README: WWLLN GLOBAL STROKE DENSITY CLIMATOLOGY

Basic information

This stroke density climatology is based on lightning observations from the World-Wide Lightning Location Network (WWLLN). The climatology is provided at 1° and 0.1° latitude/longitude resolution, with several variations to enable climatological investigation:

- A monthly-mean, hourly climatology
- An annual-mean, hourly climatology
- An annual-mean climatology

The following processing is applied to the stroke data:

- Buddy-checking: From 2 February 2015 onward, the WWLLN processing system has applied buddy-checking to reduce noise. Strokes detected by only 5 or 6 stations are matched to "buddy" strokes located by 6 or more stations within the previous 60 minutes and +/-0.75 latitude/longitude. If no "buddy" is found, the stroke is discarded. For this climatology, buddy-checking has also been applied to WWLLN data prior to 2 February 2015.
- De-duplication: Duplicates strokes occur when the WWLLN processing system receives sufficient wave packets to locate a stroke, pauses to calculate the location, and then receives additional wave packets such that the stroke is recorded again. The result is a duplicate stroke that is very close in space and time. For this climatology, for strokes within 50 μs and 15 km of each other, the stroke that is located by fewer stations or with a later timestamp is discarded.

File name convention

- *WWLLN_sd_monthly_hourly_?d.nc*: Monthly-mean lightning for each hour of the day.
- *WWLLN_sd_annual_hourly_?d.nc*: Annual-mean lightning for each hour of the day.
- *WWLLN_sd_annual_?d.nc*: Annual-mean lightning with all hours combined.
- Files ending in *_1d.nc* and *_td.nc* are at 1° and 0.1° latitude/longitude resolution, respectively.

File contents

- *WWLLN_sd_monthly_hourly_?d.nc*
  - *lat(nlat)*: Latitude coordinates for center of grid boxes.
  - *lon(nlon)*: Longitude coordinates for center of grid boxes.
  - *hr(nhr)*: UTC hour. Lightning associated with 00 UTC is summed from 00:00 UTC to 00:59 UTC.
  - *stroke_density(nmon,nhr,nlat,nlon)*: Climatological frequency of occurrence of lightning at indicated time and location. Units are strokes km^{-2} yr^{-1}.
  - *mon(nmon)*: Month (1 = January, 2 = February, etc.). Lightning associated with January is summed from 01 January to 31 January.
- *WWLLN_sd_annual_hourly_?d.nc*
  - *lat(nlat)*: Latitude coordinates for center of grid boxes.
  - *lon(nlon)*: Longitude coordinates for center of grid boxes.
  - *hr(nhr)*: UTC hour. Lightning associated with 00 UTC is summed from 00:00 UTC to 00:59 UTC.

    - *stroke_density(nhr,nlat,nlon)*: Climatological frequency of occurrence of lightning at indicated time and location. Units are strokes km^{-2} yr^{-1}.
- *WWLLN_sd_annual_?d.nc*
    - *lat(nlat)*: Latitude coordinates for center of grid boxes.
    - *lon(nlon)*: Longitude coordinates for center of grid boxes.
    - *stroke_density(nlat,nlon)*: Climatological frequency of occurrence of lightning at indicated location. Units are strokes km^{-2} yr^{-1}.

Note: the aggregation period (i.e., which years are included in in the climatology) is specified in the NetCDF file attributes.