

EARTH
NETWORKS®

2020

SOUTH ASIA
LIGHTNING REPORT



ABOUT THIS REPORT

This 2020 South Asia Lightning Report was prepared by Earth Networks using the Earth Networks Global Lightning Network (ENGLN). The following report includes in-cloud, cloud-to-ground, and total lightning data from India, Bangladesh, Sri Lanka and the surrounding water bodies during 2020. Counts, rankings, and Dangerous Thunderstorm Alerts (DTAs) in this report are from January 1, 2020 to December 31, 2020.

THE EARTH NETWORKS GLOBAL LIGHTNING NETWORK (ENGLN)

The lightning data in this report is derived from the Earth Networks Global Lightning Network (ENGLN), which monitors the combination of in-cloud and cloud-to-ground lightning strikes over 100 countries. With over 1,800 sensors, the ENGLN is the most extensive and technologically advanced total lightning network in the world. ENGLN has been specifically deployed to detect real-time lightning and provide advanced warning for severe weather events that could threaten public safety and operational efficiency.

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REPORT TERMINOLOGY

To help you better understand the insights from this lightning report, we have included definitions of our frequently used report terminology below.

Lightning Pulse: This report measures lightning pulses. A pulse is a surge of electric current in lightning usually accompanied by a burst of light. Pulses are classified as In-cloud (IC) or Cloud-to-Ground (CG).

Lightning Flash: A lightning flash is a collection of pulses close in space and time that approximates the continuous ionized channels of a complete bolt of lightning.

Cloud-to-Ground Lightning (CG): Lightning that happens between opposite charges in a cloud and on the ground.

In-Cloud Lightning (IC): Lightning that occurs between opposite charges within a thunderstorm cloud. Total Lightning Detection: The combination of all in-cloud and cloud-to-ground lightning activity.

Pulse Density: The number of lightning pulses per square kilometer per year.

Dangerous Thunderstorm Alerts (DTAs): Earth Networks patented advanced severe weather warnings that notify users of incoming storms up to 45 minutes before storm arrival.

Thunder Days: Any given day where lightning was detected in a certain area.

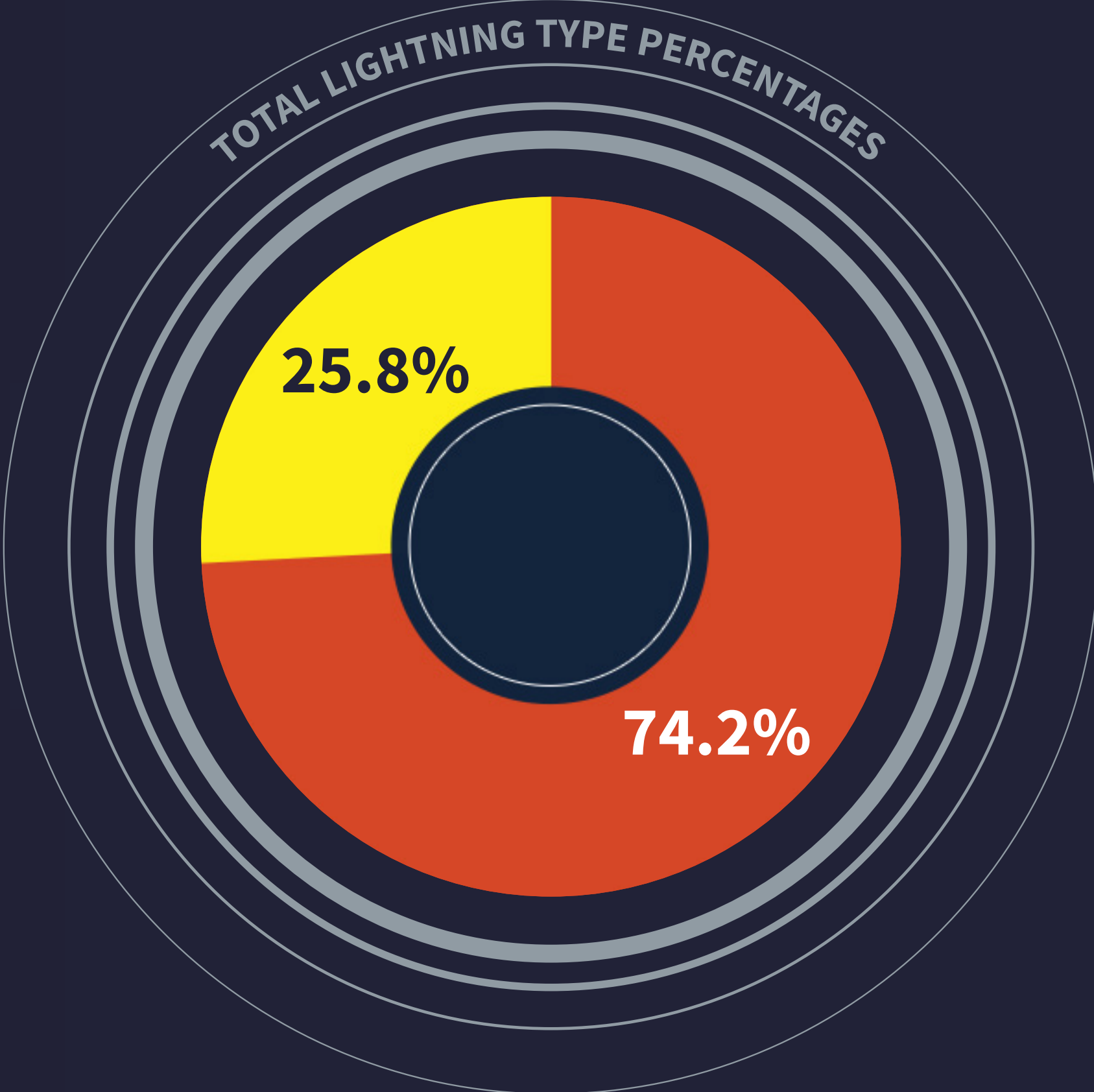
INDIA, BANGLADESH, AND SRI LANKA

57,025,856

TOTAL LIGHTNING PULSES



42,305,476
In-cloud



TOTAL LIGHTNING

is the combination of cloud-to-ground (CG) and in-cloud (IC) lightning strikes



Cloud-to-ground lightning:

Lightning that happens between opposite charges in a cloud and on the ground

In-cloud lightning:

Lightning that occurs between opposite charges within a thunderstorm cloud

14,710,507
Cloud-to-ground



INDIA

39,549,444

TOTAL LIGHTNING PULSES



26,520,484
In-cloud

TOTAL LIGHTNING

is the combination of cloud-to-ground (CG) and in-cloud (IC) lightning strikes



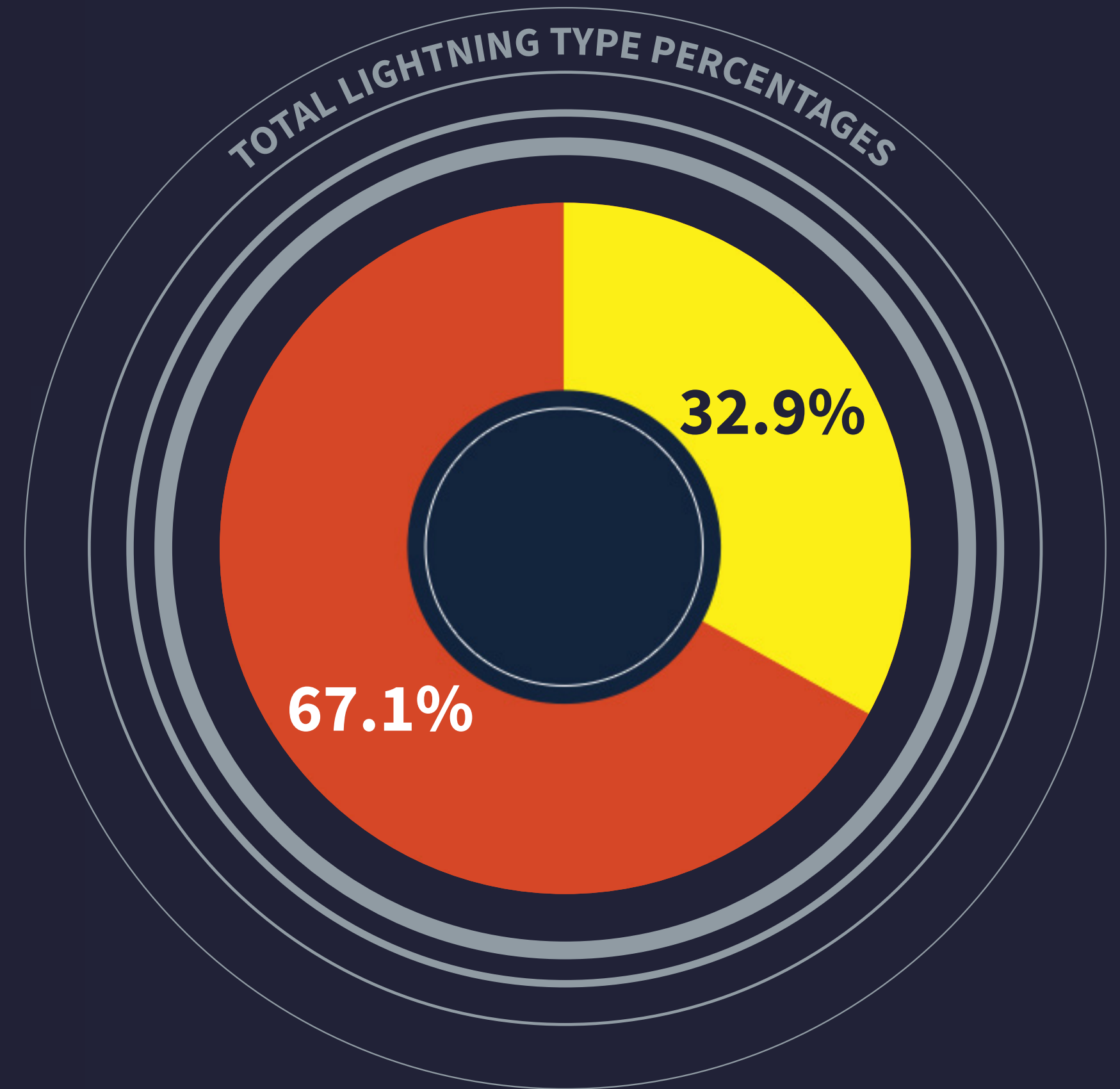
Cloud-to-ground lightning:

Lightning that happens between opposite charges in a cloud and on the ground

In-cloud lightning:

Lightning that occurs between opposite charges within a thunderstorm cloud

TOTAL LIGHTNING TYPE PERCENTAGES



13,022,403
Cloud-to-ground



BANGLADESH

3,014,115

TOTAL LIGHTNING PULSES



1,897,220

In-cloud

TOTAL LIGHTNING

is the combination of cloud-to-ground (CG) and in-cloud (IC) lightning strikes



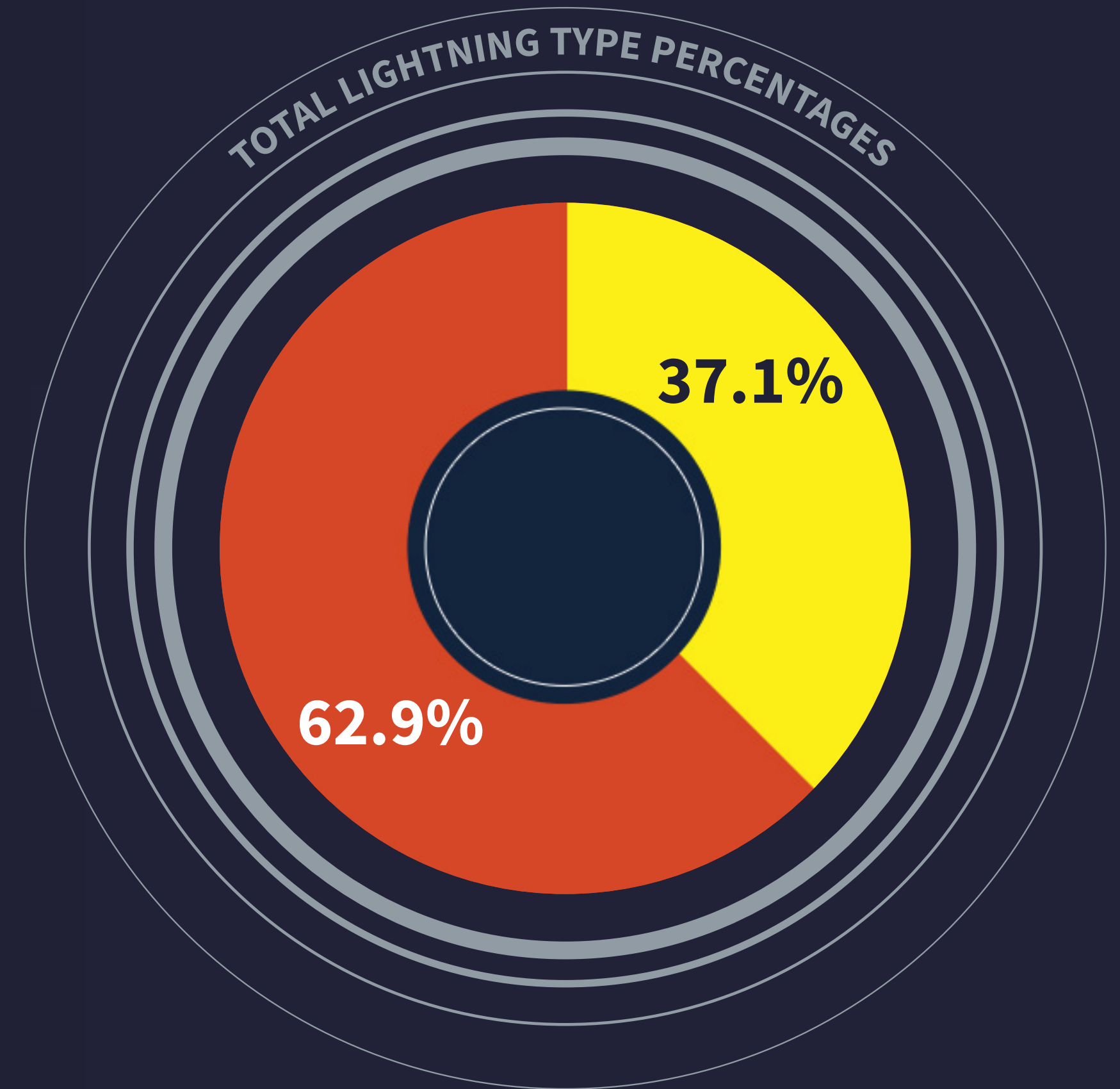
Cloud-to-ground lightning:

Lightning that happens between opposite charges in a cloud and on the ground

In-cloud lightning:

Lightning that occurs between opposite charges within a thunderstorm cloud

TOTAL LIGHTNING TYPE PERCENTAGES



1,115,375

Cloud-to-ground



SRI LANKA

14,462,297

TOTAL LIGHTNING PULSES



13,887,772

In-cloud

TOTAL LIGHTNING

is the combination of cloud-to-ground (CG) and in-cloud (IC) lightning strikes



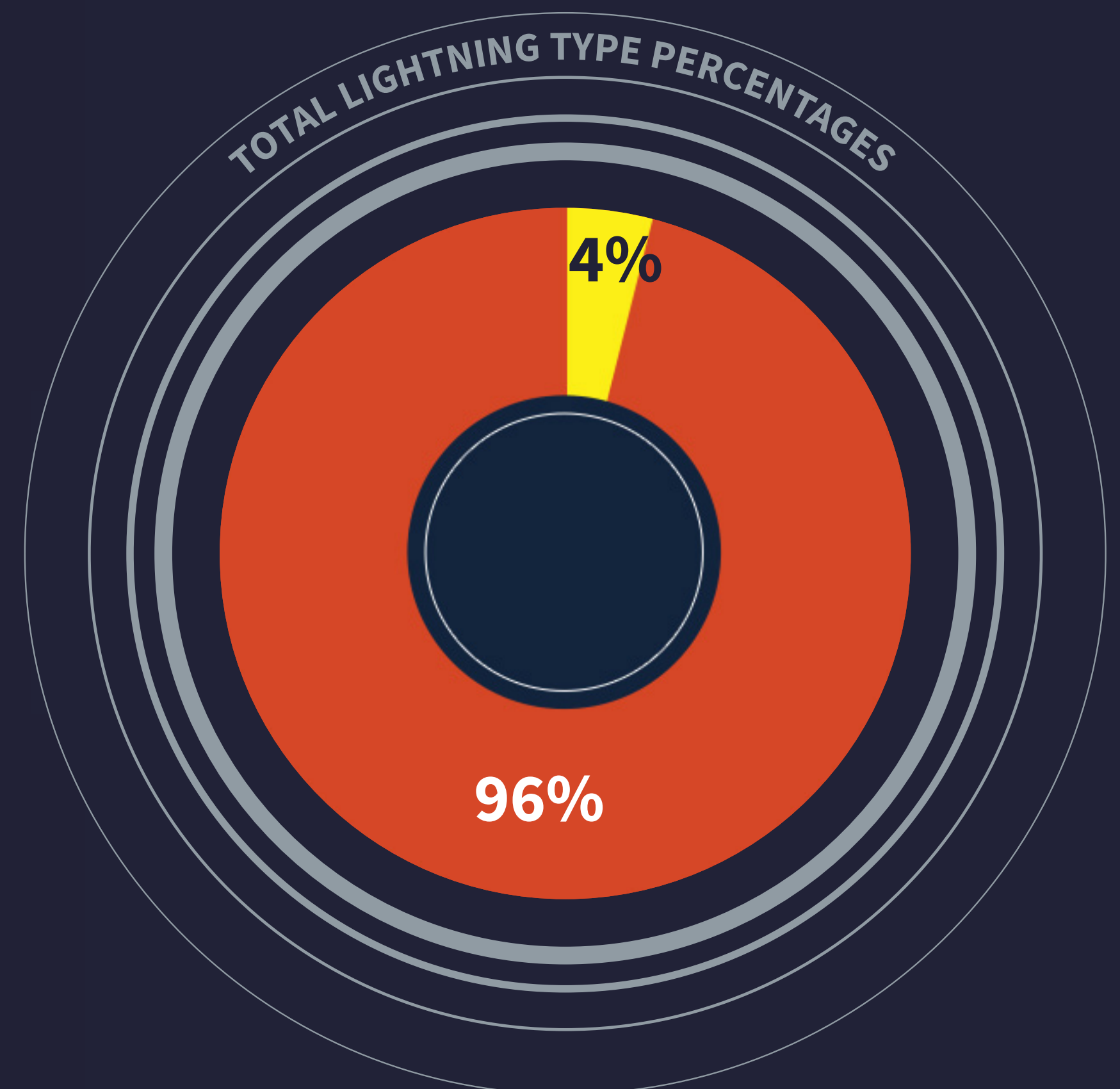
Cloud-to-ground lightning:

Lightning that happens between opposite charges in a cloud and on the ground

In-cloud lightning:

Lightning that occurs between opposite charges within a thunderstorm cloud

TOTAL LIGHTNING TYPE PERCENTAGES



572,729

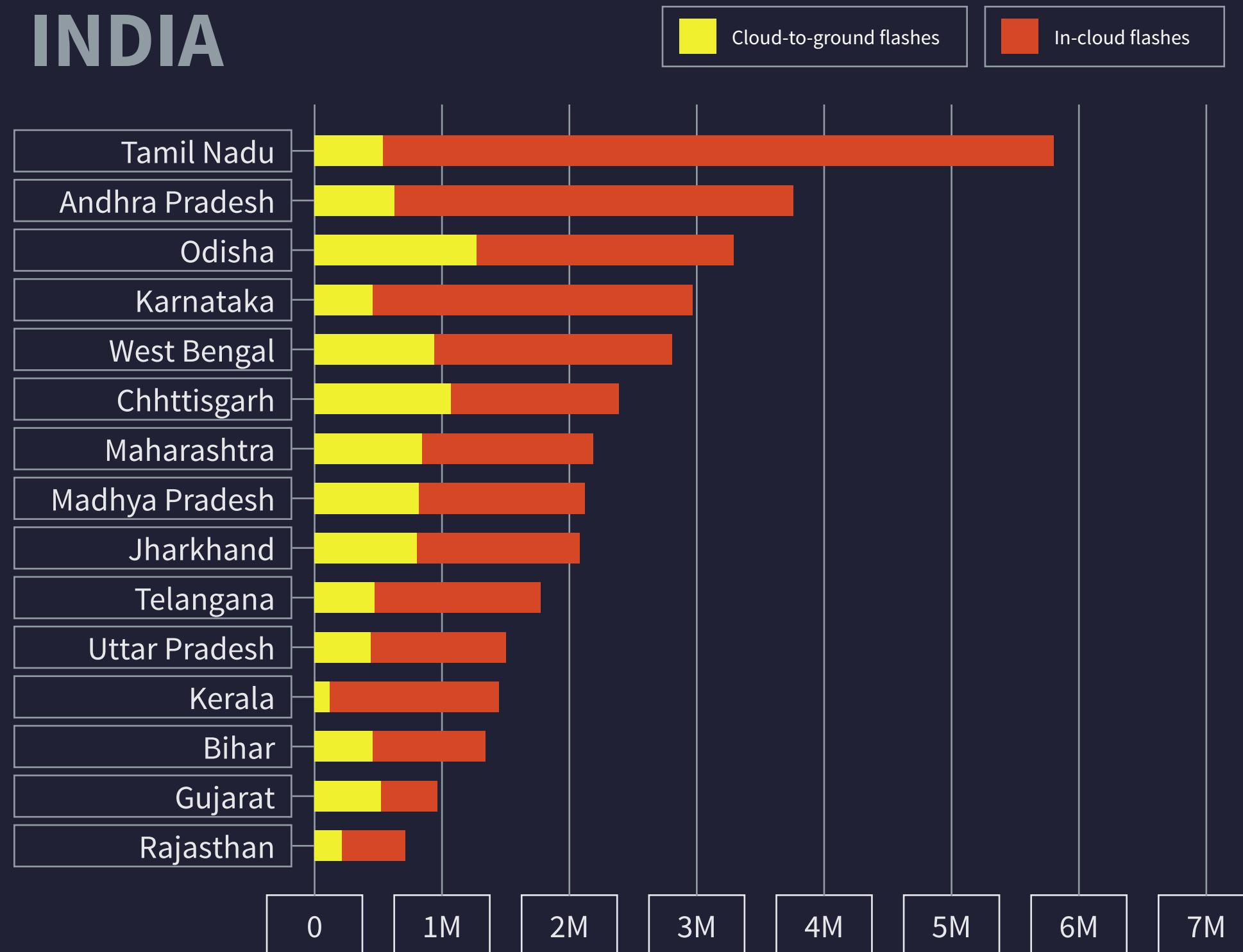
Cloud-to-ground



LIGHTNING COUNT STATE RANKINGS

These are the Indian states with the highest lightning pulse counts during 2020.

INDIA



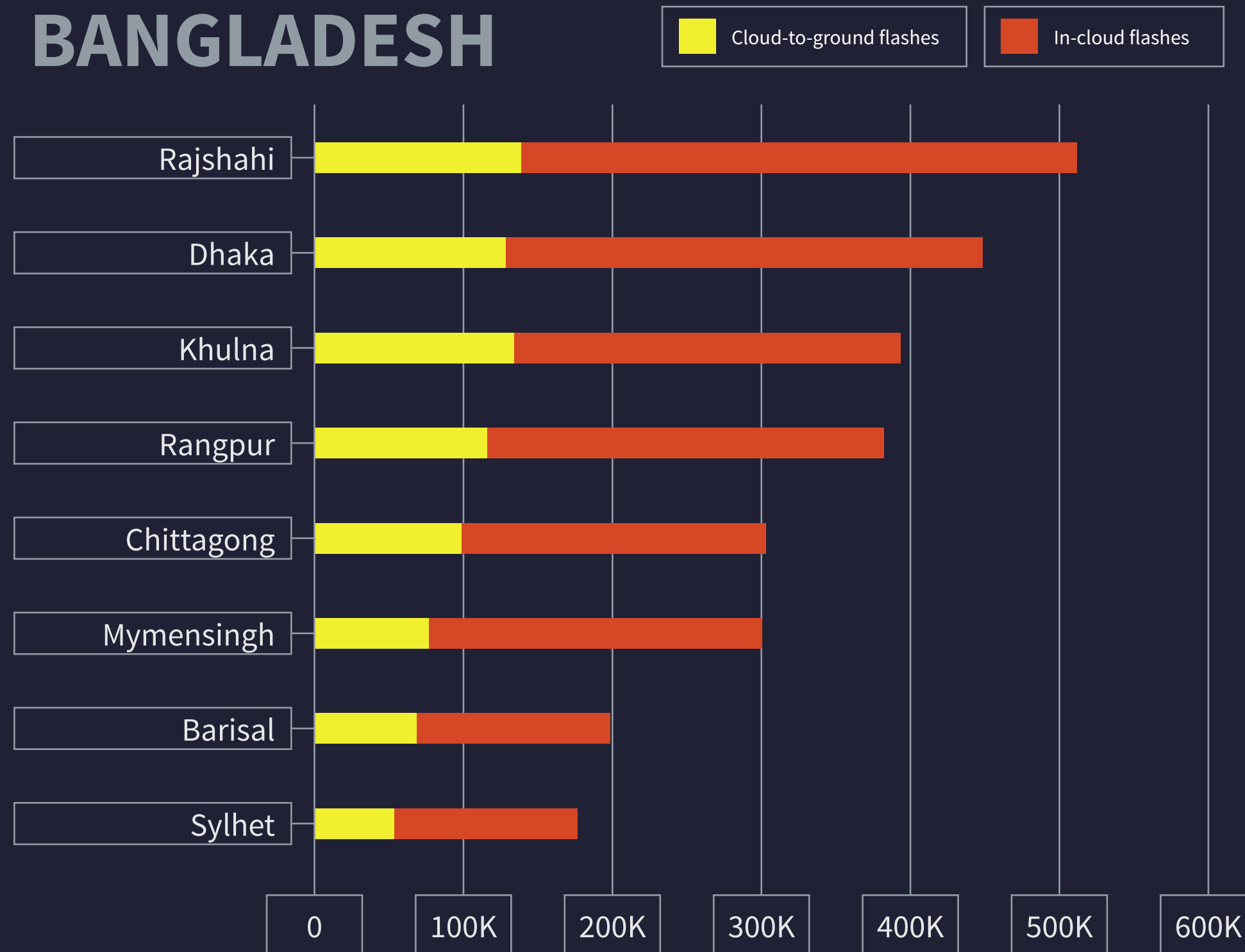
State Name	CG Count	IC Count
Tamil Nadu	547,847	5,269,333
Andhra Pradesh	634,233	3,137,697
Karnataka	438,429	2,531,763
Odisha	1,265,695	2,037,381
West Bengal	940,958	1,873,076
Maharashtra	845,088	1,353,571
Kerala	128,377	1,332,629
Chhattisgarh	1,079,151	1,311,427
Madhya Pradesh	810,288	1,310,937
Telangana	463,109	1,309,224
Jharkhand	805,077	1,288,332
Uttar Pradesh	441,138	1,066,974
Bihar	463,786	888,282
Rajasthan	210,345	513,125
Gujarat	506,259	460,139

India's most active state for total lightning pulses in 2020 was Tamil Nadu. Tamil Nadu experienced 2,045,250 more total lightning strikes than second place Andhra Pradesh. The geographical area of Tamil Nadu is 130,058 km², making it the eleventh largest state in India. The state saw more lightning pulses than larger states like Maharashtra (307,713 km²) and Odisha (155,707 km²).

LIGHTNING COUNT STATE RANKINGS

These are the Bangladesh divisions with the highest lightning pulse counts during 2020.

BANGLADESH



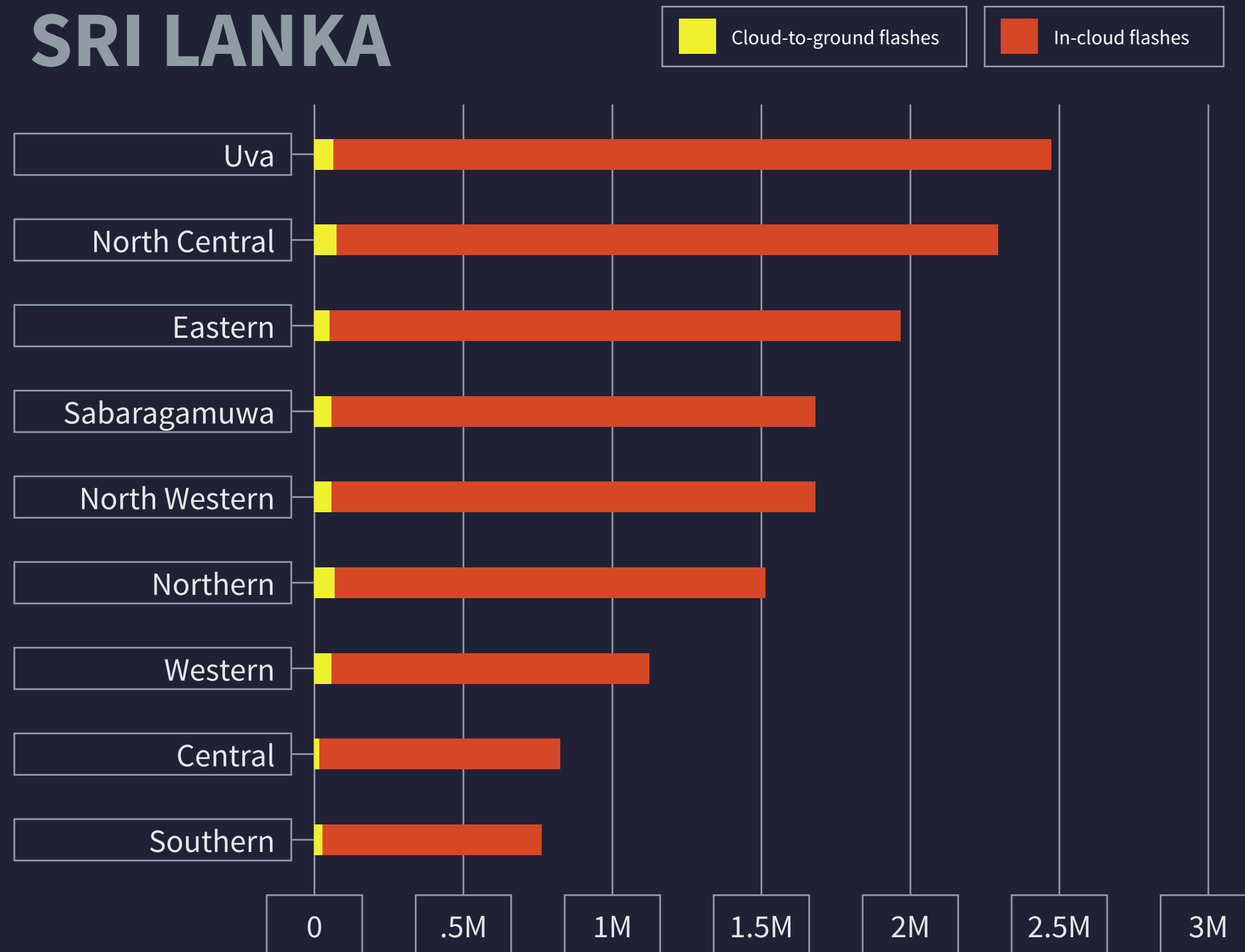
Division	CG Count	IC Count
Rajshahi	138,639	371,978
Rangpur	115,808	265,708
Khulna	133,405	259,146
Chittagong	96,639	204,527
Dhaka	128,244	321,045
Sylhet	52,570	122,944
Barisal	69,028	128,135
Mymensingh	76,565	223,737
TOTAL	810,898	1,897,220

Bangladesh is divided into eight major divisions. In 2020, Rajshahi saw the highest lightning count, experiencing 510,617 total lightning pulses. This division is 18,153.08 sqkm and has a population of approximately 18.5 million.

LIGHTNING COUNT STATE RANKINGS

These are the Sri Lanka provinces with the highest lightning pulse counts during 2020.

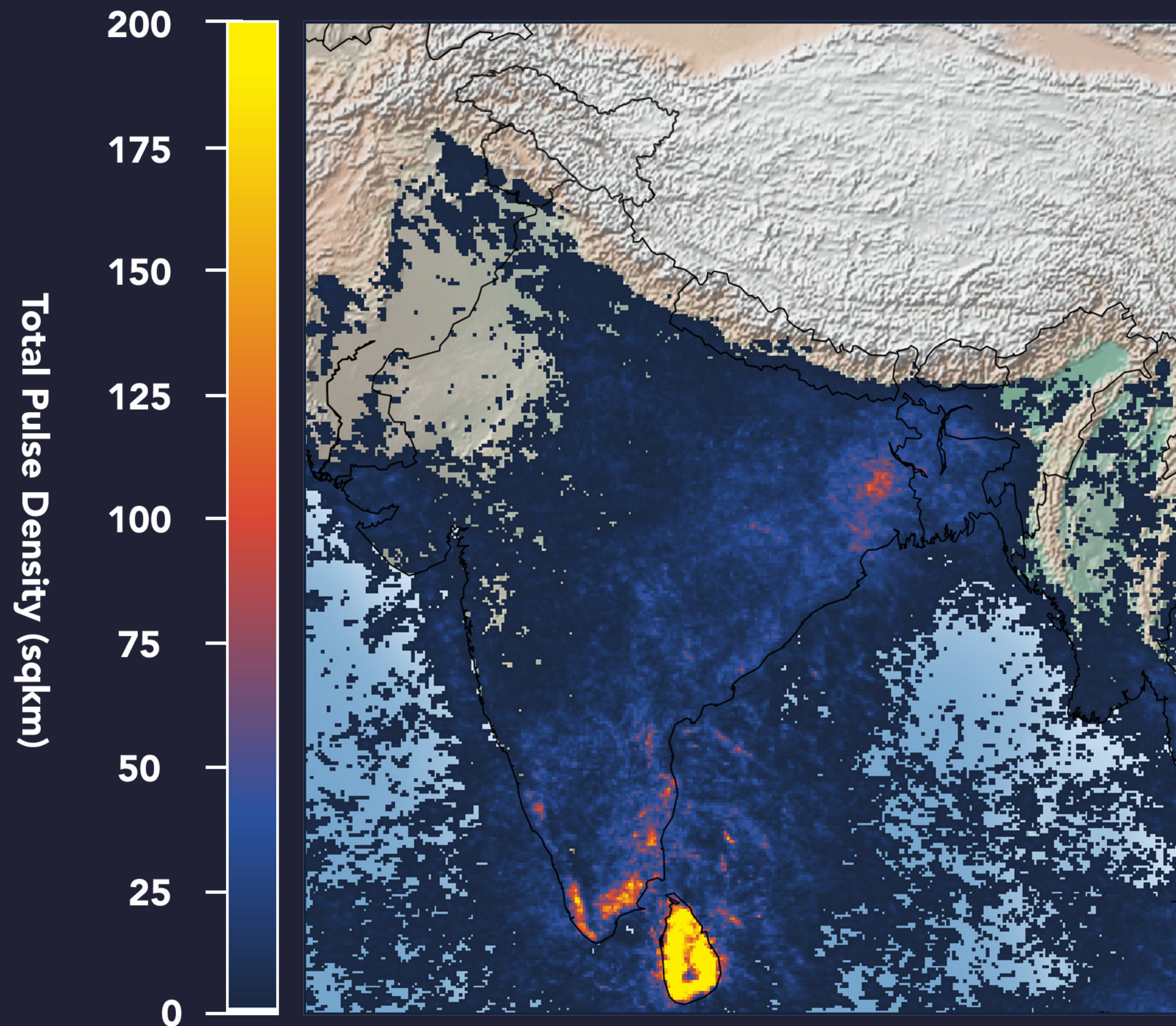
SRI LANKA



Province	CG Count	IC Count
Western	57,309	1,068,393
Northern	62,327	1,453,363
Southern	31,304	734,346
North Central	72,484	2,226,769
Central	16,611	810,951
North Western	53,460	1,631,116
Eastern	49,066	1,921,480
Sabaragamuwa	61,091	1,629,105
Uva	64,713	2,412,249
TOTAL	468,365	13,887,772

Sri Lanka is divided into nine provinces, with Uva experiencing the highest amount of lightning in 2020, encountering 2,476,962 total lightning pulses. The Southern and Central provinces of Sri Lanka saw the least amount of lightning compared to the other territories of the country.

LIGHTNING (PULSE) DENSITY MAP



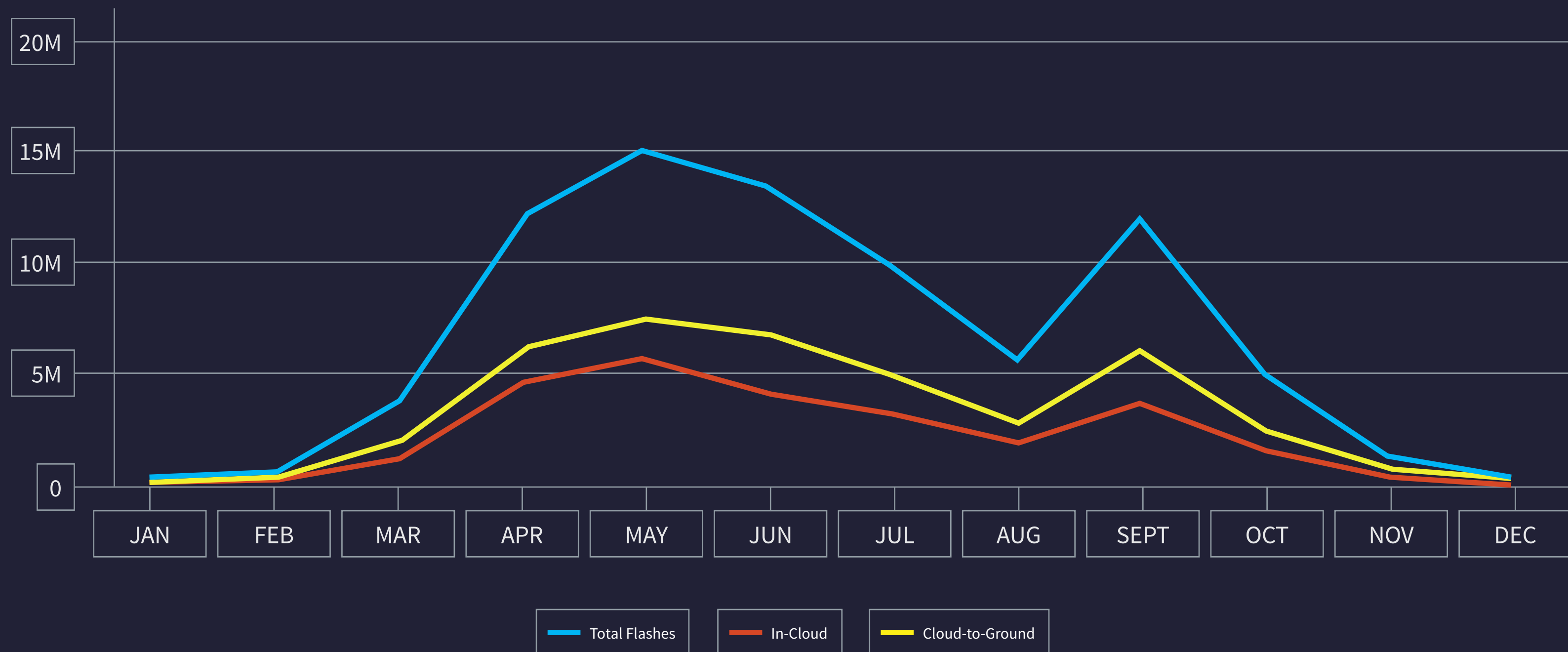
The Total Pulse Density map illustrates that the ENGLN detected high lightning pulse densities in Sri Lanka in 2020.

When comparing the lightning activity within different areas, pulse density effectively and fairly compares the data. As illustrated in the map, Sri Lanka, South India and Northeast India had the highest pulse densities. In 2020, Sri Lanka experienced 13,887,772 total lightning pulses.

The Sabaragamuwa and Western provinces had the highest total pulse density (sqkm).

LIGHTNING COUNT MONTHLY RANKINGS

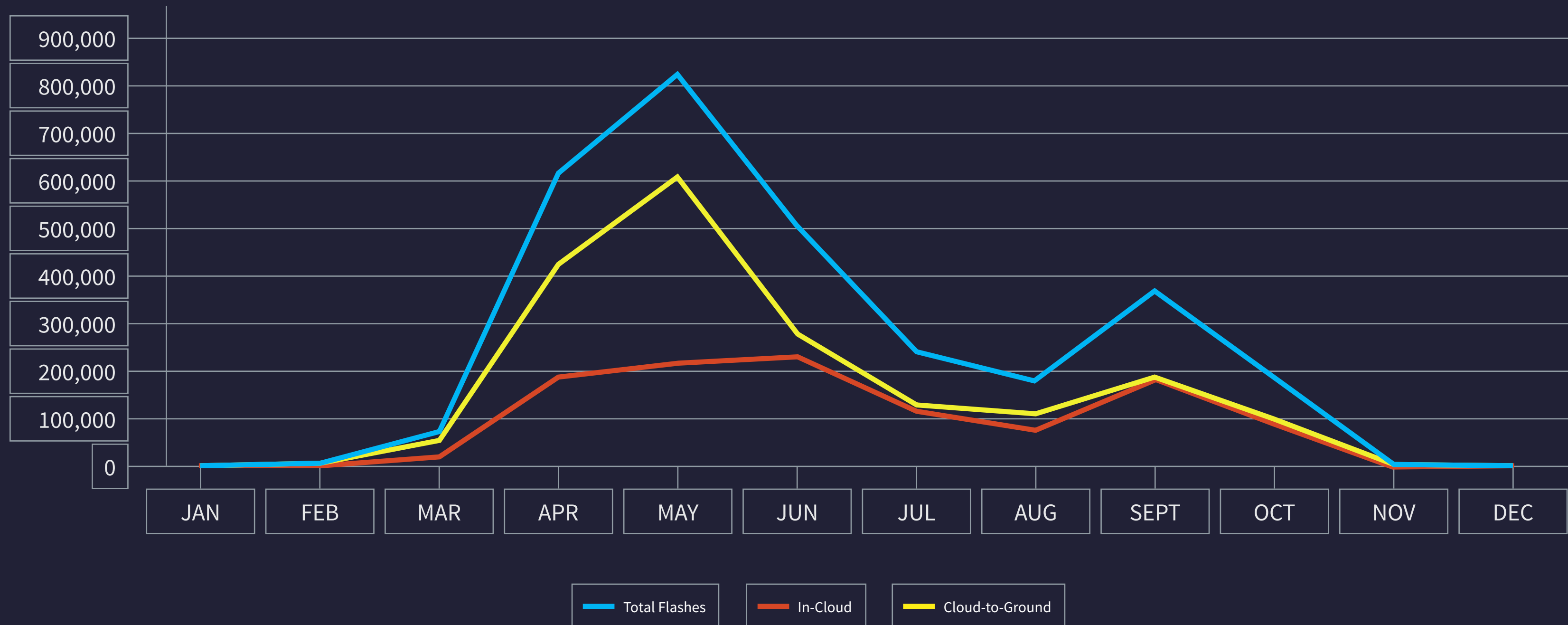
INDIA TOTAL LIGHTNING PULSE COUNT



In 2020, India saw the highest concentration of lightning in May, June, and September. The uptick in lightning during these months is closely associated with the monsoon season in India. The 2020 Southwest Monsoon End of Season Report indicates that the Southwest monsoon current reached India on May 17, 2020, five days ahead of its normal date. Lightning peaked again in September, during the last month of the monsoon season. In 2020, the rainfall average across India reached 109% of normal, just 1% less than the 2019 average of 110%.

LIGHTNING COUNT MONTHLY RANKINGS

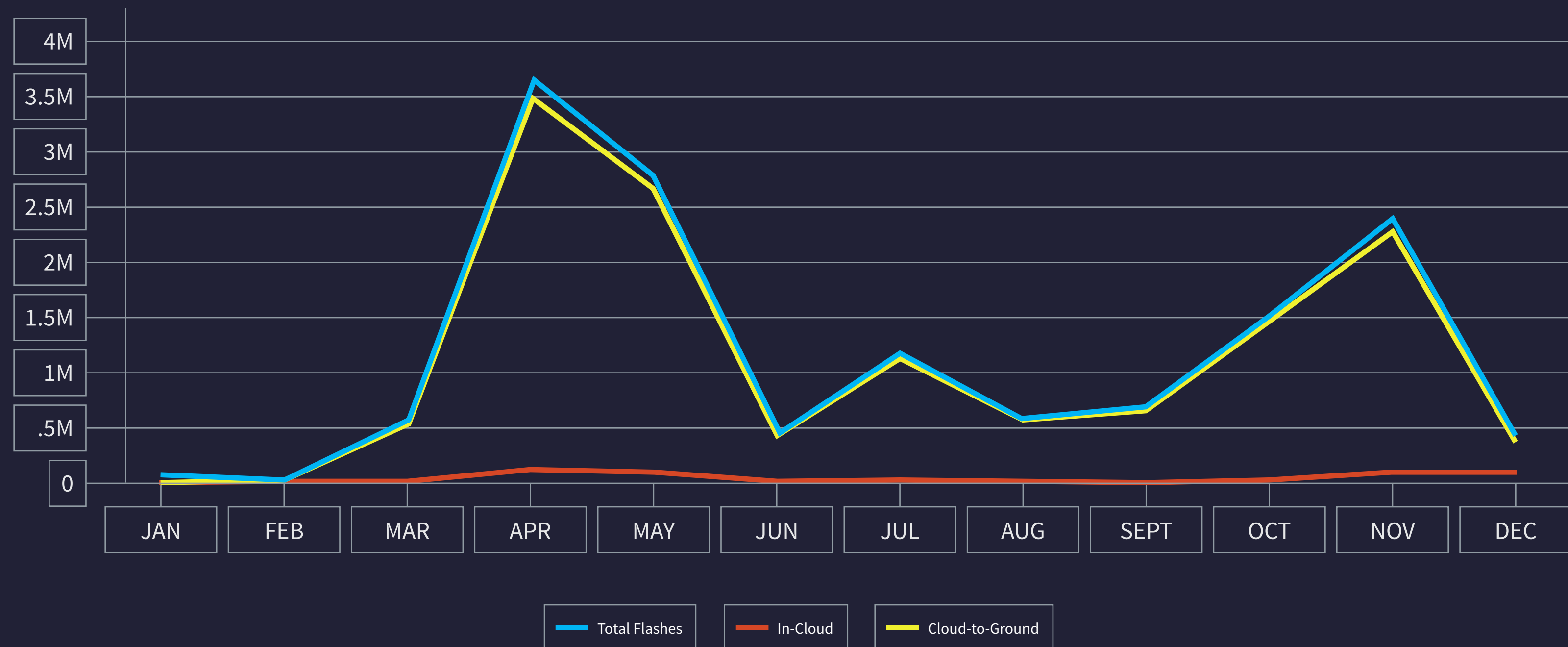
BANGLADESH TOTAL LIGHTNING PULSE COUNT



Bangladesh experienced high levels of lightning between March and July, with a peak total lightning pulse count in May 2020. This coincides with the 2020 Southwest Monsoon season.

LIGHTNING COUNT MONTHLY RANKINGS

SRI LANKA TOTAL LIGHTNING PULSE COUNT

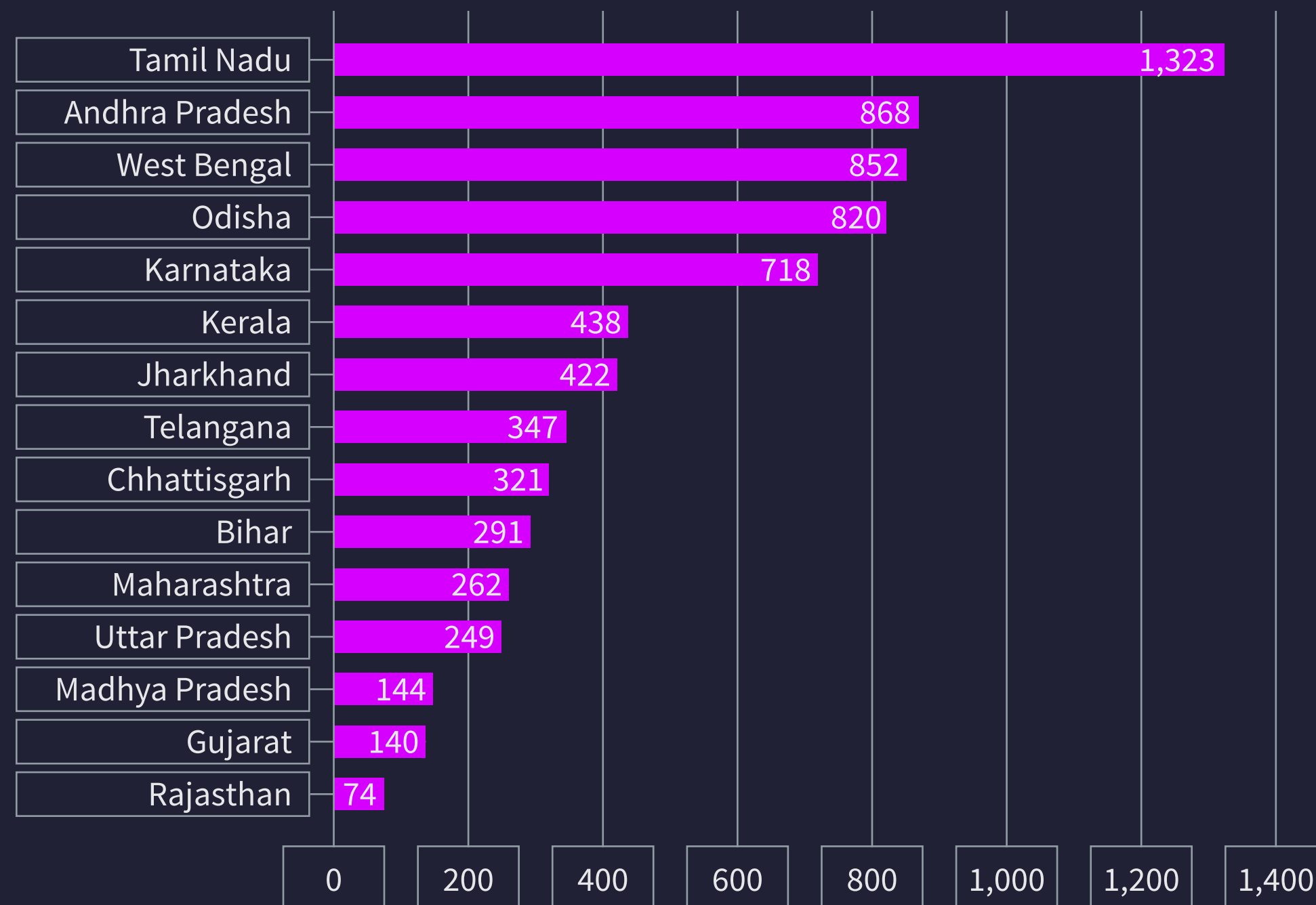


The island country experienced a peak in lightning in April 2020. The Natural Hazards Early Warning Center of Sri Lanka issued a severe lightning and heavy rain warning to several provinces on April 28th, advising that heavy rainfalls above 100 mm were likely.

DANGEROUS THUNDERSTORMS ALERTS RANKINGS

Across South Asia, our Total Lightning Network generated 9,963 Dangerous Thunderstorm Alerts during 2020. These are the Indian states where we issued the most DTAs.

INDIA

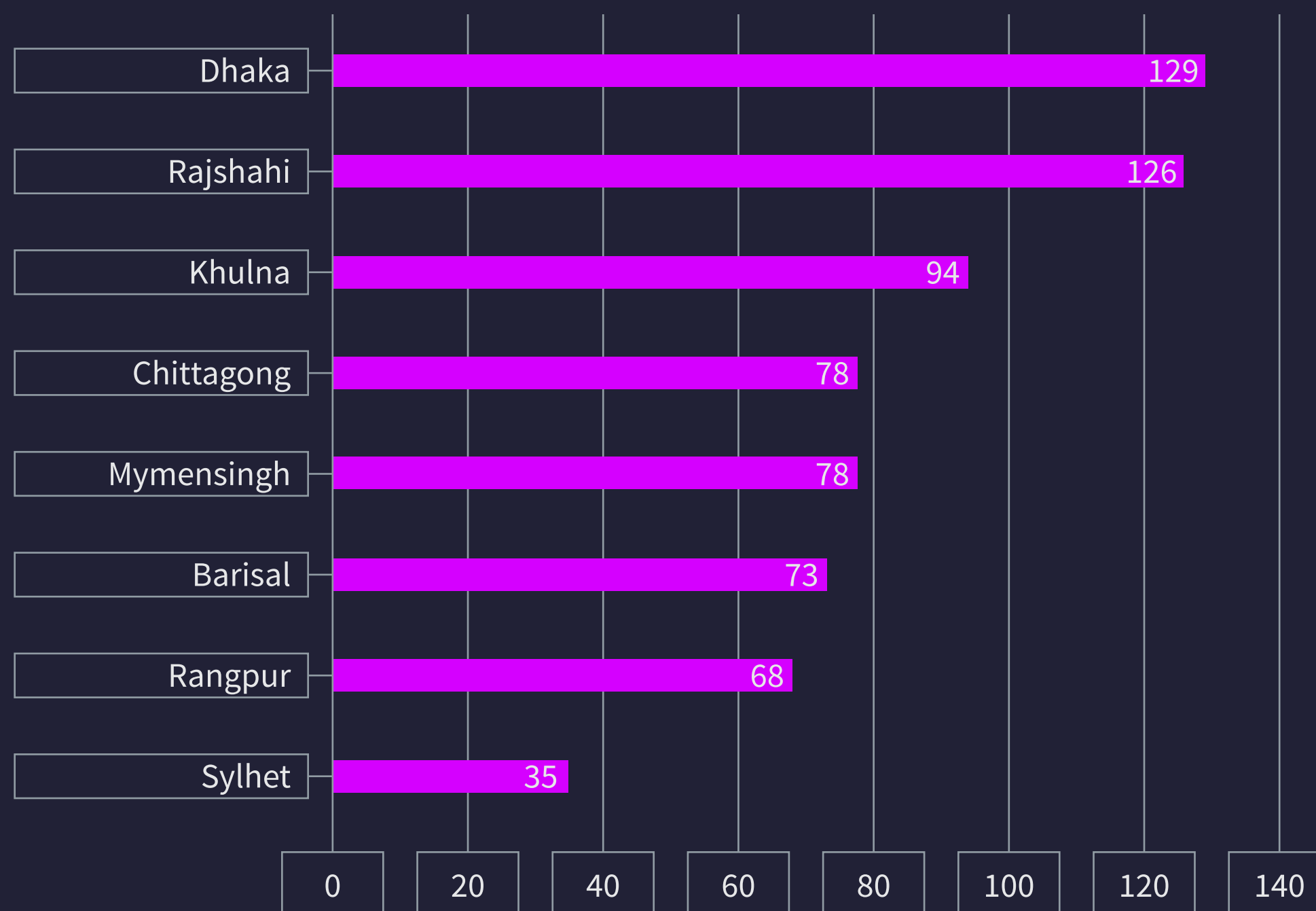


Dangerous Thunderstorm Alerts are extremely advanced severe weather warnings exclusive to Earth Networks. These patented alerts notify users severe weather is approaching up to 45 minutes before storms arrive. The graph to the left indicates the top 15 states in India that received the highest amounts of Dangerous Thunderstorm Alerts in 2020.

DANGEROUS THUNDERSTORMS ALERTS RANKINGS

Bangladesh received a total of 681 Dangerous Thunderstorm Alerts among its eight divisions in 2020.

BANGLADESH

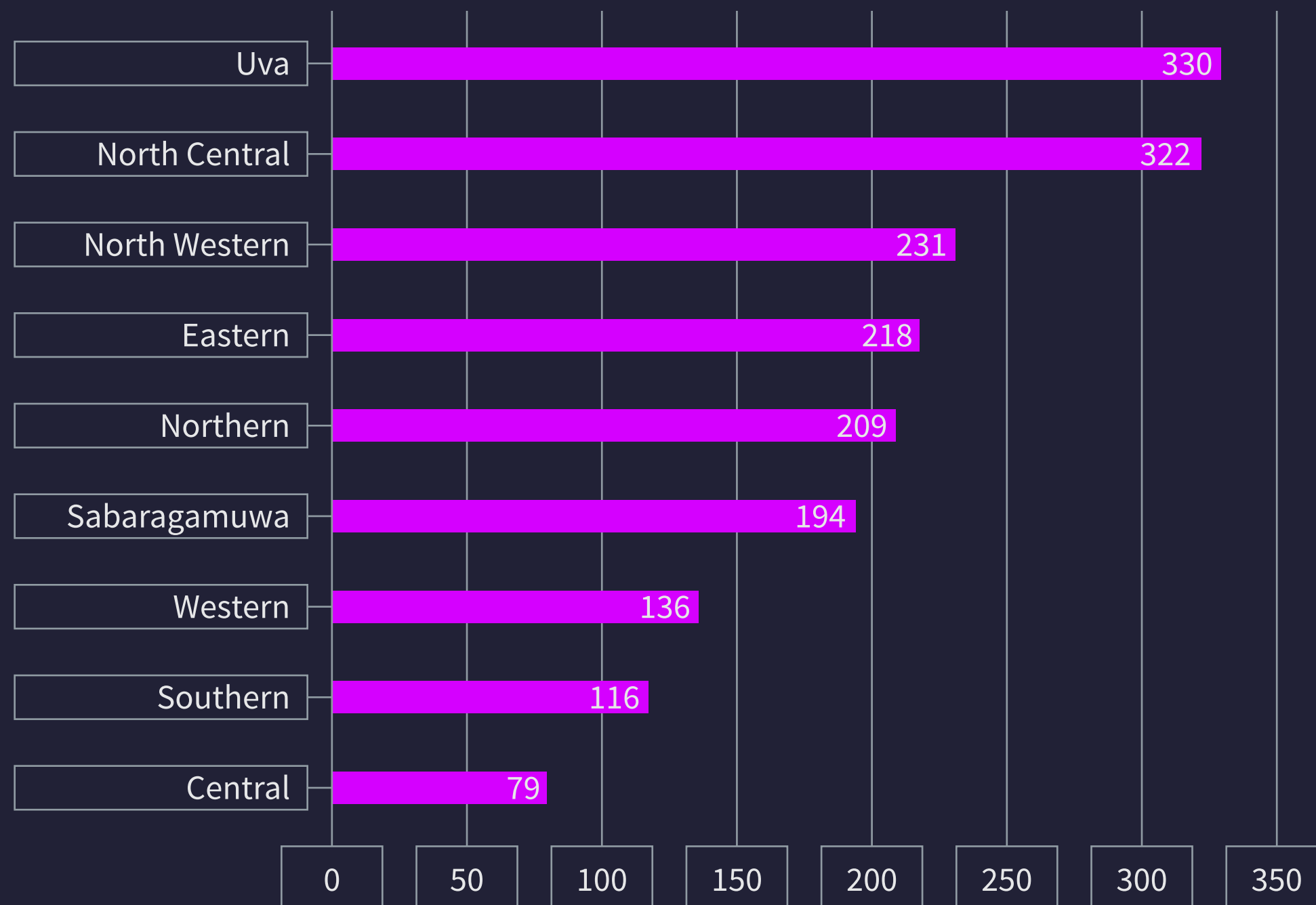


The graph to the left indicates the amount of Dangerous Thunderstorm Alerts that each of the eight divisions in Bangladesh encountered in 2020. Dhaka (20,593.74 sqkm) and Rajshahi (18,153.08 sqkm) experienced significantly more Dangerous Thunderstorm Alerts compared to the other divisions.

DANGEROUS THUNDERSTORMS ALERTS RANKINGS

Sri Lanka received a total of 1,835 Dangerous Thunderstorm Alerts throughout its nine provinces. This coincides with the intense lightning patterns that Sri Lanka experienced in 2020.

SRI LANKA

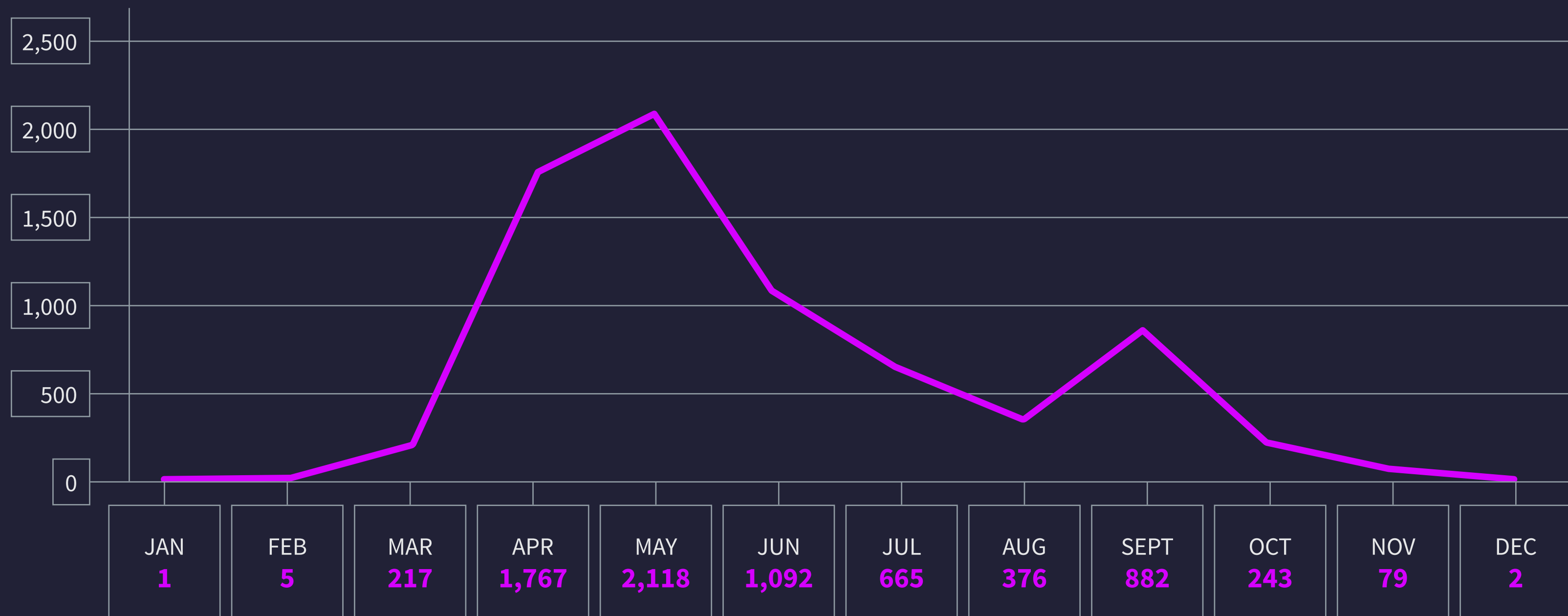


The graph to the left indicates the number of Dangerous Thunderstorm Alerts that each province in Sri Lanka received in 2020. Uva and North Central received the highest volume of DTAs, at approximately 330 and 322 respectively.

DTA MONTHLY RANKINGS

Which months saw the most severe thunderstorms in 2020?

INDIA Dangerous Thunderstorm Alerts BY MONTH

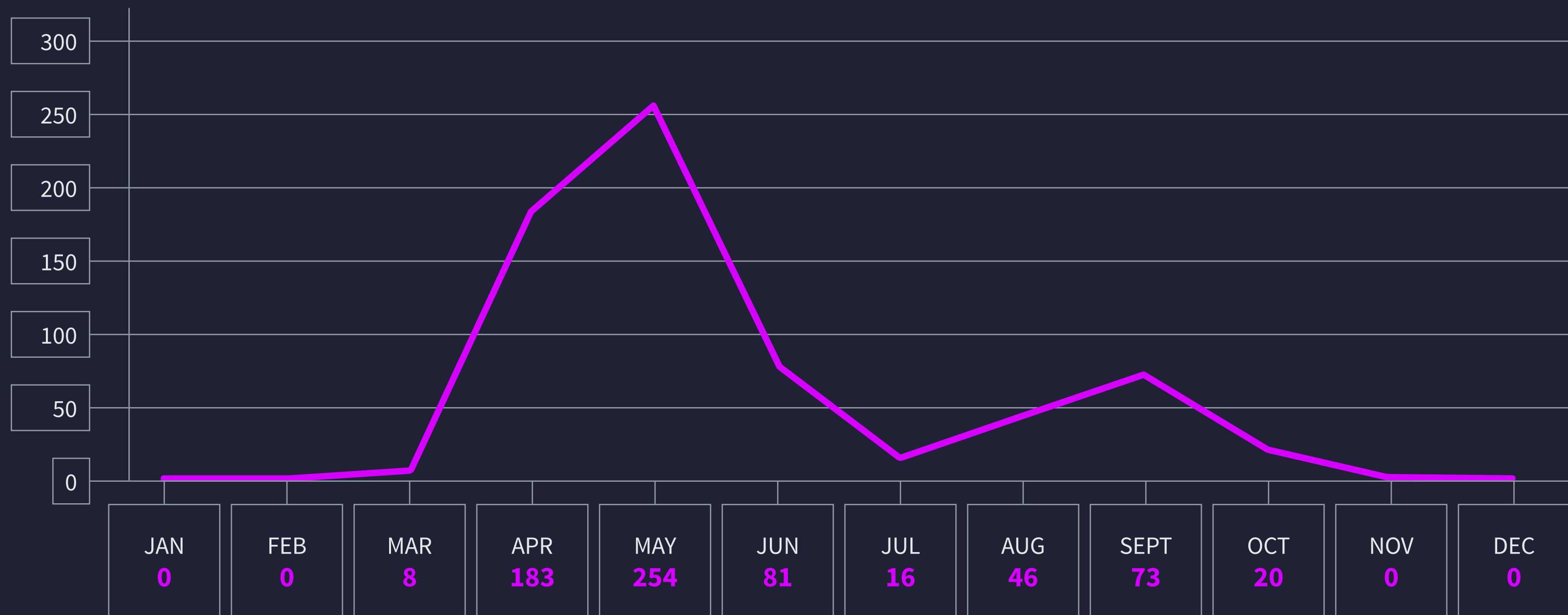


Leading up to the approaching 2020 monsoon season, April, May, and June saw the highest quantity of Dangerous Thunderstorm Alerts in India. This weather pattern is similar to the 2019 DTA data, with January and December only receiving a combined total of 3 Dangerous Thunderstorm Alerts.

DTA MONTHLY RANKINGS

Which months saw the most severe thunderstorms in 2020?

BANGLADESH Dangerous Thunderstorm Alerts BY MONTH

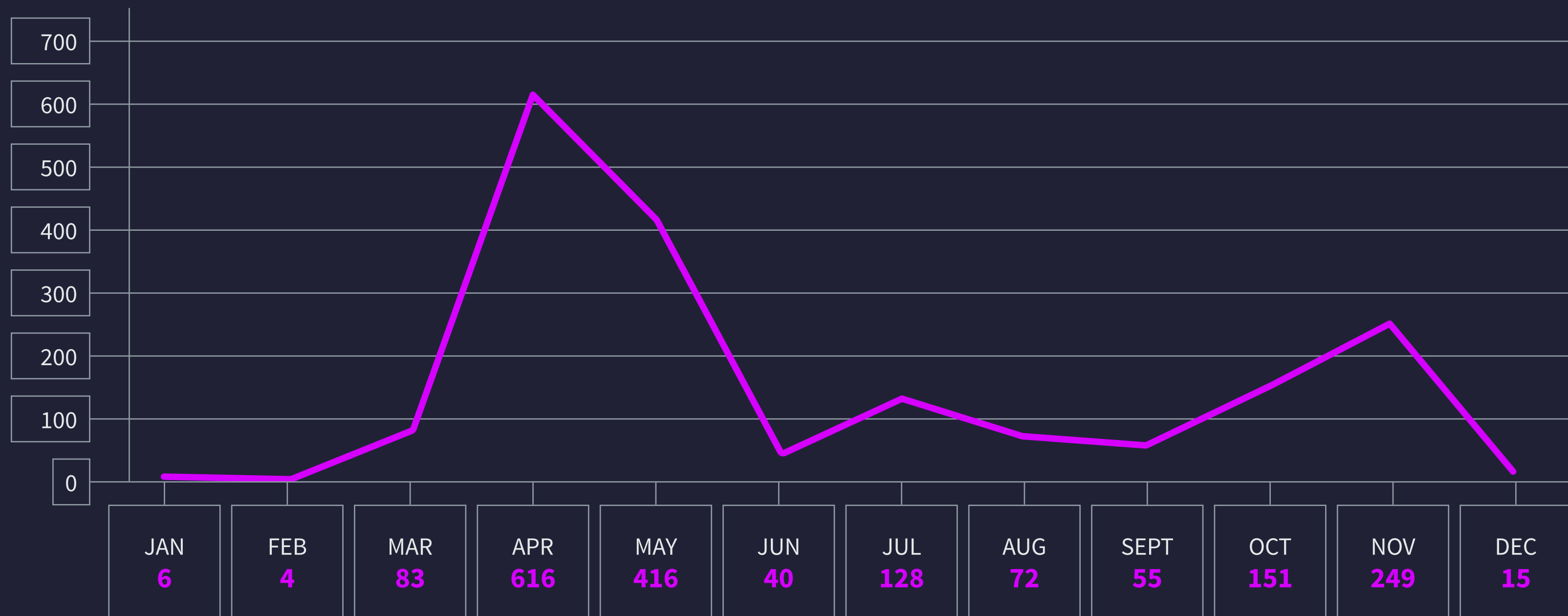


In Bangladesh, the highest number of Dangerous Thunderstorm Alerts was issued in April and May, for a combined total of 437 DTAs.

DTA MONTHLY RANKINGS

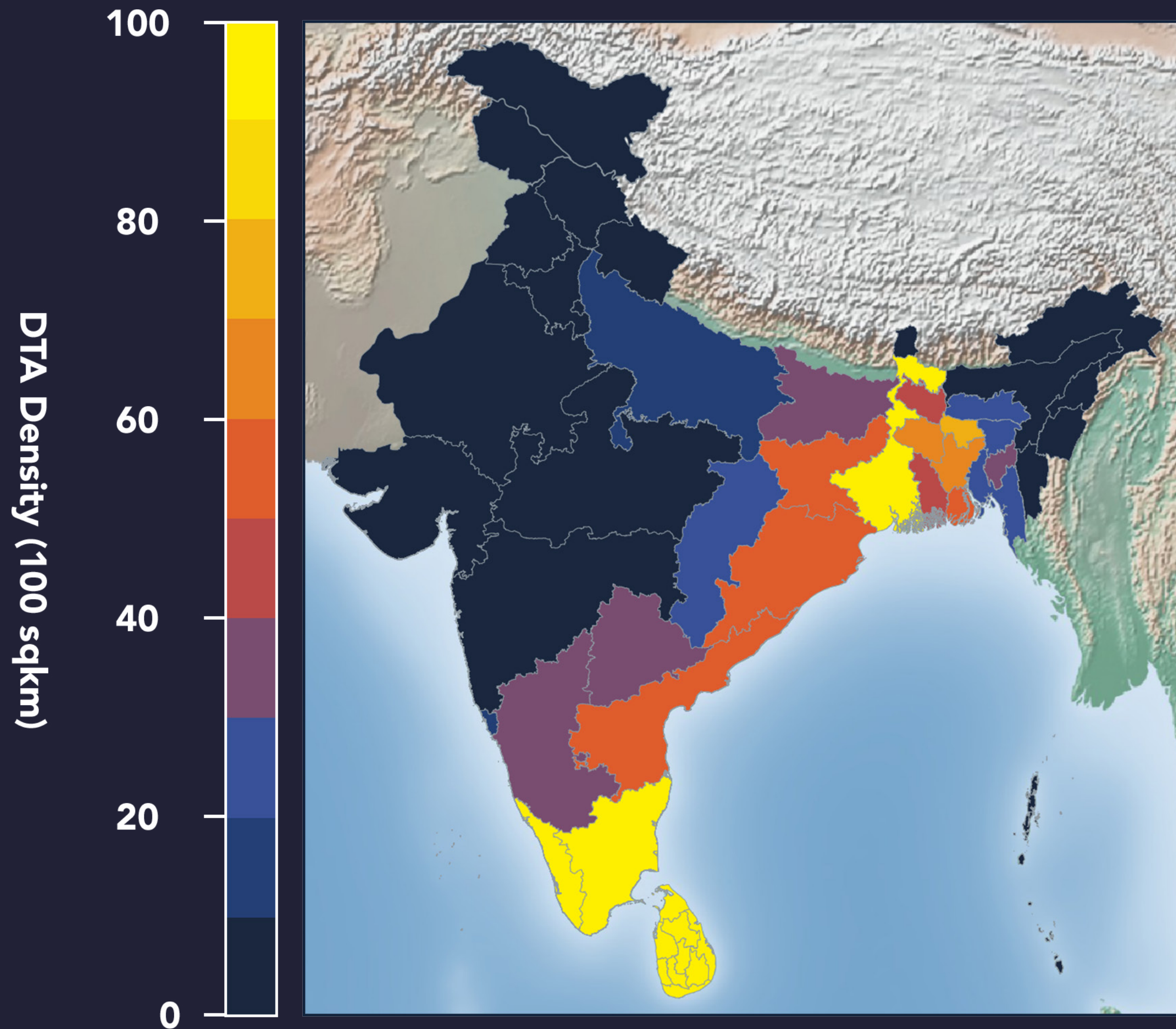
Which months saw the most severe thunderstorms in 2020?

SRI LANKA Dangerous Thunderstorm Alerts BY MONTH



Sri Lanka received many Dangerous Thunderstorm Alerts throughout the year, with each month experiencing at least some level of dangerous thunderstorm activity, signified by the DTA data, where each month received at least 4 Dangerous Thunderstorm Alerts. The highest concentration of DTAs were issued in April and May of 2020.

DANGEROUS THUNDERSTORM ALERTS DENSITY MAP



This map of Dangerous Thunderstorm Alert Density shows the regions that had the most DTAs per square kilometer between India, Bangladesh, and Sri Lanka.

The highest concentration of DTA density was in Sri Lanka, where Sabaragamuwa had the highest DTA density followed by Uva.

LIGHTNING IN INDIA, BANGLADESH, AND SRI LANKA

Severe weather and the dangers of lightning pose a great threat to the South Asian population, particularly in India, Bangladesh, and Sri Lanka. According to a study by the National Crime Records Bureau, since 2001, 2,360 people die in India every year due to lightning. While Bangladesh and Sri Lanka are physically smaller nations, severe lightning critically affects the populations of these countries as well.

This is due to two main factors:

1

India is susceptible to extreme amounts of heat and moisture, due to the country's proximity to the equator and the Indian Ocean. These factors contribute to acute thunderstorm weather throughout South Asia, as Bangladesh and Sri Lanka experience similar severe weather patterns.

2

There is a need for more weather safety awareness and lightning warning tools, to improve safety and effectively reduce risk for those exposed to lightning, i.e., those working outdoors.

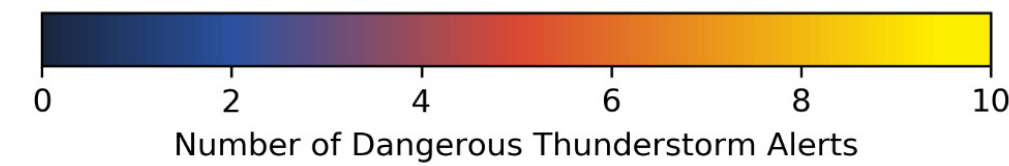
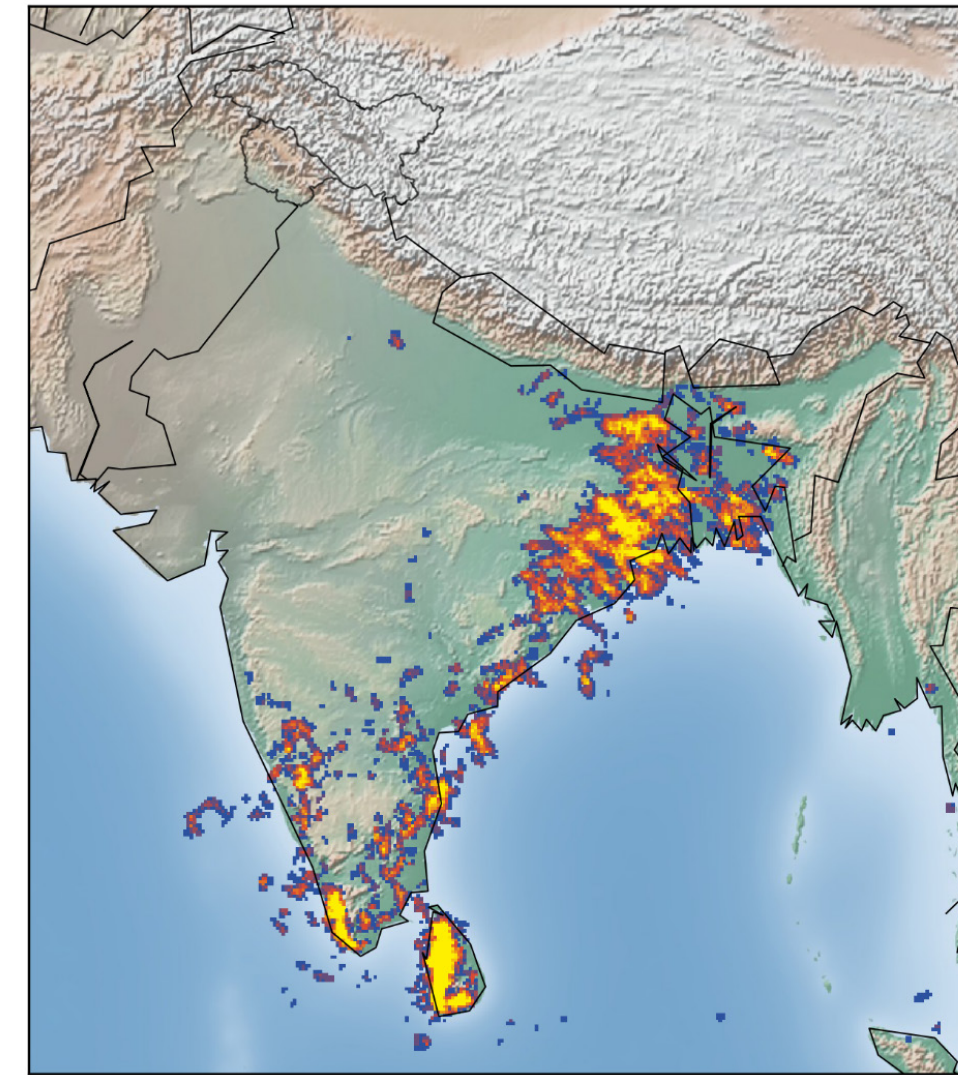
Our Earth Networks Global Lightning Network (ENGLN) solutions strive to provide as much lightning detection and alerting as possible to help save lives, protect property, and mitigate physical damage.



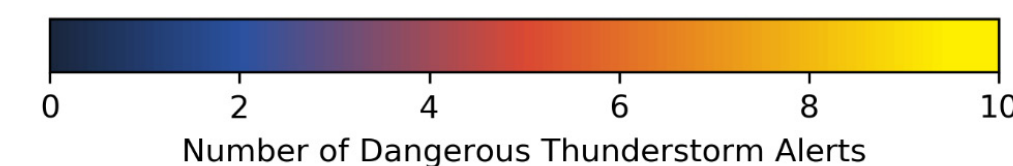
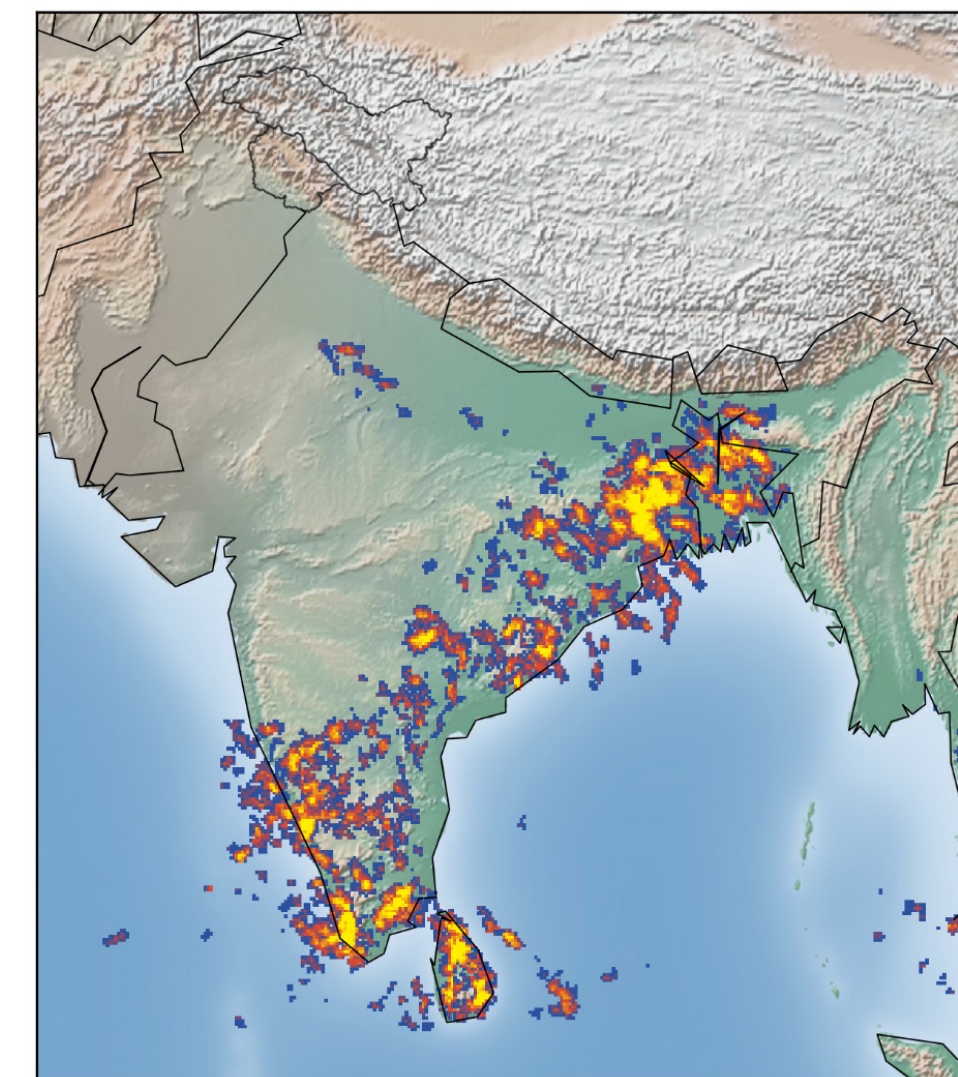
Monsoon

Case Study

In 2020, the rainfall average across India reached 109% of normal, just 1% less than the 2019 average of 110%. The monsoon season in South Asia historically occurs between late May or June, all the way through September. The monsoon season is economically beneficial to South Asian countries because agriculture relies on heavy rain for a prosperous crop. However, lightning and flooding pose major threats to these populations during monsoon season. In 2020, the Southwest Monsoon made landfall in India on May 17th, arriving five days ahead of its anticipated arrival. Furthermore, the monsoon left South Asia on September 28th, eleven days after its predicted departure. During this time, the total lightning pulses by months saw extreme increases during the months of April and May, coinciding with the farming seasons in India, Bangladesh, and Sri Lanka. A high amount of Dangerous Thunderstorm Alerts was issued in India, Bangladesh, and Sri Lanka during March, April, and May, coinciding with the approaching monsoon season. Tracking DTAs issued by month is useful during monsoon season to enable the safety of farmers in the fields. The 2020 monsoon season kicked off with the highest amount of Dangerous Thunderstorm Alerts being issued in May across all three countries: India, 2,118 DTAs, Bangladesh, 254 DTAs, and Sri Lanka, 216 DTAs. The total lightning pulse counts in the three countries gradually decreased, then peaked again in September to conclude the monsoon season.



May DTA Count
India / Bangladesh / SriLanka
2020



June DTA Count
India / Bangladesh / SriLanka
2020



Monsoon

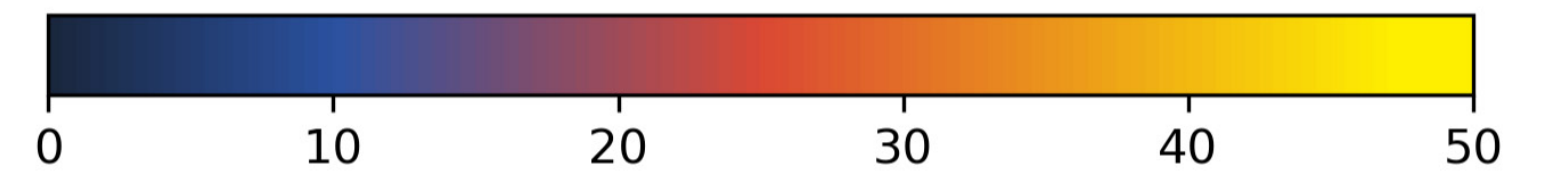
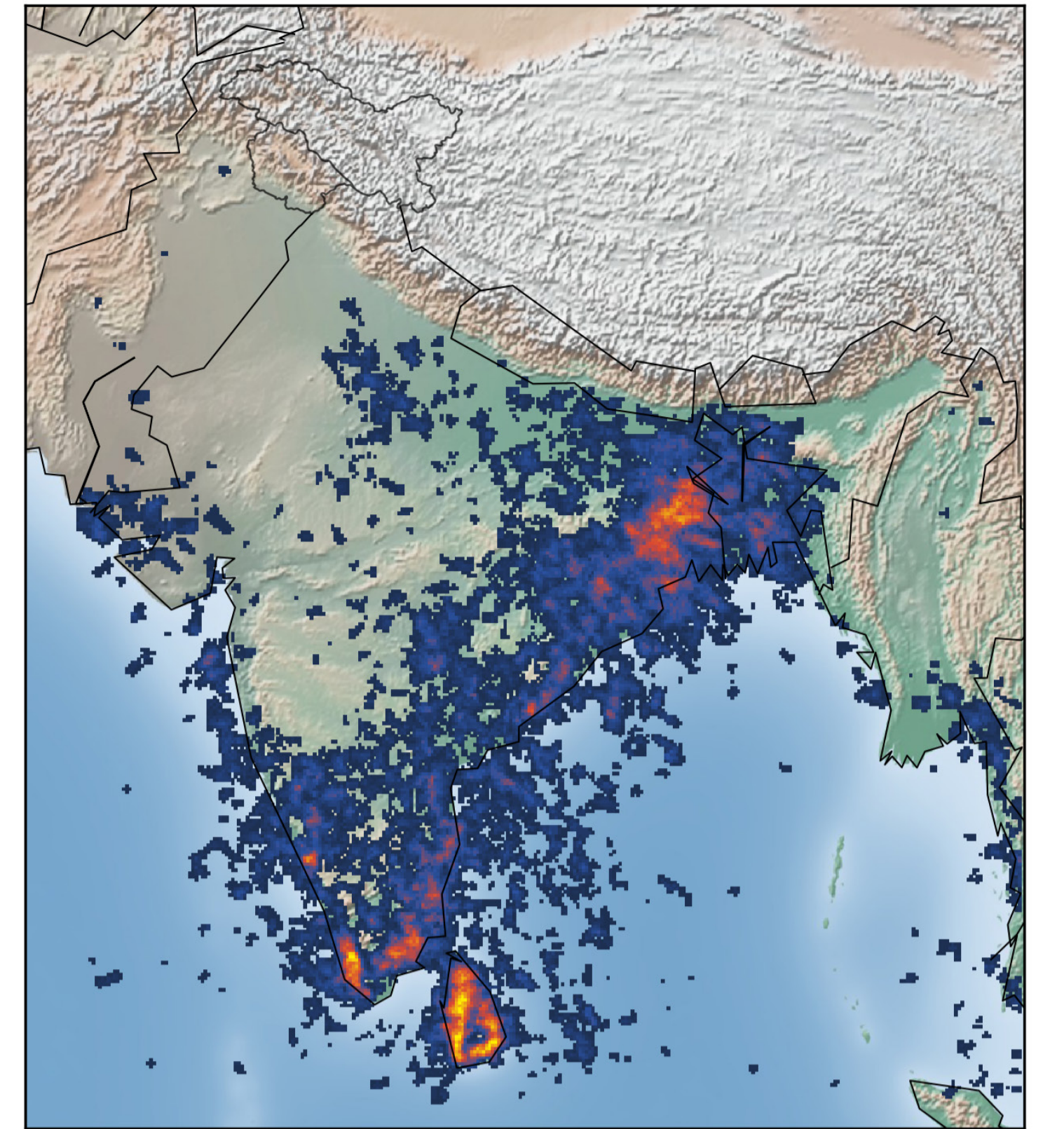
Case Study

As illustrated in the Dangerous Thunderstorm Alerts map, there were many hot spots in Sri Lanka.

The Northeastern India region is a typical hot spot for lightning, as well as Dangerous Thunderstorm Alerts.

During the pre-monsoon season, India undergoes an increase in severe storms due to the heat that comes before the Monsoon onset and the increasing moisture that occurs as the country heads toward the monsoon. This happens in April, May, and June primarily and in the Northeastern part of the country. The strong storms are called “Nor’westers” because they develop in the hills of Northeast India and move from the Northwest to the Southeast. They produce severe weather with frequent lightning, hail, very strong wind gusts and heavy rain. They are very similar to the severe storms we have in the U.S. that form in the High Plains and charge across the central U.S. in the Spring.

India gets more lightning and severe storms in the pre-monsoon (late March to early June) because a very strong temperature contrast exists between the surface and the upper levels and the increase in surface moisture that begins at that time.



Number of Dangerous Thunderstorm Alerts

Total DTA Count
India / Bangladesh / SriLanka
2020



WHAT WE'RE DOING TO HELP

It is important to understand severe weather patterns in order to provide effective, life-saving solutions. Earth Networks contributes to national, state, and municipal efforts to minimize lightning deaths, injuries, and damage throughout India by deploying and operating national total lightning detection networks and supporting stakeholders with much needed data and analytics.

Earth Networks' lightning sensors are located in most states in India. We work together with disaster management authorities in states like Andhra Pradesh, West Bengal, Odisha, Karnataka, Bihar, Assam, and Kerala.

Additionally, Earth Networks' lightning sensors are deployed in many other states and work collaboratively with agencies like NESAC (North East Space Applications Agency) and many universities. We have also deployed our sensors for the Indian Armed Forces and Ministry of Earth Sciences.

In Sri Lanka we have deployed a national network working with Dialog PLC, the largest telecom company which is using our data to send severe weather alerts to its subscribers.

We also work alongside top atmospheric scientists studying thunderstorm dynamics throughout the country. To learn more about Earth Networks' lightning alert solutions, access our [**technology guide**](#) for Early Warning Systems for Lightning in India. Our comprehensive lightning alerts save lives, reduce injuries, and minimize property damage in India.

THANK YOU

To learn how to implement this technology in India or for press inquiries, please contact Kumar Margasahayam at **+91 98453 45934** or by email at kmargasahayam@earthnetworks.com.

For additional insights or permission to use data or graphics from this report, please contact us at: info@earthnetworks.com or call **1 301 250 4000**.

To contact our partner SkyMet please email Ms. Megha Shankar Seth at info@skymetweather.com or call **+91 120 4094500**.

LIGHTNING PULSE COUNT APPENDIX

INDIA

STATE	CLOUD-TO-GROUND	IN-CLOUD	TOTAL PULSE COUNT	TOTAL THUNDER DAYS
Andaman and Nicobar	12,417	17,808	30,225	218
Andhra Pradesh	781,987	3,137,697	3,919,684	263
Arunachal Pradesh	22,600	3,627	26,227	221
Assam	153,296	186,116	339,412	252
Bihar	637,271	888,282	1,525,553	212
Chandigarh	237	158	395	41
Chhattisgarh	1,397,250	1,311,427	2,708,677	251
Dadra and Nagar Haveli	2,004	1,459	3,463	31
Daman and Diu	156	74	230	25
Goa	3,894	11,904	15,798	85
Gujarat	629,854	460,139	1,089,993	160
Haryana	59,618	117,580	177,198	162
Himachal Pradesh	22,108	9,344	31,452	193
Jammu and Kashmir	20,335	11,369	31,704	195
Jharkhand	1,024,179	1,288,332	2,312,511	228
Karnataka	526,049	2,531,763	3,057,812	251
Kerala	182,226	1,332,629	1,514,855	261
Lakshadweep	66	82	148	33
Madhya Pradesh	1,077,644	1,310,937	2,388,581	248
Maharashtra	1,101,347	1,353,571	2,454,918	244
Manipur	12,092	4,571	16,663	168
Meghalaya	125,382	234,110	359,492	219
Mizoram	38,008	28,140	66,148	171
Nagaland	15,260	7,754	23,014	180
NCT of Delhi	2,219	5,260	7,479	67
Odisha	1,657,638	2,037,381	3,695,019	250
Puducherry	2,626	20,685	23,311	137
Punjab	63,148	55,760	118,908	158
Rajasthan	292,726	513,125	805,851	213
Sikkim	2,062	1,901	3,963	83
Tamil Nadu	662,821	5,269,333	5,932,154	261
Telangana	573,075	1,309,224	1,882,299	234
Tripura	58,449	92,796	151,245	153
Uttar Pradesh	644,061	1,066,974	1,711,035	234
Uttarakhand	41,488	26,096	67,584	213
West Bengal	1,176,810	1,873,076	3,049,886	242

LIGHTNING PULSE COUNT APPENDIX

BANGLADESH

DIVISION	CLOUD-TO-GROUND	IN-CLOUD	TOTAL PULSE COUNT	TOTAL THUNDER DAYS
Barisal	90,283	128,135	218,418	168
Chittagong	156,238	204,527	360,765	201
Dhaka	166,406	321,045	487,451	200
Khulna	168,394	259,146	427,540	210
Mymensingh	100,110	223,737	323,847	181
Rajshahi	178,654	371,978	550,632	188
Rangpur	170,916	265,708	436,624	178
Sylhet	84,374	122,944	207,318	194

SRI LANKA

PROVINCE	CLOUD-TO-GROUND	IN-CLOUD	TOTAL PULSE COUNT	TOTAL THUNDER DAYS
Central	21,592	810,951	832,543	190
Eastern	59,416	1,921,480	1,980,896	216
North Central	86,722	2,226,769	2,313,491	182
North Western	64,981	1,631,116	1,696,097	174
Northern	74,801	1,453,363	1,528,164	176
Sabaragamuwa	74,734	1,629,105	1,703,839	232
Southern	41,288	734,346	775,634	208
Uva	78,981	2,412,249	2,491,230	207
Western	70,214	1,068,393	1,138,607	211

DTA COUNT APPENDIX

INDIA

STATE	TOTAL COUNT
Andaman and Nicobar	0
Andhra Pradesh	868
Arunachal Pradesh	0
Assam	45
Bihar	291
Chandigarh	0
Chhattisgarh	321
Dadra and Nagar Haveli	0
Daman and Diu	0
Goa	4
Gujarat	140
Haryana	29
Himachal Pradesh	0
Jammu and Kashmir	0
Jharkhand	422
Karnataka	718
Kerala	438
Lakshadweep	0
Madhya Pradesh	144
Maharashtra	262
Manipur	0
Meghalaya	53
Mizoram	3
Nagaland	0
NCT of Delhi	0
Odisha	820
Puducherry	6
Punjab	1
Rajasthan	74
Sikkim	0
Tamil Nadu	1,323
Telangana	347
Tripura	37
Uttar Pradesh	249
Uttarakhand	0
West Bengal	852

BANGLADESH

DIVISION	TOTAL COUNT
Barisal	73
Chittagong	78
Dhaka	129
Khulna	94
Mymensingh	78
Rajshahi	126
Rangpur	68
Sylhet	35

SRI LANKA

PROVINCE	TOTAL COUNT
Central	79
Eastern	218
North Central	322
North Western	231
Northern	209
Sabaragamuwa	194
Southern	116
Uva	330
Western	136