accordingly to the upcoming IPET-DRMM-3 meeting. The proposed bit width, reference value and scale factor will remain the same, so I believe we can still consider the validation exercise as complete.

See you all soon in Beijing! :-)

-Jeff

On Thu, Jun 18, 2015 at 2:28 AM, Alexander Kats <to.alkats@gmail.com> wrote:

 Dear Jeff,

 I also was able to fully decode the new message.

 My colleagues as well confirmed that ranges for 0-21-004 and 0-21-028 are OK and precisions are quit sufficient. It's clear the same applies to the correlation coefficient.

 I do got your point that quantities to which correlation coefficient applies may not be reported at all, I was wrong. So I agree with Enrico at this time you'd better give the descriptor more specific name and, I think, put it back to Class 21, as from your explanation it has a physical interpretation rather than characterizes quality information.

 Best regards,

 Sasha

 Wednesday, June 17, 2015, 1:52:25 PM, Enrico wrote:

 Dear Jeff,

 thank you for fixing the problems so quickly. Now I am available to fully decode the message and I don't see any technical problem.

 Regarding the "correlation coefficient" I think that an improvement can be to use "cross-polarisation correlation coefficient" as name, because in some radar applications you can have also two "co-polarisation correlation coefficients" when you deal with the correlation of the signal for the same polarisation.

 No other comments on the data.

 Best regards

 Enrico

 From: "Jeff Ator - NOAA Federal" <jeff.ator@noaa.gov>

 To: "A.Kats CAO (ЦАО)" <alexander.kats@cao-rhms.ru>

 Cc: cbs-ipet-drmm@wmo.int

 Sent: Tuesday, 16 June, 2015 5:35:13 PM

 Subject: Re: [IPET-DRMM: 548] Re: dual polarization radar data for validation

 First of all, thanks very much to Sasha, Enrico and Marian for taking a look at our initial sample file. Based on the received comments, we've made a revised sample at ftp://ftp.nco.ncep.noaa.gov/dmqab/jator/dualpol.bufr.new The changes are as follows:

 There is only one message in the file and it contains actual data values. In the previous sample, the first 5 messages contained BUFR table information (Table A message type = 11), including information about the local descriptors used in the subsequent data messages, but this proved difficult for others to process so they have been removed. The new sample uses only standard descriptors, so it should be much easier for everyone to process.

 The new sample message uses BUFR edition 4 and specifies a master table version of 25, which will be the next version in November 2015 that hopefully the new descriptors will become a part of.

 Regarding the correlation coefficient, Sasha is correct that this is a general statistic that can be used to measure the linear relationship between any two variables. But in the context of dual-polarization radar meteorology, it is normally understood to represent the linear relationship between the returned power strengths of the horizontally-polarized and vertically-polarized pulses. In general terms, higher correlation values (near +1.0) indicate homogeneous precipitation (e.g. all rain), whereas lower values indicate a mixture of precipitation (e.g. a mix of rain and snow, or rain and hail), and much lower values (< 0.8) generally indicate either very large hail or else non-meteorological objects (e.g. birds).

 That said, we wouldn't be opposed to changing the element name or adding a note to Class 33, or even moving it to a different class if that is the wish of the team. But our personal thinking is that it is fine as it is, since for radar the meaning is well-understood, and keeping the name general allows it to be potentially used for other types of data besides radar. And in any case we would not want to require that it always be tied to two previous specifically-reported values in a BUFR message, since both such values may not always be available to be reported (which, in fact, is usually the case for radar data!).

 Please let me know if you encounter any further issues, and thanks again for your time to help us with this validation!

 Best regards,

 -Jeff