

THUNDERSTORM SURVEILLANCE REPORT UNITED KINGDOM 2023



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TERMINOLOGY

To help you better understand the information in this report, here are the definitions for some of the most frequently used terms.

- **Thunder day:** Each day that lightning was detected in a given area.
- **Lightning density:** The best current representation of thunderstorm activity is lightning density, which is the number of cloud-to-ground (CG) lightning flashes per km² per year.
- **Lightning flash:** All current discharges and electrical impulses from a lightning event. A lightning flash can occur within the same cloud (IC), between a cloud and the ground (CG) or between two clouds (CC). A lightning flash can be composed of one stroke or many strokes, which are current discharges and electrical impulses.
- **Cloud-to-ground (CG) lightning flash:** Discharge of current of a certain intensity circulating between the cloud and the ground. Abbreviated to CG (Cloud-to-Ground).

To be able to compare this data with the data collected, METEORAGE counts the main current pulse circulating between the cloud and the ground, defined in this report by the term “Lightning cloud-to-ground (CG) lightning flash”.



ABOUT THE LIGHTNING REPORT

The lightning report is based on data provided by [METEORAGE's](#) lightning detection network in Europe.

Our expertise draws on more than ten years of analysis, observation and data collected in Europe, and more broadly worldwide. We have over 36 years' expertise in France.

The performance of our network has been validated scientifically and delivers the best possible results with:

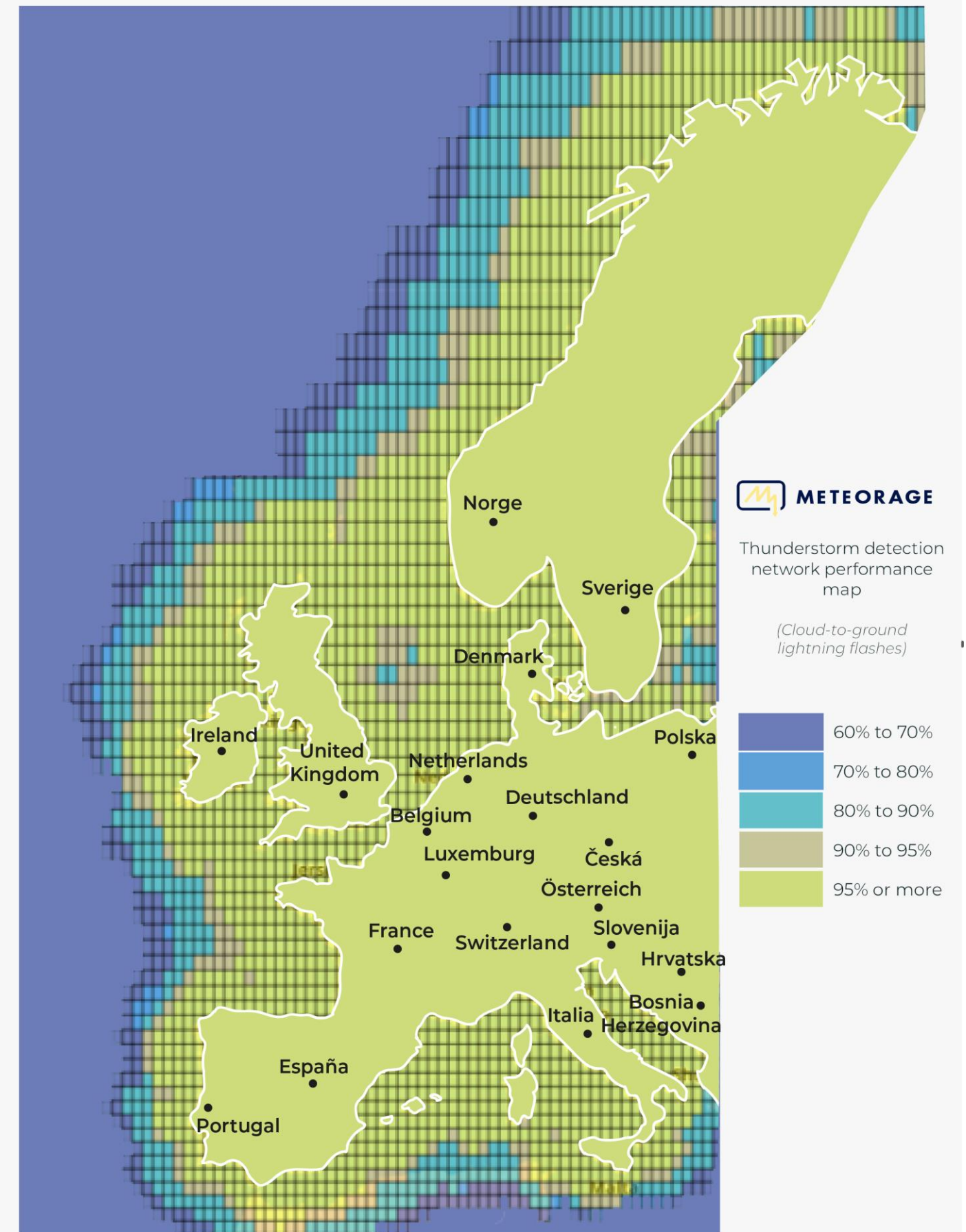
- > 98% lightning flash detection,
- a median detection accuracy of 100 meters,
- > 95% distinction made between cloud-to-ground (CG) lightning flashes and intra-cloud lightning flashes.

The METEORAGE network consists of more than 100 lightning sensors, calculators and a processing system that manages the databases. Our lightning sensors are based on the Vaisala technology, currently considered one of the best in the world. Our network achieves levels of performance validated by numerous scientific studies and publications.

This 2023 report is based on the most comprehensive source of information in the United Kingdom. The data, densities, rankings and thunder days in this report are dated from 1 January 2023 to 31 December 2023.

The information we provide concerns cloud-to-ground (CG) lightning flashes and lightning density.

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- Shutterstock
- Unsplash (Casey Horner - Frantisek Duris)
- Xavier Delorme



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ABOUT METEORAGE



Created in 1987, METEORAGE, a subsidiary of Météo France (65% stake) and Vaisala (35% stake), is an innovative French company and member of French Tech, which operates the benchmark lightning detection network in Europe.

METEORAGE's mission is therefore to deliver information services, lightning risk prevention and decision-making services tailored to the issues faced by its users and applied to numerous sectors (industry, transportation, networks, leisure, tourism, meteorological services, aviation, defense, wind turbines, etc.). Outside Europe, METEORAGE provides the same services using the GLD network.

On the strength of its experience in network design and operation, and in generating decision-making services, METEORAGE also offers turnkey thunderstorm risk prevention system solutions for national meteorological services and large institutional users.

Its expertise enables it to respond to the major (human, environmental, material and economic) security issues of its customers and partners.

METEORAGE is **ISO 9001 certified** and **Qualifoudre** approved. In 2019, it was awarded the **OR'NORMES** Trophy by AFNOR in the category "Protecting people and/or the environment".

It is committed to **CSR** and its policy has been awarded the "Confirmed" level by AFNOR Certification—internationally recognized under the Responsibility Europe label. This represents an important recognition of the ethics and actions implemented daily by METEORAGE. Corporate social responsibility has been an integral part of its culture and organization for more than 35 years.

The driving purpose of METEORAGE, that of saving lives and protecting property by mitigating the risks generated by lightning, is part of its mission as a company serving the community with an ethical approach adopted by each of its employees, who are committed ambassadors.

*source : Cooper, M. A. & Holle, R. L. Reducing Lightning Injuries Worldwide. Springer Natural Hazards (2019).

Why does METEORAGE detect and study thunderstorms and lightning?

To know its enemies better!

Each year, storm phenomena and lightning are at the origin of millions of cases of electrical damage and more than 20,000 deaths on Earth.*

METEORAGE can use its knowledge to provide its customers and partners with expertise and solutions to prevent the risks affecting people and infrastructure, through alarm services, real-time monitoring of storm phenomena, post-thunderstorm studies, etc.

METEORAGE is also actively involved in raising public and media awareness of the risks and consequences of lightning and thunderstorms.

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WEATHER- CLIMATE- ELECTRICAL ACTIVITY ANALYSIS

2023



The month of June 2023 set a record in the United Kingdom, making it the most lightning-struck month of June since METEORAGE records began.

Due to the presence of a cold-air pool off the Atlantic coastline, numerous thunderstorms developed over western Europe, particularly as they headed toward England.

Heavy thunderstorms broke over the United Kingdom between June 11 and 12, 2023.

Almost 10,000 cloud-to-ground CG lightning flashes were recorded by the METEORAGE network, representing almost one third of the annual lightning activity.

According to the expert

“With more than 31,300 cloud-to-ground (CG) lightning flashes recorded in 2023, the United Kingdom experienced its third most lightning-struck year since METEORAGE records began, overtaking 2020 and 2016.

The beginning of the year came with a relatively stable atmosphere, in line with climate normals. However, storm activity rose in late spring and early summer, marked by strong contrasts in temperature.

The month of June 2023 was particularly active in this regard, with 15,068 CG lightning flashes recorded, making it the stormiest month of June since records began. Similarly,

September 2023 ranked as the second most storm-hit month of September, with 5,694 CG lightning flashes.

A few storm fronts continued to be observed during September, before electrical activity weakened as fall progressed. Ultimately, electrical activity in the United Kingdom was therefore quite varied over the year 2023.”

Joris Royet, METEORAGE Meteorology Project Manager

SIGNIFICANT EVENTS UK 2023

2023

2023 : THIRD MOST LIGHTNING-STRUCK YEAR SINCE 2006

With nearly 31,600 cloud-to-ground (CG) lightning flashes and 172 thunder days in one year, 2023 was the third most lightning-struck year in United Kingdom since 2006, when our records began in this area, just behind 2016 (35,907 CG) and 2020 (37,320 CG).

JUNE 2023 : MOST LIGHTNING-STRUCK MONTH IN 2023 & 2ND MOST LIGHTNING-STRUCK MONTH SINCE 2006

With more than 15,068 cloud-to-ground (CG) lightning flashes and 18 thunder days, June 2023 was the most lightning-struck month in 2023 in UK and the 2nd most lightning-struck month observed in the United Kingdom. The month of August 2020 remains the most lightning-struck month, with nearly 24,000 cloud-to-ground lightning flashes.

JUNE
2023

JUNE
11 & 12
2023

JUNE 11TH AND 12TH: ELECTRICALLY CHARGED DATES IN THE UNITED KINGDOM

The most lightning-struck days in the UK, with almost 10,000 cloud-to-ground (CG) lightning flashes detected in 2 days. Those two days represent one third of the annual lightning activity.

ENGLAND : THE MOST LIGHTNING STRUCK COUNTRY

The United Kingdom's most lightning-struck country in 2023, with 22,578 cloud-to-ground (CG) lightning flashes and 129 thunder days. The highest electrical activity was recorded there on June 12TH, 2023.



BERKSHIRE (ENGLAND): THE MOST LIGHTNING-STRUCK COUNTY

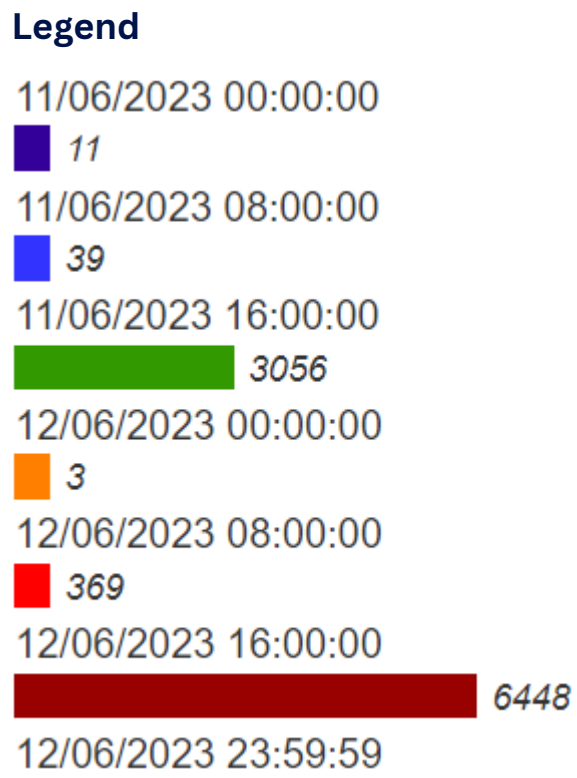
The United Kingdom's most lightning-struck county in 2023, with a lightning density* of 0.4182. The highest electrical activity was recorded there on June 11TH, 2023 (most lightning-struck day of the county since 2006).

*Lightning density: number of cloud-to-ground (CG) lightning flashes per km² per year.

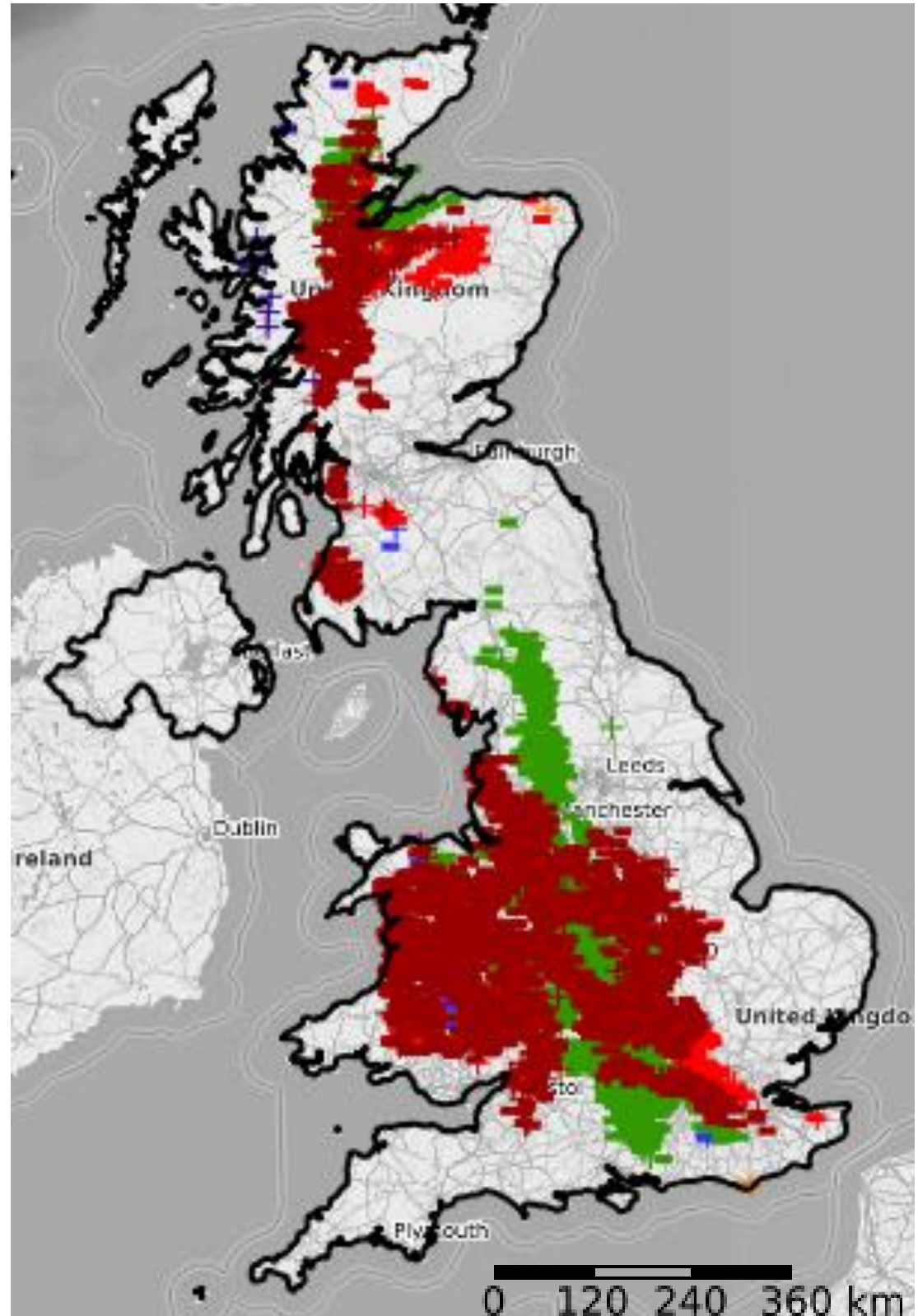
SIGNIFICANT STORM PHENOMENA 2023

JUNE 11 & 12: ELECTRICALLY CHARGED DATES IN THE UNITED KINGDOM

**Lightning flash map
June 11 and 12, 2023
(number of cloud-to-
ground lightning
strikes CG)**



Number of cloud-to-ground (CG) lightning
flashes detected
Per 8-hour period



Copyright : METEORAGE

Numerous thunderstorms developed over western Europe, particularly as they headed toward England, with two distinct waves of storms.

The first one hit the country around June 11, with low-layer convergences between an east wind driven by an anticyclone north of Europe and an oceanic west wind advected by the system of low pressures over the Atlantic. These convergences, combined with slight altitude forcing, encouraged convection within an air mass located near the ground and which was already warm. That stormy wave produced more than 3,000 strikes.

A second rainstorm wave occurred the following day, also associated with slight altitude forcing and low-layer convergences. It was even more electrically charged, with over 6,800 CG lightning flashes detected. Overall, heavy rainfall was observed locally under the most intense thunderstorms, accompanied by some hailfall producing small-diameter hailstones.

The particular intensity of this storm episode was due to the electrical activity, which was found to be significant; almost 10,000 GC lightning flashes observed by the network over these two days, amounting to nearly one-third of the annual electrical activity.

Contributor:
Joris Royet
Meteorology Project Manager
METEORAGE

LIGHTNING IN THE UK: RANKING OF COUNTRIES IN 2023

**Lightning density
of cloud-to-ground (CG)
lightning flashes per
km²/year**

**Number of
cloud-to-ground (CG)
lightning flashes**

ENGLAND

0.1727

22,578

WALES

0.1626

3,405

NORTHERN IRELAND

0.1107

1,571

SCOTLAND

0.0507

4,022



LIGHTNING IN ENGLAND: TOP 10 COUNTIES IN 2023

Ranking by lightning density of cloud-to-ground (CG) lightning flashes per km²/year

1	BERKSHIRE	0.41
2	HEREFORDSHIRE	0.40
3	OXFORDSHIRE	0.39
4	WARWICKSHIRE	0.37
5	GREATER MANCHESTER	0.35
6	LINCOLNSHIRE	0.32
7	STAFFORDSHIRE	0.31
8	CHESHIRE	0.30
9	BEDFORDSHIRE	0.28
10	CAMBRIDGESHIRE	0.27

Ranking by number of cloud-to-ground (CG) lightning flashes

1	LINCOLNSHIRE	2,284
2	OXFORDSHIRE	1,027
3	CAMBRIDGESHIRE	944
4	NORTH YORKSHIRE	931
5	NORFOLK	917
6	HEREFORDSHIRE	873
7	STAFFORDSHIRE	861
8	SHROPSHIRE	823
9	WARWICKSHIRE	751
10	CHESHIRE	728

LIGHTNING IN NORTHERN IRELAND: RANKING OF COUNTIES IN 2023

Ranking by lightning density of cloud-to-ground (CG) lightning flashes per km²/year

1	FERMANAGH	0.15
2	TYRONE	0.13
3	LONDONDERRY	0.12
4	ANTRIM	0.10
5	DOWN	0.06
6	ARMAGH	0.06

Ranking by number of cloud-to-ground (CG) lightning flashes

1	TYRONE	448
2	ANTRIM	310
3	FERMANAGH	295
4	LONDONDERRY	290
5	DOWN	164
6	ARMAGH	81

LIGHTNING IN SCOTLAND: RANKING OF COUNTIES IN 2023

Ranking by lightning density of cloud-to-ground (CG) lightning flashes per km²/year

1	HIGHLANDS	0.11
2	WEST DUNBARTONSHIRE	0.07
3	MORAY	0.07
4	SOUTH AYRSHIRE	0.07
5	FALKIRK	0.05
6	EAST RENFREWSHIRE	0.03
7	ORKNEY ISLANDS	0.03
8	CITY OF GLASGOW	0.03
9	RENFREWSHIRE	0.03
10	INVERCLYDE	0.03

Ranking by number of cloud-to-ground (CG) lightning flashes

1	HIGHLANDS	2,902
2	MORAY	172
3	PERTH AND KINROSS	126
4	ARGYLL AND BUTE	120
5	DUMFRIES AND GALLOWAY	110
6	BORDERS	107
7	ABERDEENSHIRE	88
8	SOUTH AYRSHIRE	86
9	STIRLING	50
10	WESTERN ISLES	37

LIGHTNING IN WALES: RANKING OF COUNTIES IN 2023

Ranking by lightning density of cloud-to-ground (CG) lightning flashes per km²/year

1	POWYS	0.30
2	WREXHAM	0.27
3	LONDONDERRY	0.21
4	DENBIGHSHIRE	0.18
5	CEREDIGION	0.17
6	GWYNEDD	0.16
7	FLINTSHIRE	0.14
8	TORFAEN	0.11
9	NEATH PORT TALBOT	0.09
10	CONWY	0.09

Ranking by number of cloud-to-ground (CG) lightning flashes

1	POWYS	1,697
2	GWYNEDD	481
3	CEREDIGION	348
4	CARTMARTHESHIRE	215
5	MONMOUTHSHIRE	215
6	DENBIGHSHIRE	170
7	WREXHAM	152
8	CONWY	118
9	FLINTSHIRE	80
10	NEATH PORT TALBOT	51



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