NSSL Lightning Mapping Array

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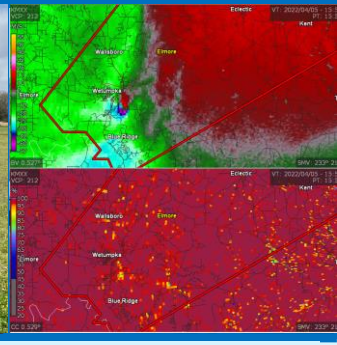

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Mobile LMA Network during PERiLS

- 8 sensors deployed per IOP (from 8 NSSL + 1 TTU)
- NSSL sensors built in 2020-21, designed for deployment of any length of time
- Disassembles into 4 components:
  - Solar panel
  - Antenna attachment
  - Antenna elements
  - Electronics box

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Processing & QC

Post-processing completed immediately after PERiLS

Some IOPs did not have full contributions from all stations

- Most issues were consistent throughout any given IOP
- Noted in readme and file headers

IOP 4 includes data from NALMA (Lang et al.)

- Using the Level 1 merge following Chmielewski et al. 2022
- Exception to statement above: sporadic GPS issues at different stations

The EOL catalogue: VHF source data with at least 5 contributing stations.

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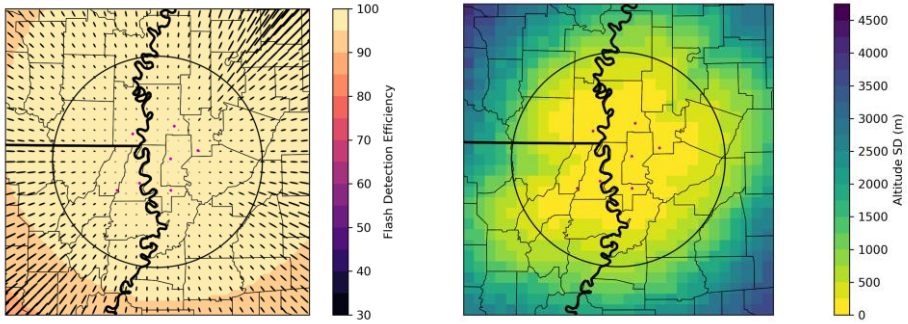
See EOL catalogue for estimates of network performance per IOP



IOP3, 23-25 March 2023. Left: Estimated flash detection efficiency based on local VHF noise thresholds and covariance ellipse of horizontal errors based on instrument uncertainty for sources with at least 5 stations contributing and a 7 km (MSL) source. Right: Altitude standard deviation based on instrument uncertainty. 100 km radius from the centroid of the array shown on both images.

Data files: standard LMA gzip, fixed-width text files of VHF sources with full metadata in header by 10-minute periods

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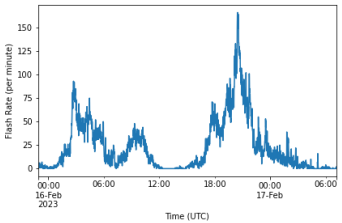
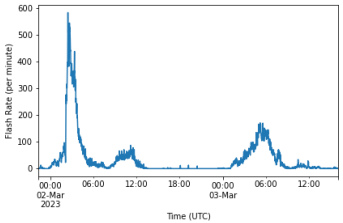
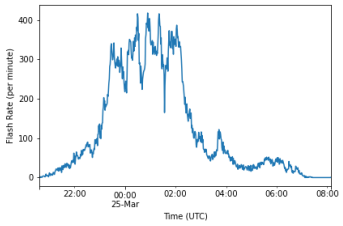
Summary of IOPs

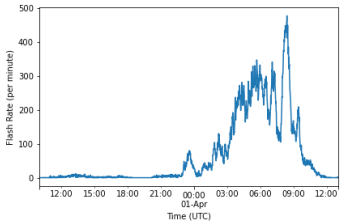
	Subdomain	Date	Number of flashes (lmatools, ≥10pts)	Number of 10-minute periods with lightning	Hours with lightning
IOP1	Brooksville / Selma	02/16/23	44,008	182	30
IOP2	Clarksdale, Mississippi	03/02/23	89,020	197	32
IOP3	Lake Providence, Mississippi	03/24/23	81,345	67	11
IOP4 (+NALMA)	Cypress Inn, Tennessee	04/01/23	108,037	150	25
IOP5	Earle / Kennett	04/05/23	37,020	85	14

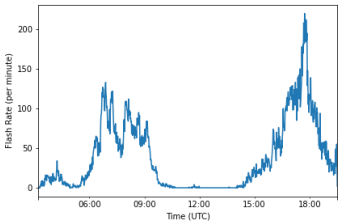
Flash Rates











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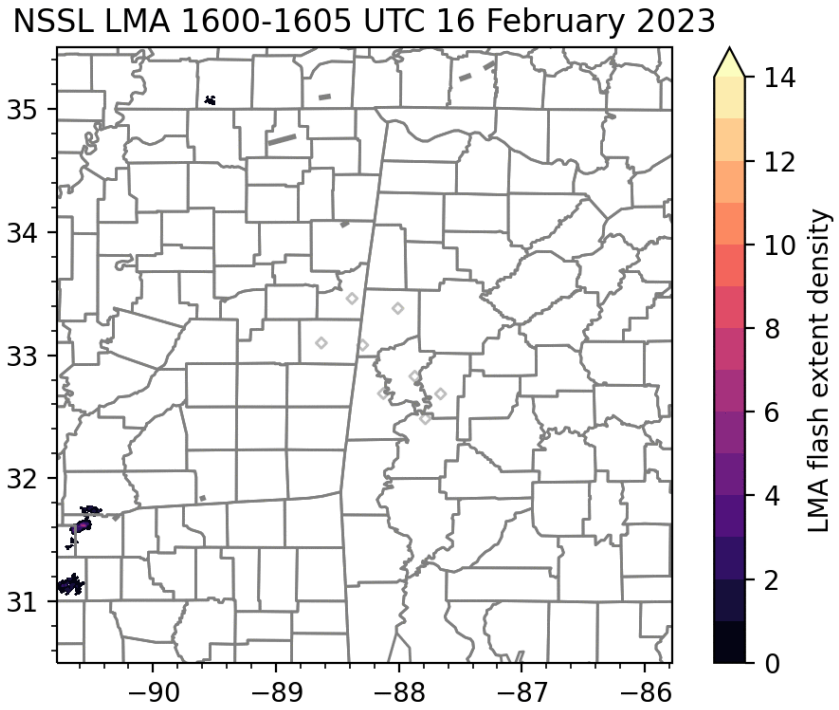
IOP 1: Selma / Brooksville Domain



Flash extent density in 5 min, 1x1 km grid cells

Relatively-disorganized case

Did capture a lot of aircraft tracks, and high flash rates in tornadic storms outside of domain

◇ – LMA Sensor

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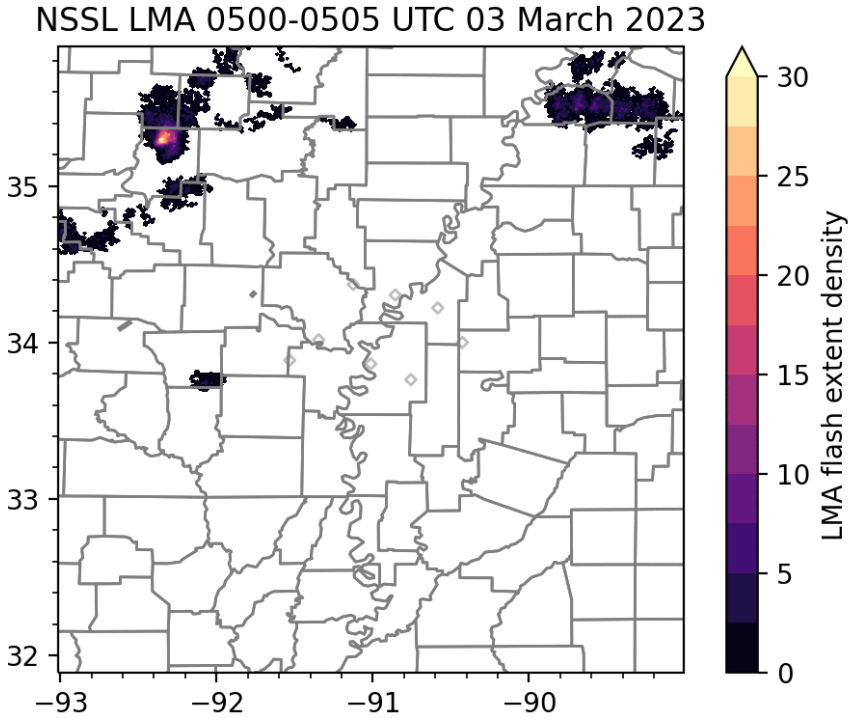
IOP 2: Clarksdale Domain



Flash extent density in 5 min, 1x1 km grid cells

Captured high flash rates in storms the night before the IOP

Did see a local enhancement in flash rates with the Jefferson Co tornado ~0757 UTC

◇ – LMA Sensor

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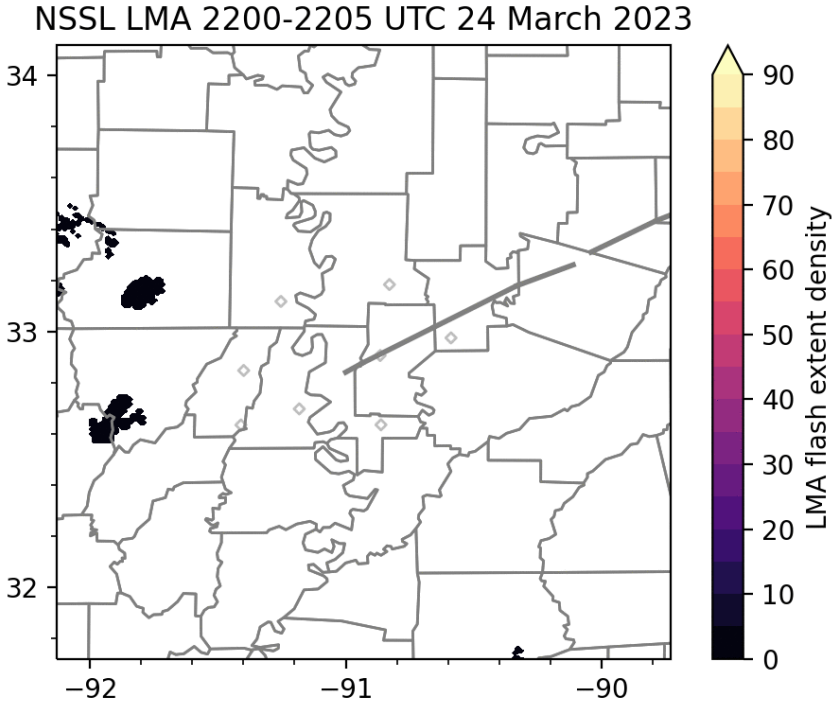
IOP 3: Lake Providence Domain



Flash extent density in 5 min, 1x1 km grid cells

Captured high flash rates in storms as they entered the domain

Observed substantial jump in rates with the Rolling Fork storm

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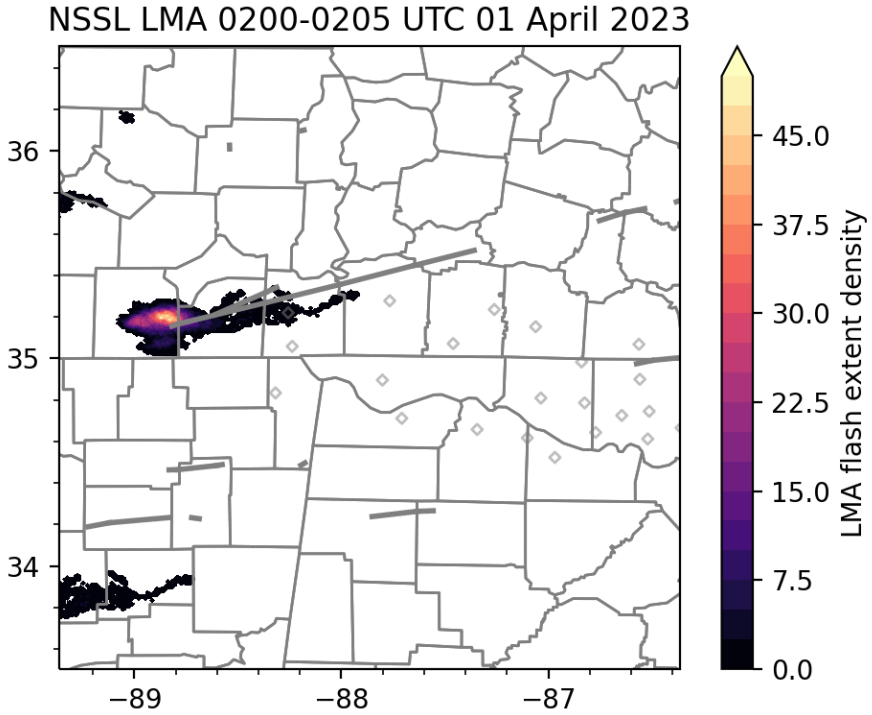
IOP 4: Cypress Inn / TN Valley Domain



Flash extent density in 5 min, 1x1 km grid cells

Combined with NALMA for enhanced overage and sustained sensitivity to the east

Captured strong enhancements in flash rates around rotation

◇ – LMA Sensor

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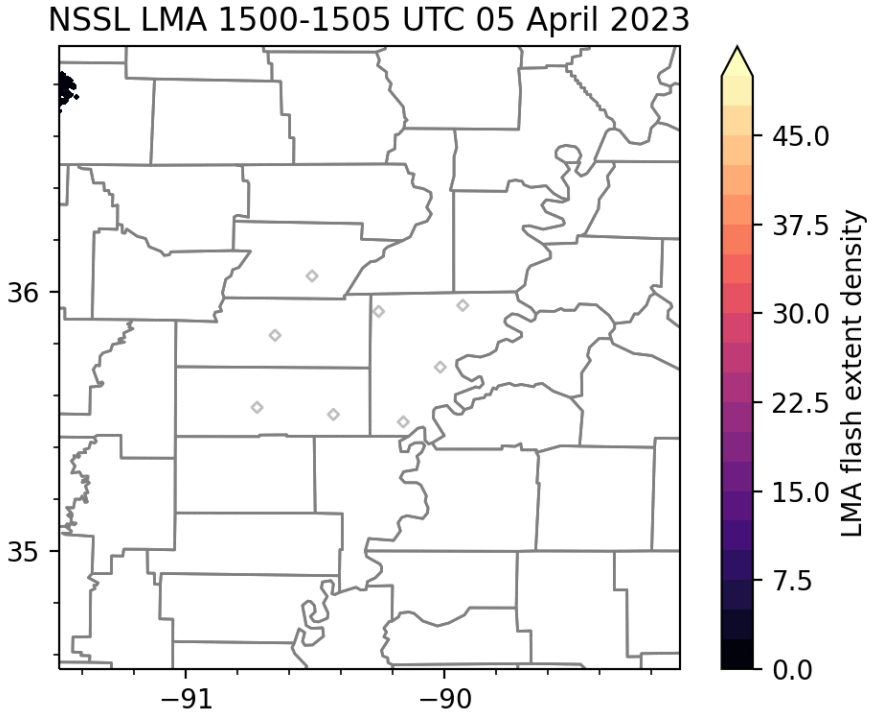
IOP 5: Kennett / Earle



Flash extent density in 5 min, 1x1 km grid cells

Relatively low flash rates but large flashes

◇ – LMA Sensor

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See some analyses

Thurs 1:40 – 1:50 pm (10 min): Spatial Trends in Lightning Characteristics During PERiLS - **Bruno Medina**

Fri 9:00 – 9:10 am (10 min): Intercomparison of Lightning Measurements in Tornadic QLCS Storms - **Jacquelyn Ringhausen**

Fri 9:55 – 10:10 am (15 min): Temporal Evolution of Lightning-Microphysics Relationships in Southeastern US Thunderstorms: Insights from StickNets, LMA, and WSR-88D - **Kelcy Brunner**

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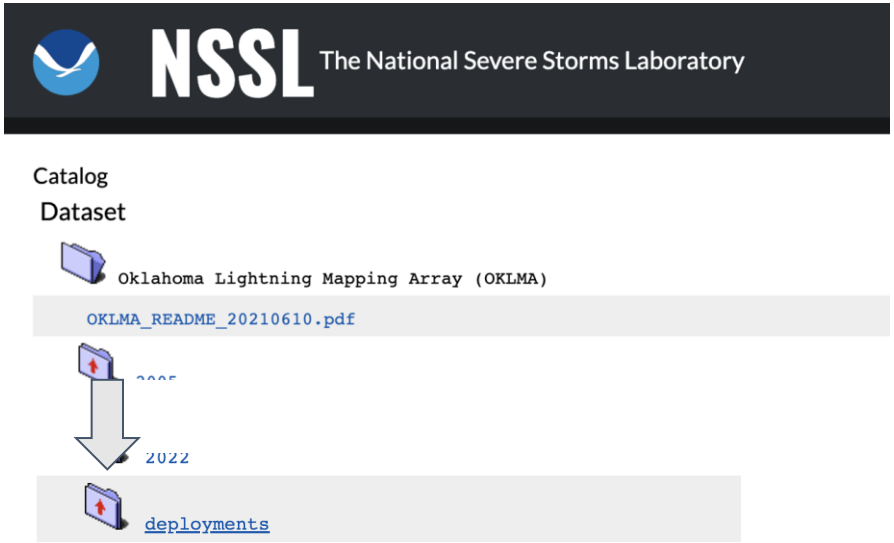
General Data Availability

Full publicly-available LMA database with the NSSL mobile LMA deployments (doi: 10.15763/DBS.DLMA): https://data.nssl.noaa.gov/thredds/catalog/WRDD/OKLMA/catalog.html



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