NOAA ProbSevere v2 file format description

Definitions:

- NOAA – the National Oceanic and Atmospheric Administration
- MRMS – Multi-Radar Multi-Sensor
- NWP – numerical weather prediction
- ENI – Earth Networks Incorporated®
- CAPE – convective available potential energy
- AGL – above ground level
- 2D – two-dimensional
- UTC – coordinated universal time
- YYYYMMDD – the UTC year, month, and date. E.g., 20190301
- HHMMSS – the UTC hour, minutes, and seconds. E.g., 083156

Product description: NOAA ProbSevere v2 is a subsystem of MRMS integrating radar, satellite, lightning, and NWP data to provide short-term storm-based probabilistic guidance to forecasters. The four ProbSevere products in v2 are: ProbHail, ProbWind, ProbTor, and probability of any severe (ProbSevere).

Format: geoJSON (http://geojson.org/)

Filename convention: MRMS_PROBSEVERE_YYYYMMDD_HHMMSS.json

Frequency: 2 min (updates with MRMS 2D severe weather products)

Size: variable; *f*(number and spatial size of features); generally between 20 kB and 2 MB

File description:

```
{"source":"NOAA/CIMSS ProbSevere",
 "product":"ProbSevere",
 "validTime":"20190303_190035 UTC",
 "productionTime":"20190303_190201 UTC",
 "machine":"fuego.ssec.wisc.edu",
 "type":"FeatureCollection",
```

- **Metadata:**
    - "source": the production location and system
    - "product": ProbSevere
    - "validTime": the MRMS UTC timestamp for this file
    - "productionTime": the UTC timetamp when this file was written (approximate)
    - "machine": the Linux machine running the production code
    - "type": the type of data in this file – a "FeatureCollection"

```
"features":[
  {"type": "Feature",
  "geometry": {
    "type": "Polygon",
    "coordinates":[[[-85.73,31.11],[-85.71,31.11],
85.79,31.09],[-85.77,31.09],[-85.73,31.11]]]
  },
```

- **Features:** the remainder of each JSON is a list of "features", or storm objects. Each feature has several fields:
  - **"type":** this will always be "Feature"
  - **"geometry"**
    - The geometry of each feature has **"type":"Polygon"** and **"coordinates"**. The **"coordinates"** is a double-nested listed of lon/lat pairs (longitudes < 0 are in the western hemisphere). Each lon/lat pair corresponds to a vertex point in the storm object. The first and last lon/lat pair will be identical (see above example).

```
"models": {
  "probsevere": {
    "PROB":"61",
    "LINE01":"ProbHail: 1%; ProbWind: 28%; ProbTor: 61%",
    "LINE02":"- MESH: 0.12 in.",
    "LINE03":"- VIL Density: 1.10 g/m^3",
    "LINE04":"- ENI Flash Rate: 1 fl/min",
    "LINE05":"- ENI Flash Density (max in last 30 min): 0.10 fl/m
    "LINE06":"- Max LLAzShear: 0.014 /s",
    "LINE07":"- 98% LLAzShear: 0.011 /s",
    "LINE08":"- 98% MLAzShear: 0.003 /s",
    "LINE09":"- Norm. vert. growth rate: 1702Z 1.9%/min (weak)",
    "LINE10":"- EBShear: 50 0 kts; SRH 0-1km AGL: 175 m^2/s^2"
```

  - **"models"**
    - This field contains four fields representing the four products of ProbSevere v2: **"probsevere"**, **"probhail"**, **"probwind"**, and **"probtor"**.
    - Each of these models contains a **"PROB"** key, which is the probability value for this product. In the example above, **"PROB":"61"** means the storm has a probability of severe of 61% (because the it is under "probsevere").
    - Each of these models also contain **"LINE"** keys. The values of the **"LINE"** keys represent the intended order to display information upon user scroll-over or hover over objects. For example, the value of "LINE01" should always be the first or top line of output. The value of "LINE02" follows "LINE01", and so on.

```
"properties": {
  "MUCAPE":"1690",
  "MLCAPE":"1429",
  "MLCIN":"0",
  "EBSHEAR":"48.3",
  "SRH01KM":"154",
  "MEANWIND_1-3kmAGL":"37.5",
  "MESH":"0.22",
  "VIL_DENSITY":"1.50",
  "FLASH_RATE":"16",
  "FLASH_DENSITY":"0.46",
  "MAXLLAZ":"0.007",
  "P98LLAZ":"0 006"
```

  - **"properties"**
    - These are key / value pairs for different attributes or predictors in ProbSevere. These are unimportant for display purposes. These properties may change as ProbSevere v2 evolves.
      - ID: the object ID number of this storm object. This will help link together storm objects through time.
      - MUCAPE: the most-unstable CAPE for this storm, in units of J/kg
      - MLCAPE: the mixed-layer CAPE (0-90mb) for this storm, in units of J/kg

- MLCIN: the mixed-layer convective inhibition for this storm, in units of J/kg
- EBSHEAR: the effective bulk shear for this storm, in units of kts
- SRH01KM: the 0-1km storm relative helicity for this storm, in units of J/kg
- MEANWIND_1-3kmAGL: the 0-1km AGL mean wind for this storm, in units of kts
- MESH: the MRMS maximum expected size of hail for this storm, in units of in
- VIL_DENSITY: the MRMS vertically integrated liquid density for this storm, in units of g/m^3
- FLASH_RATE: the ENI flash rate for this storm, in units of flashes/min
- FLASH_DENSITY: the ENI flash density for this storm, in units of flashes/min/km^2
- MAXLLAZ: the MRMS maximum 0-2km AGL azimuthal shear for this storm, in units of s^{-1}
- P98LLAZ: the MRMS 98th percentile value of 0-2km AGL azimuthal shear for this storm, in units of s^{-1}
- P98MLAZ: the MRMS 98th percentile value of 3-6km AGL azimuthal shear for this storm, in units of s^{-1}
- MAXRC_EMISS: the maximum rate of change in 11 μm top-of-troposphere emissivity (aka normalized satellite growth rate) for this storm, in units of %/min
- MAXRC_ICECF: the maximum rate of change in the ice cloud fraction (aka glaciation rate) for this storm, in units of min^{-1}
- WETBULB_0C_HGT: the height of the lowest wet-bulb 0^oC level for this storm, in units of kft
- PWAT: the precipitable water for this storm, in units of in
- CAPE_M10M30: the CAPE between -10^oC and -30^oC levels for this storm, in units of J/kg
- LJA: the ENI lightning jump algorithm sigma value for this storm, in units of standard deviation
- SIZE: the number of pixels for this storm; each pixel is roughly equivalent to 1 km^2.
- AVG_BEAM_HGT: the average radar beam height for this storm from the nearest NEXRAD site, assuming standard atmospheric refraction
- MOTION_EAST: the eastward or westerly motion for this storm, in units of m/s (values < 0 mean westward/easterly motion)
- MOTION_SOUTH: the southward or norther motion for this storm, in units of m/s (values < 0 mean northward/southerly motion).