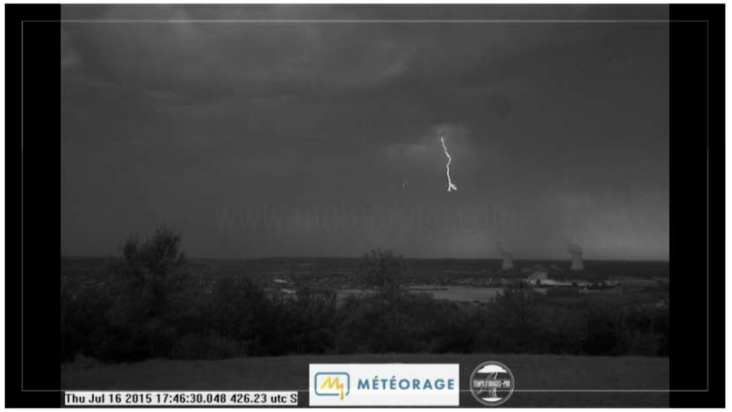
Detecting lightning without onsite sensors

MÉTÉORAGE

LIGHTNING INFORMATION AND SOLUTIONS



Who are we?

MÉTÉORAGE
LIGHTNING INFORMATION AND SOLUTIONS

LIGHTNING DETECTION

since 1987

AN INTERNATIONAL CENTRE

for storm monitoring

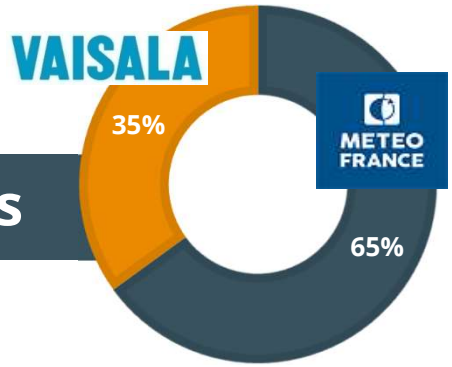
OUTSTANDING TECHNOLOGY

and significant R&D

CAPABILITIES AND QUALIFICATIONS

recognised internationally

Our shareholders



A **French SME** of **international stature**

Qualifoudre

The meteorology of lightning

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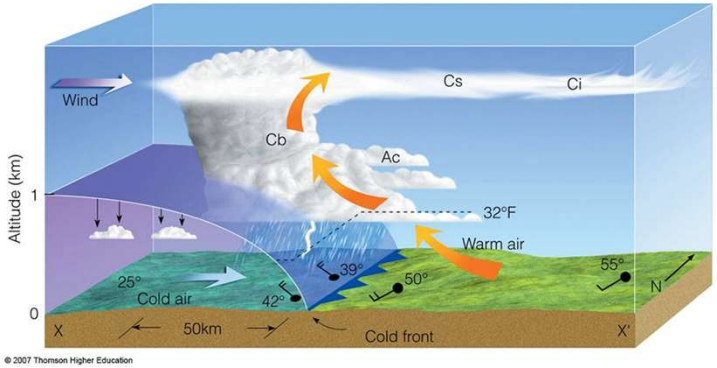
Storm formation

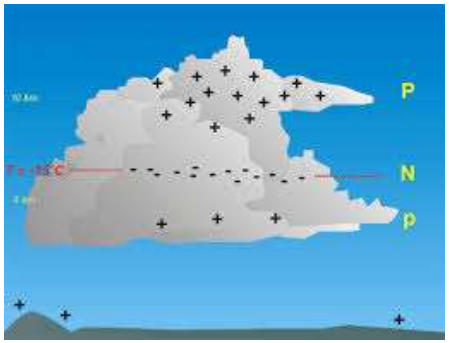
Air masses of **different temperature** and **humidity** are needed to produce a storm

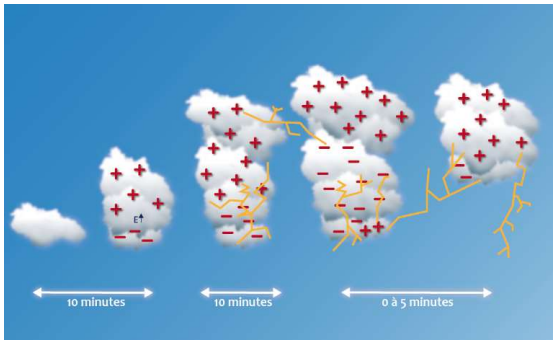


a. Hot, humid air tends to rise in the atmosphere (**convection**)
b. As it rises, it cools down, leading to the formation of water, then ice (**condensation**)
c. These transformations generate electrical charges (**electrification**)

Lightning formation

An **electrical field** intense enough to make the air conductive is needed to produce a flash





a. Condensation produces **positive and negative ions**
b. The electrical charges are distributed over three **superimposed levels**.
c. An electrical field appears between the layers, and increases until the air **'cracks'**
d. Electrical currents flowing through ionised channels emit **radio signals**

Different types of lightning flashes

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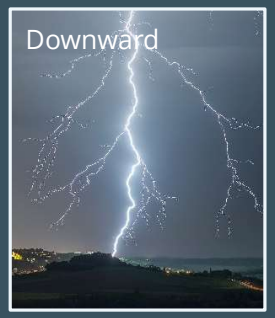
90%
of storm activity takes place in the clouds



10%
of storm activity takes place between cloud and ground

A distinctive concept...

BEFORE

1987

AFTER

The **'keraunic level'**: human observers record the days on which thunder is heard

In France, a start-up decides to set up the **world's first nationwide equipment network**, to detect lightning and commercialise this information

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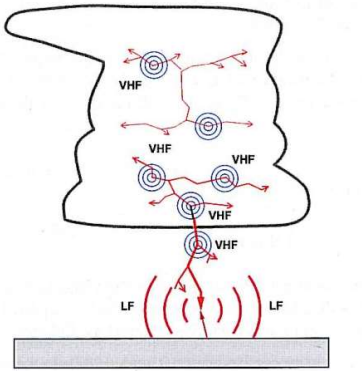
For **+30 years**

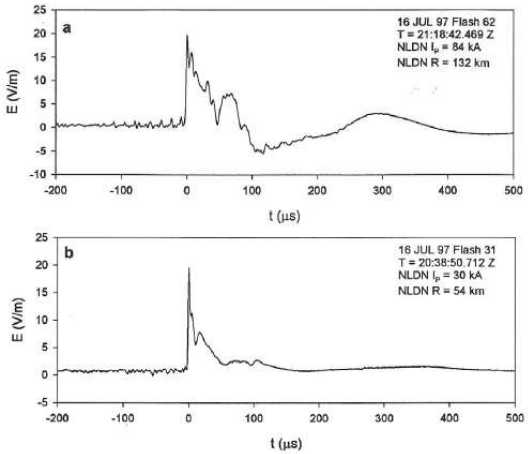
24/7 storm monitoring

Unique expertise in storm risk analysis and prevention

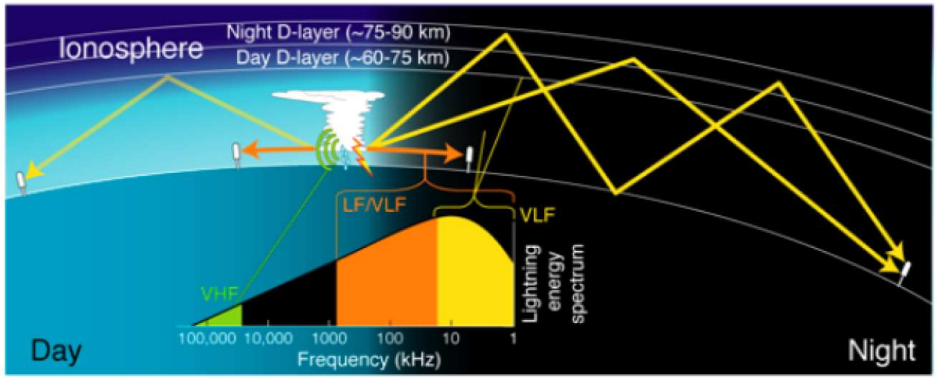
Location identification techniques

Radio signatures

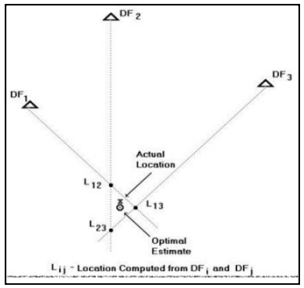




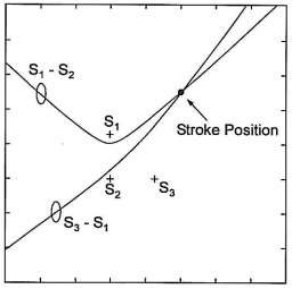
Propagation of radio signals



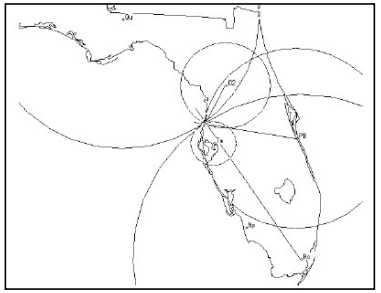
Radio direction finding techniques



Triangulation



Difference of arrival time



IMProved Accuracy by Combined Technology (IMPACT)

Lightning localization by triangulation

One technology, different options

Stand-alone sensors

- Expensive
(equipment investment & maintenance)
- No localization
(angular sector)
- Autonomous

...still better than field mills

VHF networks

- Very expensive
- Very precise
- Research applications

LF networks

Coverage: region to multiple countries

- Baseline: 300km
- 100-150m localization accuracy
- Detection effectiveness > 98%

VLF networks

Coverage: worldwide

- Baseline: 4000km
- 1.5km localization accuracy
- Detection effectiveness > 80%

Vaisala's GLD360 global network

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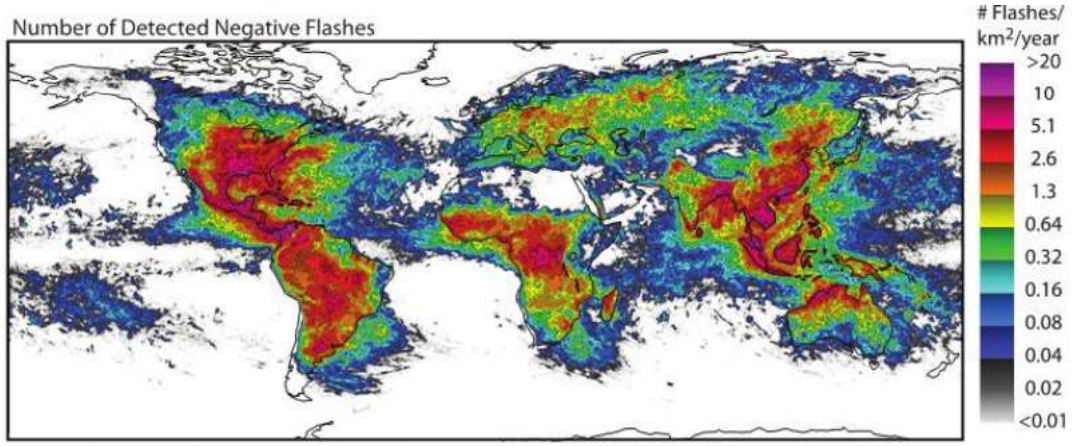
Long-distance detection… for global coverage

- **VLF frequency** range (~500 Hz – 48 kHz)
- Measure of **arrival angle** and **time**
- Use of a **waveform** database
- Correction of **propagation effects** (ionospheric height variation, soil conductivity, ionospheric reflections, etc.)



Available parameters

- ✔ Date and time to 1/10th of a microsecond
- ✔ Geographical location of arcs
- ✔ Detection of most intense intra-cloud lightning
- ✔ Amplitude and polarity of arc current
- ✔ Location identification quality
- ✔ Intra-cloud/cloud-to-ground differentiation

Detection effectiveness > 80%
Localization accuracy: 1.5 km

(Manufacturer data)

Evaluating a network's performance

Equipment towers

Storm chaser videos

Press and web articles

Our service offer

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EVALUATE

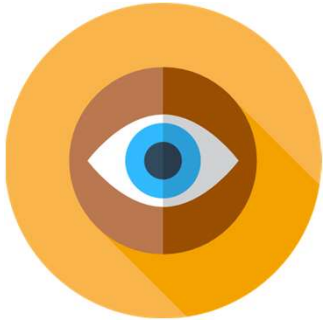
the lightning risk

Lightning statistics

ANTICIPATE

an immediate risk

Alert services



FOLLOW

the thunderstorm's evolution

Observation and visualisation

CHECK

the situation after a thunderstorm

Lightning analysis

Thanks for listening

You can find us on

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Types of lightning data

Definition of lightning data

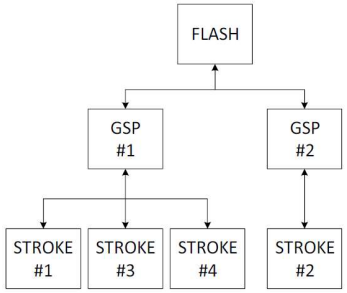
Information about the occurrence and characteristics of an electric discharge in a storm:

date, location, intensity and polarity of current of all discharges. Types of discharge: Intra-cloud, Cloud-to-ground, Contact point or Return stroke

Type of lightning data

Intra-cloud | Cloud-to-ground | Contact point

Hierarchy of data and applications



- Communication with general public, lightning strike density (Ng), alert service...
- Synthetic incident correlation, lightning strike density (Nsg)...
- Precise incident correlation, fine discharge analysis

Example of a branched flash (2 CPs) consisting of 4 arcs