Korea LMA Level 3 File Documentation

The Korean LMA was a NASA system that was deployed near Seoul during May-October 2023 for a field campaign called Korea Precipitation Observation Program (KPOP): International collaborative experiments for Mesoscale convective system (MCS) in Seoul metropolitan area (KPOP-MS). The NASA Marshall Space Flight Center contacts for this dataset are Timothy Lang (timothy.j.lang@nasa.gov) and Matthew Wingo (matthew.t.wingo@nasa.gov). The lead for KPOP-MS was GyuWon Lee (gyuwon@knu.ac.kr) of Kyungpook National University.

Level 3 data were created using the lmatools Python package (https://github.com/deeplycloudy/lmatools). See references below for more information about LMA data, processing, and each variable.

Each Korean LMA Level 3 file is a netCDF4 architecture. All data were processed with a chisqr maximum of 5 and requiring at least 5 VHF sources to identify a flash. Data are gridded to 1-km resolution grids (all dimensions) and binned every minute. New files are available every 10 minutes. Two-dimensional data structures are (ntimes, lon, lat) and 3D data structures are (ntimes, lon, lat, alt). Number of bins in each dimension are 10 (ntimes) x 400 (lon) x 401 (lat) x 20 (alt)

Info about files

- *_flash_extent.nc & *_flash_extent_3d.nc: Flash extent density (km^{-2} or km^{-3}; i.e., number of flashes that pass through a given pixel/cube in the given time bin)
- *_flash_init.nc & *_flash_init_3d.nc: Number of flashes that initiated within the given pixel/cube and time bin
- *_footprint.nc & *_footprint_3d.nc: Footprints (mean area/volume in km^2/km^3) of flashes that occurred within pixel/cube and time bin
- *_specific_energy.nc & *_specific_energy _3d.nc: Specific energy (mean; J/kg) of flashes that occurred within pixel/cube and time bin
- *_total_energy.nc & *_total_energy _3d.nc: Total energy (J) of flashes that occurred within pixel/cube and time bin
- *_source.nc & *_source_3d.nc: Number of sources (km^{-2} or km^{-3}) that occurred in grid element
- *_flashsize_std.nc & *_flashsize_std_3d.nc: Standard deviation (km^2 or km^{-3}) of flash sizes within grid element

Each file also contains dimensional variables such as time, longitude, latitude, and altitude.

In Python, you can retrieve level 3 data into numpy arrays using the following example code snippet:

```
import numpy as np
import xarray
data = xarray.open_dataset('KOREA_20230709_032000_600_5src_0.0113deg-
dx_flash_extent.nc')
lon = np.array(data.lon.data)
lat = np.array(data.lat.data)
bintime = np.array(data.time.data)
flash_extent = np.array(data.flash_extent.data)
data.close()
```

References

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