PPS GRIB2 file release notes

The half-hourly and monthly Integrated Multi-satellitE Retrievals for GPM (IMERG) products in GRIB2 format, the Goddard Profiling Algorithm (GPROF) daily and monthly products for all GPM/TRMM constellation satellites in GRIB2 format, and the Precipitation Retrieval and Profiling Scheme (PRPS) MT1 SAPHIR daily and monthly products in GRIB2 format are available at NASA PPS. Not only the whole domain but also their subset GRIB2 file can be ordered from PPS.

For **half-hourly and monthly IMERG GRIB2 files**, the projection is the Equidistant Cylindrical (WGS84), and resolution is 0.1° by 0.1° from a full global domain to a subset depending on user's request. With the WMO regulation, the precipitation rate unit will be changed to (kg m-2 s-1) in GRIB2 file. The Table 1 lists the variable names of half-hourly and monthly IMERG products in HDF5 file and their corresponding entries in GRIB2 file.

Table 1. The GRIB2 table entries for the half-hourly and monthly IMERG product

HDF5		GRIB2		
Variable name	Units	Product Definition Template Number	Parameter number	Units
PrecipitationCal or precipitation	mm/hr	0 - Analysis or forecast at a horizontal level or in a horizontal layer at a point in time.	52 - Total Precipitation Rate	kg m^{-2} s^{-1}
probabilityLiquidPrecipitation	%	5 - Probability forecasts at a horizontal level or in a horizontal layer at a point in time: Probability type (2 - Probability of event between upper and lower limits)	33 - Categorical rain	%
randomError	mm/hr	35 - Satellite product with or without associated quality values: Quality value associated with parameter (4 - Random error)	52 - Total Precipitation Rate	kg m^{-2} s^{-1}

The contents of a sample monthly IMERG GRIB2 file with WGRIB2 utility are:

```
wgrib2 -V 3B-MO.MS.MRG.3IMERG.20180601-S000000-E235959.06.V05B.GRIB2
1.1:0:vt=2018060100:surface:anl:TPRATE Total Precipitation Rate [kg/m^2/s]:
   ndata=6480000:undef=1413836:mean=3.04658e-05:min=0:max=0.000853778
   grid_template=0:winds(N/S):
         lat-lon grid:(3600 x 1800) units 1e-06 input WE:SN output WE:SN res 48
```

```
        lat -90.000000 to 90.000000 by 0.100000
        lon 180.000000 to 180.000000 by 0.100000 #points=6480000

1.2:0:vt=2018060100:surface:anl:CRAIN Categorical Rain [prob]:prob >=0 <101
   ndata=6480000:undef=0:mean=73.4618:min=0:max=100
   grid_template=0:winds(N/S):
        lat-lon grid:(3600 x 1800) units 1e-06 input WE:SN output WE:SN res 48
        lat -90.000000 to 90.000000 by 0.100000
        lon 180.000000 to 180.000000 by 0.100000 #points=6480000

code_table_4.5a: product definition template #35 not supported
code_table_4.5b: product definition template #35 not supported
1.3:0:vt=2018060100:no_level:anl:TPRATE Total Precipitation Rate [kg/m^2/s]:
   ndata=6480000:undef=1413836:mean=8.36541e-06:min=3e-07:max=0.0006913
   grid_template=0:winds(N/S):
        lat-lon grid:(3600 x 1800) units 1e-06 input WE:SN output WE:SN res 48
        lat -90.000000 to 90.000000 by 0.100000
        lon 180.000000 to 180.000000 by 0.100000 #points=6480000
```

Here is an example of a subset half-hourly IMERG GRIB2 file with WGRIB2 utility:

```
wgrib2 -V 3B-HHR-CS-7W57N81E25S.MS.MRG.3IMERG.20171101-S010000-E012959.0003.V05B.GRIB2
1.1:0:vt=2017110101:surface:anl:TPRATE Total Precipitation Rate [kg/m^2/s]:
   ndata=746490:undef=0:mean=2.67162e-05:min=0:max=0.0200072
   grid_template=0:winds(N/S):
        lat-lon grid:(894 x 835) units 1e-06 input WE:SN output WE:SN res 48
        lat -25.500000 to 58.000000 by 0.100000
        lon 352.400000 to 81.800000 by 0.100000 #points=746490

1.2:0:vt=2017110101:surface:anl:CRAIN Categorical Rain [prob]:prob >=0 <101
   ndata=746490:undef=0:mean=93.805:min=0:max=100
   grid_template=0:winds(N/S):
```

lat-lon grid:(894 x 835) units 1e-06 input WE:SN output WE:SN res 48

lat -25.500000 to 58.000000 by 0.100000

lon 352.400000 to 81.800000 by 0.100000 #points=746490

code_table_4.5a: product definition template #35 not supported

code_table_4.5b: product definition template #35 not supported

1.3:0:vt=2017110101:no_level::TPRATE Total Precipitation Rate [kg/m^2/s]:

ndata=746490:undef=0:mean=0.000165333:min=6.61e-05:max=0.0359007

grid_template=0:winds(N/S):

lat-lon grid:(894 x 835) units 1e-06 input WE:SN output WE:SN res 48

lat -25.500000 to 58.000000 by 0.100000

lon 352.400000 to 81.800000 by 0.100000 #points=746490

*Note: The product definition template #35 was approved and published at WMO web site in May 2018. However, the latest WGRIB2 utility was released in December 2017, which was before the approval. This caused the message “product definition template #35 not supported”.

For the **GPROF daily and monthly products in GRIB2 format**, the projection is the Equidistant Cylindrical (WGS84), and resolution is 0.25° by 0.25° from a full global domain to a subset depending on user’s choice. With the GRIB2 regulation, the precipitation rate unit will be changed to (kg m-2 s-1) in GRIB2 file. The Table 2 lists the variables of daily and monthly GPROF products in HDF5 file and their corresponding entries in GRIB2 file.

Table 2. The GRIB2 table entries for the daily and monthly GPROF product

HDF5		GRIB2		
Variable name	Units	Product Definition Template Number	Parameter number	Units
surfacePrecipitation	mm/hr	0 - Analysis or forecast at a horizontal level or in a horizontal layer at a point in time.	52 - Total Precipitation Rate	kg m^{-2} s^{-1}
convectivePrecipitation	mm/hr	0 - Analysis or forecast at a horizontal level or in a horizontal layer at a point in time.	37 - Convective Precipitation Rate	kg m^{-2} s^{-1}
frozenPrecipitation	mm/hr	0 - Analysis or forecast at a horizontal level or in a horizontal layer at a point in	95 - Freezing or Frozen Precipitation Rate	kg m^{-2} s^{-1}

		time.		

The contents of a daily GPROF GRIB2 file for GCOMW1 (a TRMM constellation satellite) with WGRIB2 utility are:

```
wgrib2 -V 3A-DAY.GCOMW1.AMSR2.GRID2017R1.20140601-S000000-E235959.152.V05A.GRIB2
1.1:0:vt=2014060100:surface:anl:TPRATE Total Precipitation Rate [kg/m^2/s]:
   ndata=1036800:undef=64778:mean=2.07843e-05:min=0:max=0.0095456
   grid_template=0:winds(N/S):
         lat-lon grid:(1440 x 720) units 1e-06 input WE:SN output WE:SN res 48
         lat -90.000000 to 90.000000 by 0.250000
         lon 180.000000 to 180.000000 by 0.250000 #points=1036800

1.2:0:vt=2014060100:surface:anl:CPRAT Convective Precipitation Rate [kg/m^2/s]:
   ndata=1036800:undef=64778:mean=8.58116e-06:min=0:max=0.00806272
   grid_template=0:winds(N/S):
         lat-lon grid:(1440 x 720) units 1e-06 input WE:SN output WE:SN res 48
         lat -90.000000 to 90.000000 by 0.250000
         lon 180.000000 to 180.000000 by 0.250000 #points=1036800

1.3:0:vt=2014060100:surface:anl:FZPRATE Freezing or Frozen Precipitation Rate [kg/m^2/s]:
   ndata=1036800:undef=64778:mean=1.51888e-06:min=0:max=0.000434403
   grid_template=0:winds(N/S):
         lat-lon grid:(1440 x 720) units 1e-06 input WE:SN output WE:SN res 48
         lat -90.000000 to 90.000000 by 0.250000
         lon 180.000000 to 180.000000 by 0.250000 #points=1036800
```

Here is an example of GMI GPROF monthly GRIB2 file with WGRIB2 utility:

```
wgrib2 -V 3A-MO.GPM.GMI.GRID2017R1.20181001-S000000-E235959.10.V05A.GRIB2
1.1:0:vt=2018100100:surface:anl:TPRATE Total Precipitation Rate [kg/m^2/s]:
   ndata=1036800:undef=241920:mean=2.7811e-05:min=0:max=0.0013977
   grid_template=0:winds(N/S):
         lat-lon grid:(1440 x 720) units 1e-06 input WE:SN output WE:SN res 48
         lat -90.000000 to 90.000000 by 0.250000
         lon 180.000000 to 180.000000 by 0.250000 #points=1036800
```

1.2:0:vt=2018100100:surface:anl:CPRAT Convective Precipitation Rate [kg/m^2/s]:
ndata=1036800:undef=241920:mean=1.23155e-05:min=0:max=0.00125252
grid_template=0:winds(N/S):
lat-lon grid:(1440 x 720) units 1e-06 input WE:SN output WE:SN res 48
lat -90.000000 to 90.000000 by 0.250000
lon 180.000000 to 180.000000 by 0.250000 #points=1036800

1.3:0:vt=2018100100:surface:anl:var discipline=0 master_table=18 parmcat=1 parm=95:
ndata=1036800:undef=241920:mean=1.67635e-06:min=0:max=0.000120397
grid_template=0:winds(N/S):
lat-lon grid:(1440 x 720) units 1e-06 input WE:SN output WE:SN res 48
lat -90.000000 to 90.000000 by 0.250000
lon 180.000000 to 180.000000 by 0.250000 #points=1036800

For the **PRPS MT1 SAPHIR daily and monthly products in GRIB2 format**, the projection is the Equidistant Cylindrical (WGS84), and resolution is 0.25° by 0.25° from a full global domain to a subset depending on user's choice. With the GRIB2 regulation, the precipitation rate unit will be changed to (kg m-2 s-1) in GRIB2 file. The Table 3 lists the variables of daily and monthly PRPS products in HDF5 file and their corresponding entries in GRIB2 file.

Table 3. The GRIB2 table entries for the daily and monthly PRPS MT1 SAPHIR product

HDF5		GRIB2		
Variable name	Units	Product Definition Template Number	Parameter number	Units
precipitation	mm/hr	0 - Analysis or forecast at a horizontal level or in a horizontal layer at a point in time.	52 - Total Precipitation Rate	kg m^{-2} s^{-1}
dataQuality	%	35 - Satellite product with or without associated quality values: Quality value associated with parameter (0 - Confidence index)	33 - Categorical rain	Numeric
error	mm/hr	35 - Satellite product with or without associated quality values: Quality value associated with parameter (4 - Random	52 - Total Precipitation Rate	kg m^{-2} s^{-1}

		error)		

The contents of a sample daily PRPS MT1 SAPIR GRIB2 file with WGRIB2 utility are:

```
wgrib2 -V 3A-DAY.MT1.SAPHIR.GRIDPRPSv1.20181101-S000000-E235959.305.V06A.GRIB2
1.1:0:vt=2018110100:surface:anl:TPRATE Total Precipitation Rate [kg/m^2/s]:
   ndata=1036800:undef=719829:mean=3.1252e-05:min=0:max=0.00446019
   grid_template=0:winds(N/S):
         lat-lon grid:(1440 x 720) units 1e-06 input WE:SN output WE:SN res 48
         lat -90.000000 to 90.000000 by 0.250000
         lon 180.000000 to 180.000000 by 0.250000 #points=1036800

code_table_4.5a: product definition template #35 not supported
code_table_4.5b: product definition template #35 not supported
1.2:0:vt=2018110100:no_level::TPRATE Total Precipitation Rate [kg/m^2/s]:
   ndata=1036800:undef=719829:mean=1:min=1:max=1
   grid_template=0:winds(N/S):
         lat-lon grid:(1440 x 720) units 1e-06 input WE:SN output WE:SN res 48
         lat -90.000000 to 90.000000 by 0.250000
         lon 180.000000 to 180.000000 by 0.250000 #points=1036800

code_table_4.5a: product definition template #35 not supported
code_table_4.5b: product definition template #35 not supported
1.3:0:vt=2018110100:no_level::TPRATE Total Precipitation Rate [kg/m^2/s]:
   ndata=1036800:undef=719829:mean=4.49381e-05:min=0:max=0.00494837
   grid_template=0:winds(N/S):
         lat-lon grid:(1440 x 720) units 1e-06 input WE:SN output WE:SN res 48
         lat -90.000000 to 90.000000 by 0.250000
         lon 180.000000 to 180.000000 by 0.250000 #points=1036800
```

Here is an example of PRPS MT1 SAPHIR monthly GRIB2 file with WGRIB2 utility:

```
wgrib2 -V 3A-MO.MT1.SAPHIR.GRIDPRPSv1.20181101-S000000-E235959.11.V06A.GRIB2
1.1:0:vt=2018110100:surface:anl:TPRATE Total Precipitation Rate [kg/m^2/s]:
   ndata=1036800:undef=712910:mean=3.39725e-05:min=0:max=0.0019127
   grid_template=0:winds(N/S):
```

```
        lat-lon grid:(1440 x 720) units 1e-06 input WE:SN output WE:SN res 48
        lat -90.000000 to 90.000000 by 0.250000
        lon 180.000000 to 180.000000 by 0.250000 #points=1036800

Warning: g2lib/g2clib complex encode/decode may differ from WMO standard, use -g2clib 0 for WMO
standard
code_table_4.5a: product definition template #35 not supported
code_table_4.5b: product definition template #35 not supported
1.2:0:vt=2018110100:no_level::TPRATE Total Precipitation Rate [kg/m^2/s]:
   ndata=1036800:undef=712910:mean=1:min=1:max=1
   grid_template=0:winds(N/S):
        lat-lon grid:(1440 x 720) units 1e-06 input WE:SN output WE:SN res 48
        lat -90.000000 to 90.000000 by 0.250000
        lon 180.000000 to 180.000000 by 0.250000 #points=1036800

code_table_4.5a: product definition template #35 not supported
code_table_4.5b: product definition template #35 not supported
1.3:0:vt=2018110100:no_level::TPRATE Total Precipitation Rate [kg/m^2/s]:
   ndata=1036800:undef=712910:mean=4.9052e-05:min=0:max=0.00216217
   grid_template=0:winds(N/S):
        lat-lon grid:(1440 x 720) units 1e-06 input WE:SN output WE:SN res 48
        lat -90.000000 to 90.000000 by 0.250000
        lon 180.000000 to 180.000000 by 0.250000 #points=1036800
```

PPS team is doing its best to support the user community. If there is any question on the IMERG, GPROF and PRPS GRIB2 files, or any requests on other products in GRIB2 format, please contact the PPS Help Desk at helpdesk@mail.pps.eosdis.nasa.gov.

References:

http://www.wmo.int/pages/prog/www/WMOCodes/WMO306_vI2/LatestVERSION/LatestVERSION.html
http://www.nco.ncep.noaa.gov/pmb/docs/grib2/grib2_doc/
http://www.nco.ncep.noaa.gov/pmb/docs/grib2/download/
http://www.nco.ncep.noaa.gov/pmb/codes/GRIB2/
https://confluence.ecmwf.int/display/ECC
http://www.cpc.ncep.noaa.gov/products/wesley/wgrib2/