

2022 HFP: Updates

➤ MMR Test Flight (20220719I1) [Reasor et al.]

- Jan 2021 (revised Feb 2022) HRD/NSSL stated requirements for MMR CfRadials
- 20220719I1 was first opportunity to see if suitable CfRadial changes were made
 - Conclusion: Most important request not implemented properly X

```
first_filter:units = "meters" ;
first_filter:_FillValue = -9999.f ;
float stc_params ;
  stc_params:long_name = "stc_params" ;
  stc_params:units = "Db" ;
  stc_params:_FillValue = -9999.f ;
float radar_beam_width_h ;
  radar_beam_width_h:long_name = "half_power_radar_beam_width_h_channel" ;
  radar_beam_width_h:units = "degrees" ;
  radar_beam_width_h:_FillValue = -9999.f ;
  radar_beam_width_h:meta_group = "radar_parameters" ;
float radar_beam_width_v ;
  radar_beam_width_v:long_name = "DBZ" ;
  radar_beam_width_v:units = "dB" ;
  radar_beam_width_v:_FillValue = -9999.f ;
  radar_beam_width_v:meta_group = "radar_parameters" ;
  radar_beam_width_v:sampling_ratio = 1.f ;
  radar_beam_width_v:add_offset = 0.f ;
  radar_beam_width_v:scale_factor = 0.375f ;
  radar_beam_width_v:coordinate = "time_range" ;
  radar_beam_width_v:grid_mapping = "grid_mapping" ;
float VEL(time, range) ;
  VEL:long_name = "VEL" ;
  VEL:_FillValue = -9999.f ;
  VEL:units = "meters per second" ;
byte DBZ(time, range) ;
  DBZ:long_name = "DBZ" ;
  DBZ:_FillValue = -9999.f ;
  DBZ:units = "dB" ;
  DBZ:coordinate = "time_range" ;
  DBZ:grid_mapping = "grid_mapping" ;

// global attributes:
:Conventions = "CF-1.3" ;
:title = "MMR CFRadial Scientific Data" ;
:institution = "Harris-EDO and IAI-ELTA" ;
:references = "Conversion Software netCDF 4.4.0" ;
:source = "APY-11_ELM2022_Radar" ;
:history = "" ;
:comment = "netCDF libraries Version 4.4.0" ;
:instrument_name = "MMR_P-3" ;
```

CfRadial 1.3 requires `scale_factor` and `add_offset` attributes if values stored in byte format:

Float DBZ = (byte DBZ value) * `scale_factor` + `add_offset`

- 1) `Scale_factor`, `add_offset` attributes added to wrong variable
- 2) `Scale_factor`, `add_offset` should be attributes of DBZ
- 3) `Scale_factor` value shown seems incorrect (see next slide)

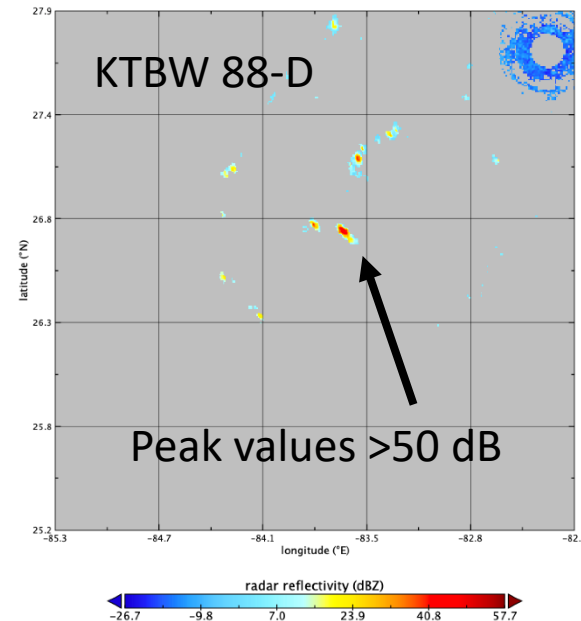
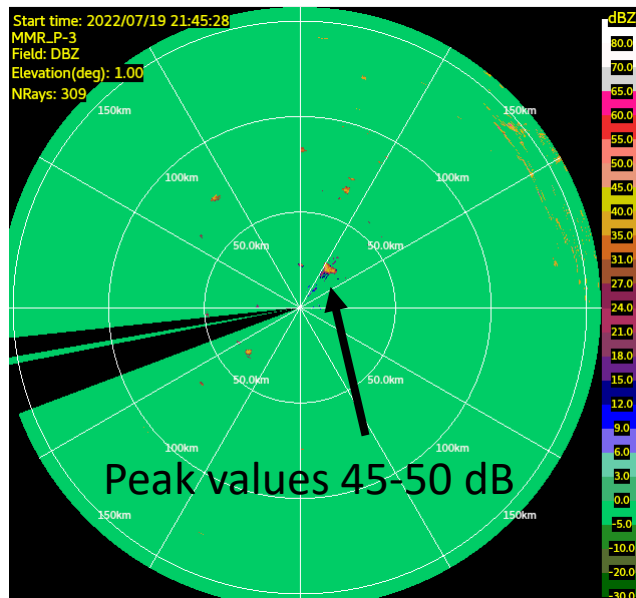
Because MMR processing doesn't appear to flag low SNR regions (as other research radars do), instead reporting a min value of 0 dB for weak (<0 dB) echo and noise (<<0 dB), we requested:

DBZ:comment = "Reflectivity less than 0 dB has been assigned a value of 0 dB"

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- Use HawkEye to visualize the HWX byte DBZ data



Conclusions, questions and recommendations:

- 1) The byte DBZ values seem to correspond well to the 88-D values
- 2) Is `scale_factor = 1.0` and `add_offset = 0.0` for DBZ?
- 3) If “yes” to 2), then move those attributes to DBZ and assign the proper values

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– Were other requests implemented properly?

```
float radar_beam_width_h ;
    radar_beam_width_h:long_name = "half_power_radar_beam_width_h_channel" ;
    radar_beam_width_h:units = "degrees" ;
    radar_beam_width_h:_FillValue = -9999.f ;
    radar_beam_width_h:meta_group = "radar_parameters" ;

float radar_beam_width_v ;
    radar_beam_width_v:long_name = "DBZ" ;
    radar_beam_width_v:units = "dB " ;
    radar_beam_width_v:_FillValue = -9999.f ;
    radar_beam_width_v:meta_group = "radar_parameters" ;
    radar_beam_width_v:sampling_ratio = 1.f ;
    radar_beam_width_v:add_offset = 0.f ;
    radar_beam_width_v:scale_factor = 0.375f ;
    radar_beam_width_v:coordinate = "time_range" ;
    radar_beam_width_v:grid_mapping = "grid_mapping" ;
```

Requested: horizontal/vertical beam width variables with proper values

- radar_beam_width_v = 5.6 ✓
- radar_beam_width_h = 1.4 ✓

Note: The attributes of radar_beam_width_v should mirror those of radar_beam_width_h X

Requested: standard variable names DBZ and VEL ✓

Note: NAW reflectivity variable is now also called DBZ (but it has 4 values within 1-deg azimuth, then a .5-deg jump)

Requested: Nyquist velocity variable contain proper value

- nyquist_velocity = 6.8703645 ✓

Requested: beam azimuth and elevation clarified as aircraft-relative or earth-relative ✓



Requested: clarification on why _FillValue = -9999.f if that value is never used! X

```
float rotation(time) ;
    rotation:long_name = "ray_rotation_angle_relative_to_platform" ;
    rotation:units = "degrees" ;
    rotation:_FillValue = -9999.f ;

float tilt(time) ;
    tilt:long_name = "ray_tilt_angle_relative_to_platform" ;
    tilt:units = "degrees" ;
    tilt:_FillValue = -9999.f ;

float azimuth(time) ;
    azimuth:standard_name = "ray_azimuth_angle" ;
    azimuth:long_name = "azimuth_angle_from_true_north" ;
    azimuth:units = "degrees" ;
    azimuth:axis = "radial_azimuth_coordinate" ;
    azimuth:_FillValue = -9999.f ;

float elevation(time) ;
    elevation:standard_name = "ray_elevation_angle" ;
    elevation:long_name = "elevation_angle_from_horizontal_plane" ;
    elevation:units = "degrees" ;
    elevation:axis = "radial_elevation_coordinate" ;
    elevation:_FillValue = -9999.f ;
```

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- Were other requests implemented properly?

Requested: variables northward_wind, etc. be populated with correct values from the INU

- northward_wind, eastward_wind, vertical_wind empty **X**
- heading_rate, pitch_rate, roll_rate populated (need to verify values) **?**

Requested: proper range and range to center of first gate information **?**

```
float range(range) ;
    range:standard_name = "projection_range_coordinate" ;
    range:long_name = "Range_from_instrument_to_center_of_gate" ;
    range:units = "meters" ;
    range:spacing_is_constant = "true" ;
    range:axis = "radial_range_coordinate" ;
    range:meters_to_center_of_first_gate = 40 ;
    range:meters_between_gates = 119 ;
    range:num_of_range_cells = 1312 ;
```

```
range = 40.47, 160.38, 280.29, 400.2, 520.11, 640.02, 759.93, 879.84,
999.75, 1119.66, 1239.57, 1359.48, 1479.39, 1599.3, 1719.21, 1839.12,
1959.03, 2078.94, 2198.85, 2318.76, 2438.67, 2558.58, 2678.49, 2798.4.
```

HWX

Try: Compare distance to cell in image with reported range

```
float range(range) ;
    range:standard_name = "projection_range_coordinate" ;
    range:long_name = "Range_from_instrument_to_center_of_gate" ;
    range:units = "meters" ;
    range:spacing_is_constant = "true" ;
    range:axis = "radial_range_coordinate" ;
    range:meters_to_center_of_first_gate = -29 ;
    range:meters_between_gates = 149 ;
    range:num_of_range_cells = 1296 ;
```

```
range = -29.5, 120.39, 270.28, 420.17, 570.06, 719.95, 869.84, 1019.73,
1169.62, 1319.51, 1469.4, 1619.29, 1769.18, 1919.07, 2068.96, 2218.85,
2368.74, 2518.63, 2668.52, 2818.41, 2968.3, 3118.19, 3268.08, 3417.97,
```

NAW

Requested: similar attribute changes for DBZ in NAW files **✓ / **X****

```
byte DBZ(time, range) ;
    DBZ:_FillValue = -9999.f ;
    DBZ:sampling_ratio = 1.f ;
    DBZ:units = "dB " ;
    DBZ:long_name = "DBZ" ;
    DBZ:add_offset = 0.f ;
    DBZ:scale_factor = 0.375f ;
    DBZ:coordinate = "time range" ;
    DBZ:grid_mapping = "grid_mapping" ;
```

scale_factor probably should be 1.0
no comment clarifying meaning of DBZ=0

X Final FYI: Something is *wrong* with **VEL**! Values are mostly 0 with **pos. integer** values [1,2,3,4,5,6] up to the Nyquist velocity.