

VISUAL A PHOTOGRAPHIC RECORD OF 150 YEARS OF FLOODS IN MEDITERRANEAN ARC COUNTRIES RECOLLECTIONS



“THERE’S NOTHING NEW EXCEPT
WHAT HAS BEEN FORGOTTEN” Rose Bertin*



A district in Toulouse after the Garonne
flooded on 23 June 1875.

Source: gallica.bnf.fr
National Library of France.



The Salines neighbourhood in Ajaccio after a serious
incident of surface runoff on 11 June 2020.

photo: Philippe Casanova.

Terms followed by an asterisk are defined in the glossary on page 108.

PRÉFACE

The Covid-19 pandemic has shown us the importance of preparation and adaptation for our ability to recover. The same applies to other major hazards, especially those related to flooding.

This response is primarily based on sharing knowledge about past events and their harmful effects to foster a risk awareness culture common to us all. This is the goal of preventive information introduced by the French Parliamentary Act of 22 July 1987 granting the public the right to information, together with duties for Prefects and Mayors.

In addition to regulatory instruments, such as notices, flood level markers, documents held in town halls, specialist websites, etc., comment and reactions have always stressed the importance of recollections and sharing them widely to forge mutual awareness.

This book meets this goal for the highly vulnerable Mediterranean region, be it from the prevalence of rainstorm events or the wide-ranging human, economic, property-based and ecological implications.

With several decades of experience working locally to understand and assess natural hazards, the authors' choice of events and recollections, together with photographs, maps, historical accounts as well as 'before-and-after' comparisons should relate to everyone.

No longer will be able to say that we didn't know!

Jacques Faye



Jacques Faye : trained as an Architect before joining the French civil service, working as a town planner in several fields, such as heritage, nature sites, land-use planning and training architects. He managed the major hazard preventive information unit from 1997 to 2018, in successive government ministries tasked with the environment.

In addition to regulatory matters, he also introduced and developed tools to foster a risk awareness culture, such as the Prim.net web portal, education programmes for schools and the PPMS (specific safety measures plan) with Iffo-Rme institute, the use of RDS with Radio France, involving schools of architecture to create a specialised DSA degree course and gathering recollections and records of natural disasters with the IHMc.

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FOREWORD

Photography has historically been used to aid our recollections. Whether artistic or not, photographs have captured the majority of many past floods that have hit the Mediterranean arc region.

Images of historic floods help us understand, not to forget and to persuade others.

They recount times gone by, get people talking and encourage dialogue.

Sometimes, their existence provides the proof of a forgotten reality, while they frequently rekindle painful memories of devastating events.

All these aspects make photos an irreplaceable tool to foster and relay risk awareness in our region.

Our goal with this book is to use photographs to show that floods are part of the history of the Mediterranean arc.

Without seeking to be exhaustive in our choices, we have instead selected a collection of images to take a journey through space and time to flooded and flood-prone areas in a Mediterranean arc.

These photos act as a reminder that our local areas and flooding are inseparable. They also invite us to learn from the past to better prepare for the future and adapt to this reality with humility.

Ghislaine Verrhiest-Leblanc

The Inter-regional Mediterranean Arc Flood Unit

This geo-guide was produced with support from the Inter-regional Mediterranean Arc Flood Unit.

The flood unit was established in 2017 by the Prefect for the South Defence and Safety Zone. It covers those mainland French regions most exposed to torrential flooding, such as Provence-Alpes-Côte d'Azur, Occitanie, Corsica, as well as the Drôme and Ardèche Departments.

The unit reports to the DREAL* PACA which is also the DREAL* branch office here, in the local area.

The flood unit strives to improve the performance of flood risk prevention schemes and ensure that such schemes are applied consistently from zone to zone and within the Mediterranean Arc as a whole. To do this, it works on inter-Ministerial and multi-partnership initiatives that foster synergies between

civil protection and risk prevention stakeholders. The working method used is based on grass-roots approaches to apply the principles, experiment and even innovate, to learn lessons or promote useful guidance for all stakeholders in the Mediterranean Arc.

This book contributes to one of the key areas of work in the area strategy led by the flood unit: boosting preventive information and fostering a risk awareness culture towards flooding.

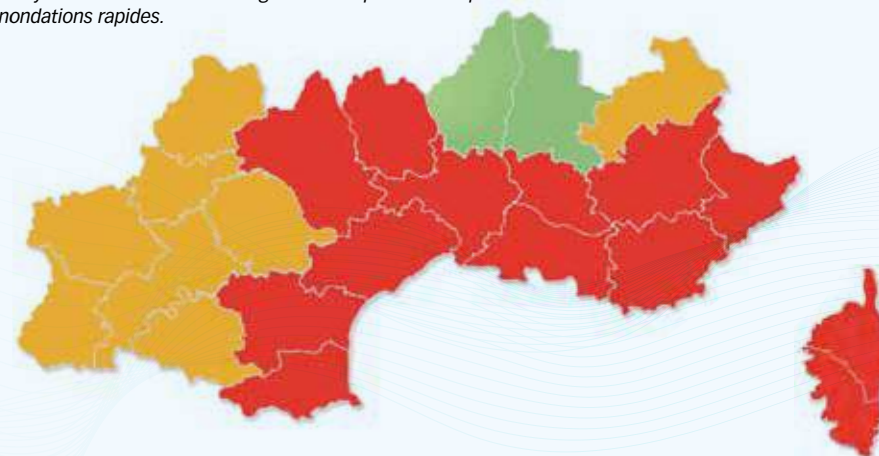
04

Area covered by the Mediterranean Arc Flood Unit

■ Departments belonging to the Mediterranean Arc outside the South Defence and Safety Zone.

■ Departments belonging to the Mediterranean Arc within the South Defence and Safety Zone.

■ Other Departments in the South Defence and Safety Zone also exposed to heavy rainfall and flash floods également exposés à des pluies intenses et des inondations rapides.



The authors



Jean-Marc Décombe

Jean-Marc Décombe : Jean-Marc holds a degree in physical geography and studied natural hazards before managing the natural hazards unit at the CPIE* des Pays de Vaucluse for more than 20 years. While there, he developed a role-play game on flooding called RIVERMED and published a series of guidebooks entitled, “La Mémoire des Risques”.

He established his consultancy firm, SUDALEA in 2017 and works closely with the Inter-regional Mediterranean Arc Flood Unit to assemble an extensive image bank of photos and videos on flooding, as well as a geo-guide on flooding in the Gardon river catchment.



Ghislaine Verrhiest-Leblanc

Ghislaine Verrhiest-Leblanc : Ghislaine holds a Doctor of Science degree and has worked in risk prevention for almost 20 years. She joined the Ministry of Ecology in 2001 and has held a range of posts in various government departments and public bodies, in areas such as industrial risk prevention, nuclear facility inspections, natural hazard prevention – flooding, earthquakes, forest fires and risks and hazards in mountainous areas, etc. She is also Vice-President of the French Association of Earthquake Engineering (AFPS) and graduated in seismic building standards at the National School of Architecture, Marseille Luminy. She has been head of the inter-regional Mediterranean Arc flood prevention and coordination unit since 2017 where she develops and delivers numerous activities to assist local areas to cope with major flood risks, while making them more resilient. Fostering a risk awareness culture towards flooding is key to her tasks.

A few facts about floods

A flood is when water submerges land that is normally out of its reach.

In the South of France, these floods tend to be referred to a 'Cévenol episodes', especially in the media.

But are Cévenol episodes really Cévenol?

Our Mediterranean regions are regularly hit by these extreme weather events.

Our Mediterranean regions regularly experience so-called "Cévenol episodes". These are very heavy downpours based on the amount of water falling in a given time. They commonly occur in late summer and early autumn, resulting in large amounts of rain falling in a short period. For example, a famous record dates back to 29 September 1900 when 950 mm of rain fell in 10 hours on Valleraugue, at the foot of Mont-Aigoual. That is the equivalent of 10 bathfuls of water for every square metre!

By comparison, normal annual rainfall in Nîmes is 762mm. That said, the Mediterranean climate means that this falls over just 64 days, while the combined monthly average from September to January is 428 mm. These 'episodes' can be highly localised or more widespread.

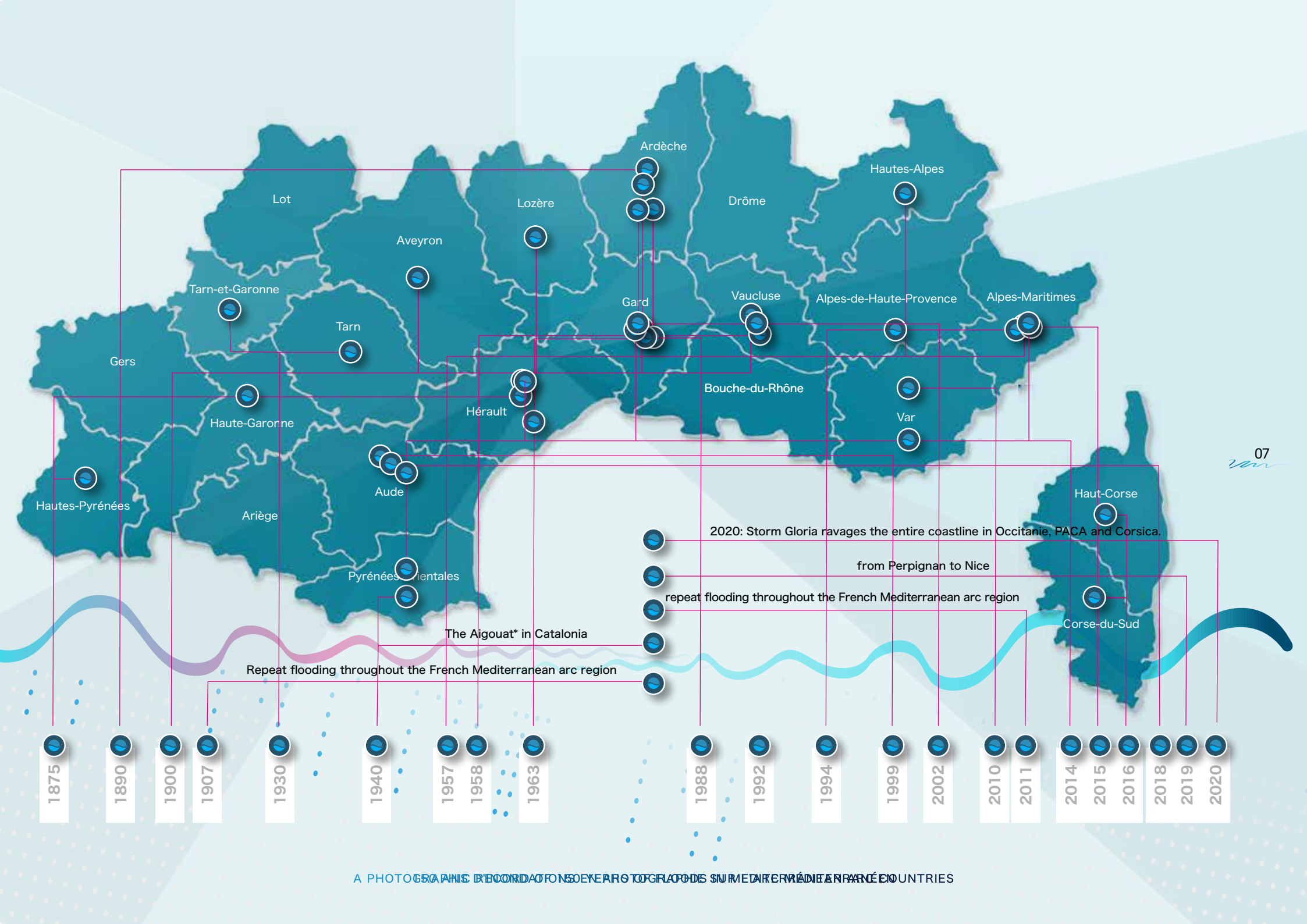
Although frequent in the Cévennes, these 'episodes' are especially typical of Mediterranean coastal areas, squeezed between the sea and mountains. Recent floods in Corsica as well as the regions of Occitanie and the Ardèche, in autumn 2019, can be explained by these episodes as can recent flood events in Spain. In this case, we refer to heavy Mediterranean downpours which trigger flash flooding.



The Calavon in spate at Apt
On 1 December 2019.

Photo: Jean-Marc Faday,
Saignon photography club.





From runoff to a flood, how a climate event develops

Surface runoff is partly due to rainfall intensity and partly to relief. The steeper the slopes, the greater the runoff speeds.

Soil permeability is an important factor too. Indeed, the geology and types of surfaces in urban areas are crucial. Some rock, like limestone, can absorb a lot of water.

Other rock materials such as clay, but also artificial surfaces, for instance, concrete, tarmac or tiles, can be virtually impermeable.

Runoff can reach aquifers or collect in thalwegs*. The water then travels along in permanent streambeds creating a surge in flow*. When this happens, we say the river is on stormflow and above a certain level, the river can overflow from

its streambed* into its floodplain*. Just how far the water spreads depends on the surrounding relief.

In both cases (surface runoff or overbank flooding), there's going to be flooding! In a given area, the probability of a flood occurring that reaches a specific height and flow rate is called a climate hazard. This hazard can be high, moderate or residual.

From flood hazard to risk!

If this hazard threatens assets like property and human life, economic activities, roads, public services and property, etc. we then refer to a flood risk. The more vulnerable the assets, the greater the risk.





The Calavon in spate at Apt on 1 December 2019.
Photo: Colette Lépaule, Saignon Photography Club.

Flooding, some basic facts, history, pictures and photographs

Ever since photography was invented (officially, in 1839) by Nicéphore Niepce and Louis Daguerre, there has been an exponential rise in the number of images we see about flooding.

Before, only engravings and paintings provided a freeze-frame, such as vast, slowly flooding plains like those bordering the Seine, captured here by Alfred Sisley* in 1876.

This book focuses on the Mediterranean Arc countries (the regions of Occitanie, PACA, Corsica as well as the Departments of the Ardèche and the Drôme). These areas are primarily exposed to brief, sometimes extreme, flood events that regularly affect an ever-increasing number of buildings and property due to expanding human land-use.

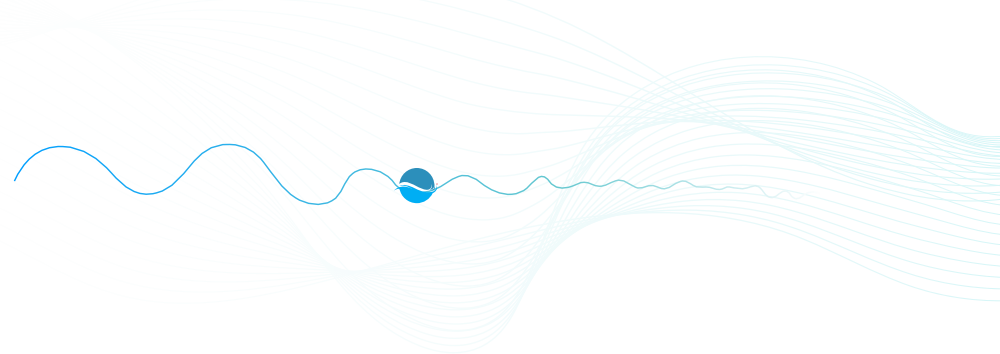
Photographs provide a precious, visual record of floods which sometimes fade

in people's memories. Cameras were initially just for the experts but now almost everybody can take photos, especially since the advent of smartphones and social networks. They enable us to access more information, perhaps sometimes too much, but are our attitudes towards flood risk and our recollections of flooding really more advanced than before?

Given the clear indications of climate change, flood risks seem to be increasingly frequent and damaging.

So, today, perhaps even more so before, let's not forget the scars and images of the past. Let's humbly look back and learn what we can from these sometimes ancient events.

This compilation provides a collection of images to help you discover, or rediscover, some major flood events that provide an opportunity for local decision-makers and residents alike to learn some useful lessons.





"Boat in the flood at Port Marly"
Alfred Sisley, oil painting, 1876
Museum of Fine Arts, Rouen.

June and September 1875, **nothing but water!**

Maréchal Mac-Mahon, French President at the time, uttered this famous expression when he visited Toulouse on 26 June to witness the damage caused by a major flood of the Garonne, more commonly known as the Aïguat* of St Jean.

The Prefect, who accompanied him, was thought to have replied,

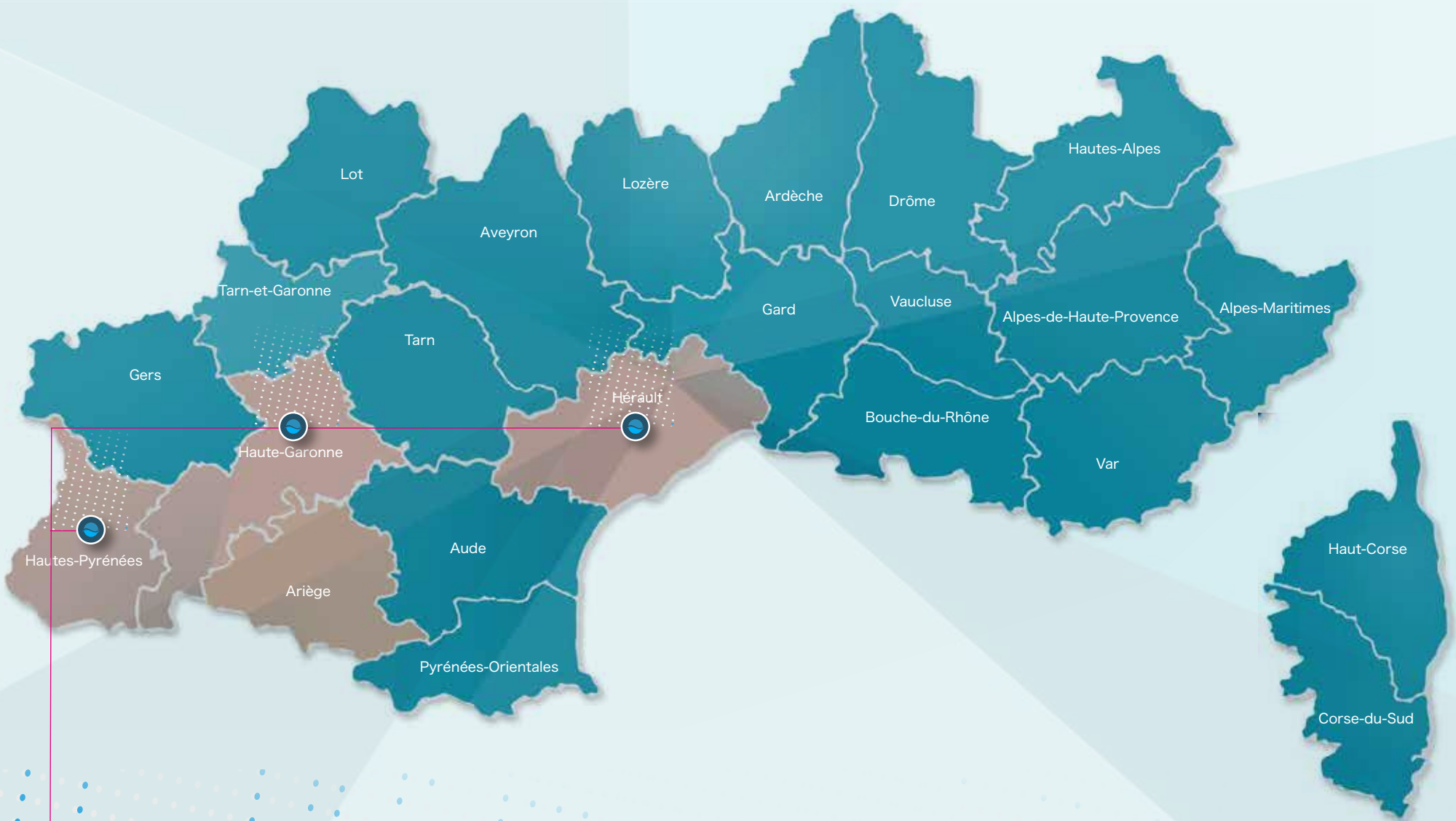
“And this is just the surface!”

On the 23 June 1875, the Garonne breached its banks and devastated the city of Toulouse. The district of St Cyprien, built on the inside bend of a meander* of river bore the brunt of the rising water. 200 people died and more than 1,000 buildings were destroyed.

Three of the city's four bridged were also washed away.

A scene of utter destruction in Toulouse. Repeating events in the Rhône Valley in spring 1856, a very wet June compounded by snowmelt from the Pyrenees fed floodwaters that engulfed Toulouse on 20 June and reached their peak on the 23.





1875

1890

1900

1907

1930

1940

1957

1958

1963

1977

1988

1992

1994

1999

2002

2010

2011

2014

2015

2016

2018

2019

2020

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Flood damage in the St Cyprien district, Route de Tournefeuille. The dark stains on the houses are flood lines* showing how high the floodwaters rose.

*Image: Antoine Provost.
Source: gallica.bnf.fr/ National Library of France. Ref. G 69634.*



*The street of the pont St Pierre in Toulouse.
Author Antoine Provost.
Source : gallica.bnf.fr/ Bibliothèque Nationale de France. Côte G 69629.*

According to Maurice Pardé*, over 500 people lost their lives along the length of the Garonne, in the city of Agen and throughout South Western France, while other sources refer to 3,000 deaths.

These floods would also extend to the Adour river valley in the Hautes-Pyrénées Department, as well as the Aude.

In Tarbes, the central section of a bridge collapsed, killing two onlookers who were standing there.

Further east, in the Val d'Ariège, river flooding and debris flows* claimed 82 lives.



*Drawing of the bridge at Tarbes over the Adour river when it collapsed...
Source: Christophe Cathelain – loucrup65.fr.*

...and caught in a photograph.
Source Christophe Cathelain – loucrup65.fr.



A villager said,

“A villager said, “The water came down from the mountains at blinding speed and cut a path through all obstacles. It stopped at nothing, maiming, uprooting and carrying away everything in its path. It’s natural course took it the Vernazobre which couldn’t hold all the extra water and so it flowed back into the neighbouring streets which turned into torrents. In five to ten minutes, the village was submerged and terror reached its peak.”

12 September 1875, the village of St Chinian, in the Hérault, was next to experience a shocking flash flood* so typical of fleeting yet highly intense Mediterranean episodes. A large thunderstorm broke over the hills above the Vernazobre river valley, a small affluent of the River Orb. After becoming blocked by a log-jam*, it unleashed a wave that engulfed the medieval village with astounding ferocity, submerging it under 1.5 m of water.



The toll was very heavy, with 97 deaths, 149 houses destroyed, 300 condemned and more than 200 families reduced to a state of misery. Crops ready for harvest were also destroyed where they stood in the fields.

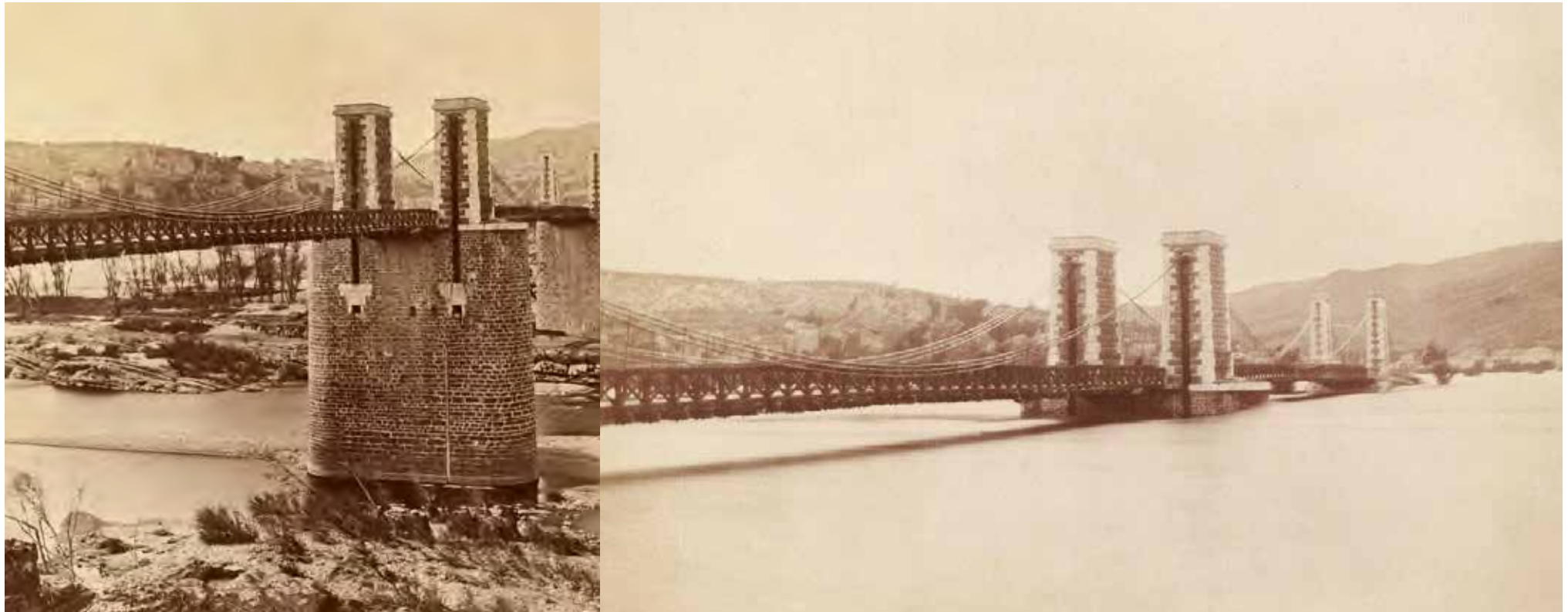


St Chinian after the disaster
Photo by Albert Fabre.
Source : Montpellier Media Library
Ref. Ms 1076_08.

September 1890, the Ardèche pushed to the limit

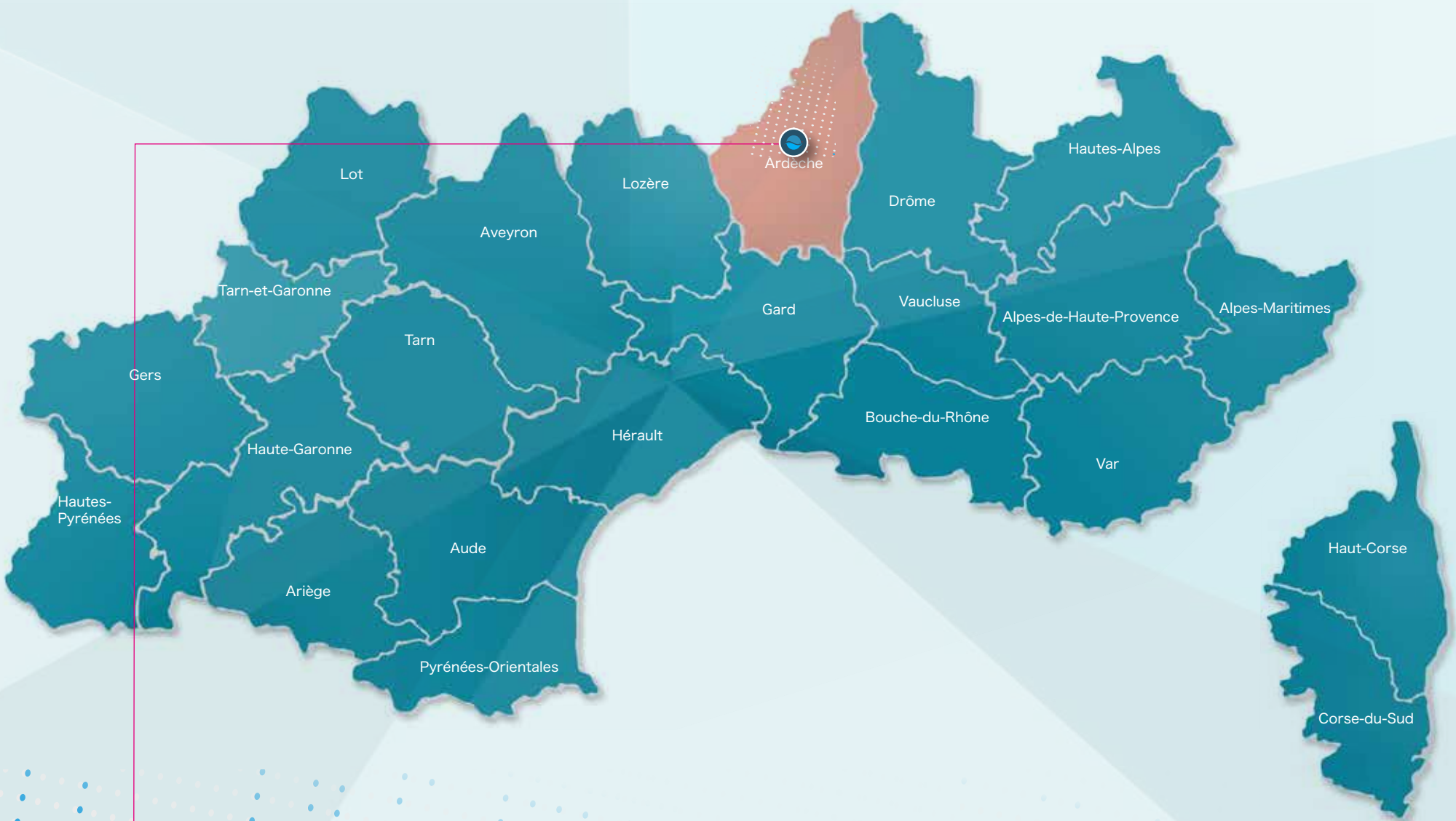
The flooding that hit the Ardèche river catchment* on 23 September 1890 still strikes a chord as the river's record flood. Gorged with continuous rainfall that began in the evening of 19 September, it reached a peak on the 22. After a brief lull, the rain returned in the night of the 23rd and swamped the North Vivarais. The whole Department was affected, including the Eyrieux river valley.

Henry Vaschalde, a weather watcher at Vals-les-Bains recorded many accounts referring to some fifty victims, extensive damage to crops and no less than 28 bridges destroyed in the Ardèche river valley.



The bridge between Salavas (in the background) and Vallon Pont d'Arc spanning the Ardèche River. Low-level flow (left) and in spate (right) on 22 September 1890. It reached a height of 17.6 m!*

Source: gallica.bnf.fr/ National Library of France.



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The water level peaked at 21 metres at Pont d'Arc.

Source: gallica.bnf.fr/ National Library of France. Ref. G 69629.



*The bridge at St Laurent-du-Pape destroyed by floodwaters from the Eyrieux.
"The bridge dated back to the ancient province of the Vivarais and had survived
the floods of 1827, 1846 and 1857", Henry Vaschalde.*

Editions J Brun et Compagnie, Carpentras.



*Locals set up a system of ropes and pulleys each side
of the ruined bridge to exchange goods.*

From a photograph by Dr Juventin.

September 1900, the Cévennes

While 1900 is mainly remembered for extreme Cévenol episodes that hit the Gard and Lozère, floods extended virtually throughout the Mediterranean Arc (Vaucluse, Aveyron, Hérault, Durance Valley, etc.) and as far as Spain and Italy. The rains triggered a major flood of the Rhône leading, in particular, to the Ardèche taking another battering ("Coup d'Ardèche").

1900 was also a record-breaking year.

1900 was also a record-breaking year

950 mm of rainfall was recorded in 10 hours at Valleraugue (30) at the foot of Mont-Aigoual, on 29 September, which caused the Hérault River to flood. Although this account was deemed highly doubtful for many years, it has now been confirmed.

In addition to rivers in the Cévennes and Gard, the River Tarn in the Lozère heaped misery on the population. It peaked at 18 metres at Sainte Enimie, on 28 September, reaching the second floors of homes and washing away several bridges.

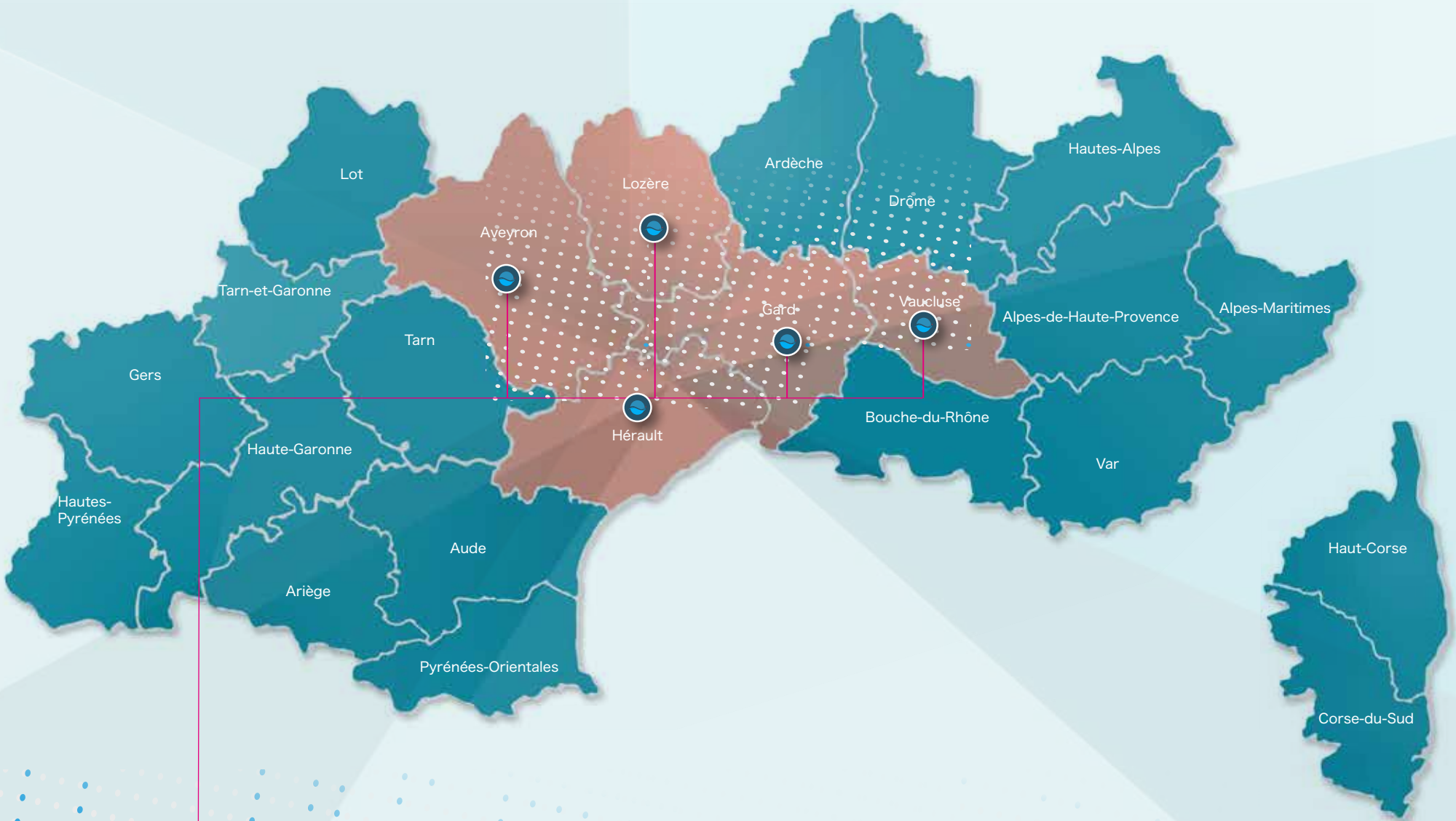


Sainte Croix-Vallée-Française (30) ravaged when the Gardon de Sainte Croix river flooded.

Lozère Departmental Archives.

“The Hérault was transformed into a raging torrent, creating a wave that reached the first floors of nearby houses, sweeping away everything in its path. There was no recorded loss of life or injuries in Valleraugue
wrote Mr Michel, a primary school teacher in the village.

”



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*Sainte Croix-Vallée-Française (30) ravaged
when the Gardon de Sainte Croix river flooded.
Lozère Departmental Archives.*

"La Roulotte des Saltimbanques" during a flood of the River Tarn, at Sainte Enemie (48).

Lozère Departmental Archives.



Bridge swept away by the Tarn at Sainte Enemie.

Lozère Departmental Archives.



The Montvert bridge (48) after the Tarn flood.

Lozère Departmental Archives.

1907, repeat flooding

In 1907, the entire French part of the Mediterranean Arc experienced a series of powerful, devastating floods in 1907.

Five major floods hit various areas killing at least 25 people.

The Departments of the Gard and Hérault were the first to be flooded from 2 to 28 September, followed by the Lozère and Ardèche on 8 and 9 October, with 'Mediterranean episode' downpours.

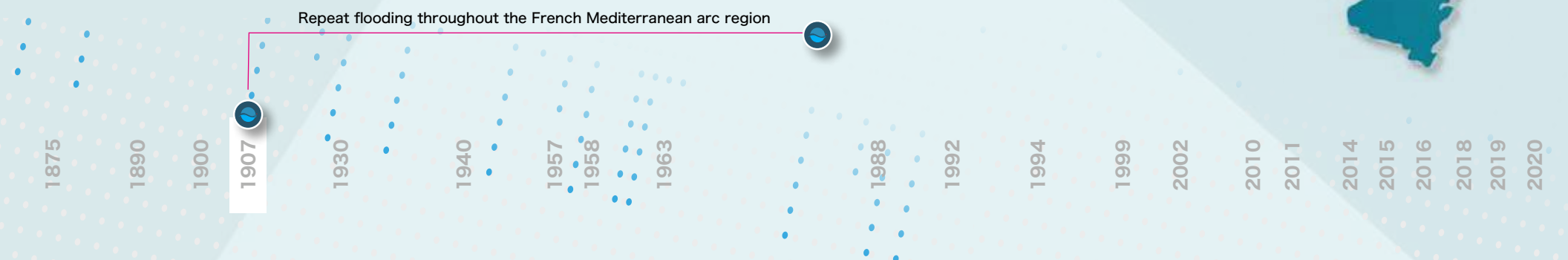
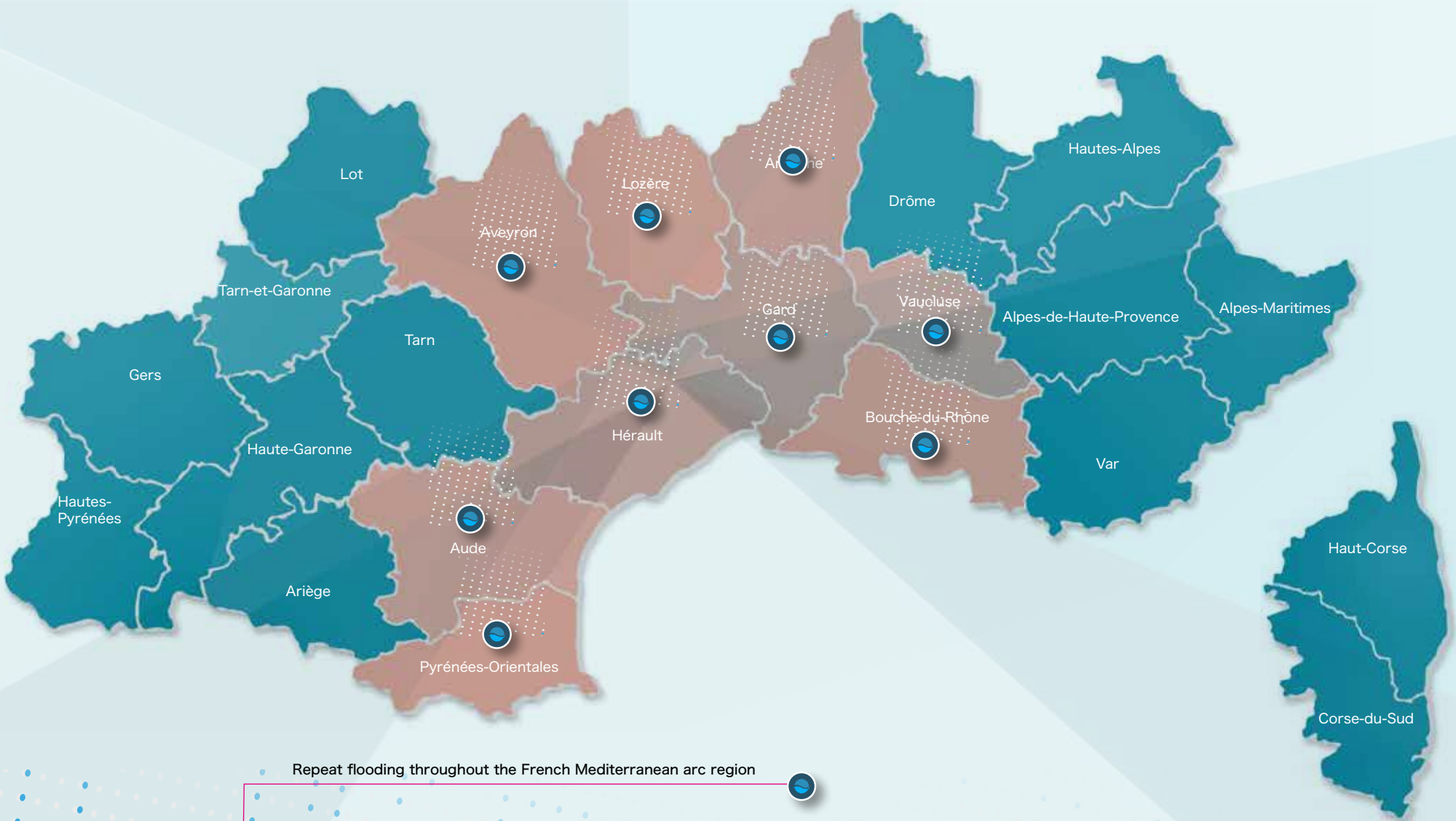
On 12 to 13 October, the Aude and the Pyrénées-Orientales were in the firing line while floodwaters once again returned to the Gard and the Hérault Departments on 15 and 17 October.

Finally, Occitanie was again flooded from 6 to 9 November (Aude, Hérault, Aveyron) as was Provence (Vaucluse and Bouches-du-Rhône).



*The Gardon d'Alès in spate
at the Pont Vieux
and Rochebelle bridge, in Alès on 16 October.*

Source: Gard Departmental Archives.



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Railway line destroyed by the Hérault, at Montagnac (34) during the November floods.

Source: geneant.org.



Sommières after the Vidourle flooded on 26 and 27 September.

French President, Armand Fallières, visited the town to witness the damage.

Source: Nemaussensis.com

Sommières

“As morning broke on 28 September, the town was in a pitiful state requiring a lengthy description.

On the esplanade, and wooden arenas had been swept away, the streets gouged out by the current and most blocked by various debris, while some were turned into muddy swamps.

Houses in the neighbourhood around the bridge had been torn apart by tree trunks that turned into battering rams in the floodwater, forcing their way through the most solid obstacles. Seven horses and a cow were found dead. In short, everywhere was a scene of devastation, made worse by a lack of drinking water and gas as the local production plant had been flooded”.

Extract from “Le Vidourle et ses vidourlades”, by Ivan Gaussen, published by Le Livre d'Histoire.

In Apt (84) the Calavon River rose on 8 November.

The writing at the top of the postcard reads:

"Vines and trees were swept away at Uncle Ode's. It's an unmitigated disaster", while lower down, is written, "Yesterday evening at 7 pm, the bridge was completely underwater".

Providing yet more useful details, the reverse side reads, "Rose arrived in good health but in pouring rain that is still falling as I write. We are flooded, the Calavon has breached its banks and is washing away the bridges. There is 1.5 m of water in the lower part of the Rue de la République but it hasn't yet reached our house. There is 2.5 m of water in the cellar at my father-in-law's house and the water has carried away barrels full of wine that were stored there".

Source: Jean-Paul Jouval collection.



At Bédarrides, in Vaucluse, the Ouvèze flooded the village for the umpteenth time.

Source: M Mazzia collection.

March 1930, the Tarn and the Agout

The entire South West of France was hit by unremitting rain combined with snowmelt in late winter, which led to one of France's deadliest floods of the 20th century.

The flood was especially lethal in the Tarn river valley, particularly downstream from the confluence with its tributary, the Agout, in the towns of Reyniès, Moissac and Montauban (82).

The rain started to fall on 28 February and did not relent until midday on 3 March. Along the Tarn, floodwater peaked during the night from 3 to 4 March, catching local people unawares. According to estimates there were 230 deaths, 130 alone in Moissac where a dyke and a railway embankment suddenly collapsed. As well as the loss of human life, the economic impact on manufacturing, farming and utilities was enormous.

Undoubtedly, in light of this tragedy, flood-prone area plans were drafted constituting one of the first land-use planning documents in France concerning flood risk. These would be introduced a few years later.



Ruined houses at Moissac (82) after a dyke collapsed on the canal quay.

*Tarn-et-Garonne Departmental Archives
Edit. J. Bouzin, Cote AD82 2F1 Moissac 137.*

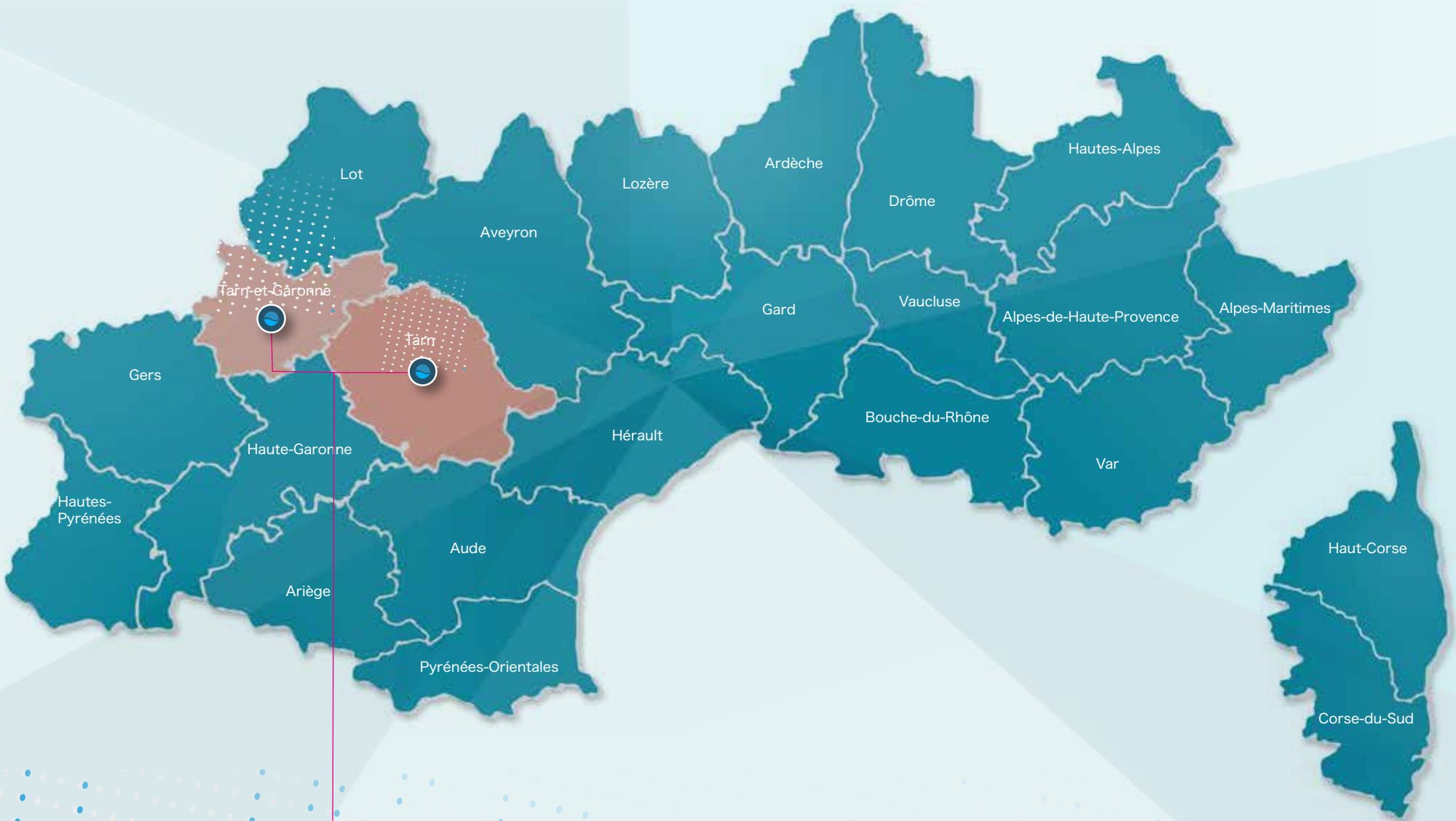
Despite rising water levels, some of the local residents in Moissac watched a performance by the Hagenbeck Circus troupe who had pitched their big tent on a safe area.

When they returned home at 10 pm, they found their neighbourhoods flooded, where others had unfortunately stayed at home.

“ One victim of the flood at Moissac described the series of events; how just an hour or two before the flood bank collapsed, police patrolled the streets calling for people to evacuate. While most failed to take heed, at least part of the ill-fated town's people were lucky enough to have gone to see the travelling circus that evening. Even so, the Tarn had already risen by 30-40 centimetres as night fell.

”

(Pardé, 1930)*





The Saplacou neighbourhood in Montauban (82), completely devastated by the River Tarn.

Tarn-et-Garonne Departmental Archives. CL. Jaubert, Ref. AD82 2FI Montauban 112.



The church square neighbourhood in Reyniès (82), completely razed to the ground.

Tarn-et-Garonne Departmental Archives

Edit. J. Bouzin, Cote AD82 2FI Reyniès 3 The Tarn flood left only the church and town hall standing.



9 major bridges and more than 3,000 houses were destroyed in the Tarn River catchment. Many of the latter were especially vulnerable to flooding due to the materials used to build them (mud bricks).

Montauban (82).

Source: gallica.bnf.fr/ National Library of France.

1940 the Aiguat* in Catalonia

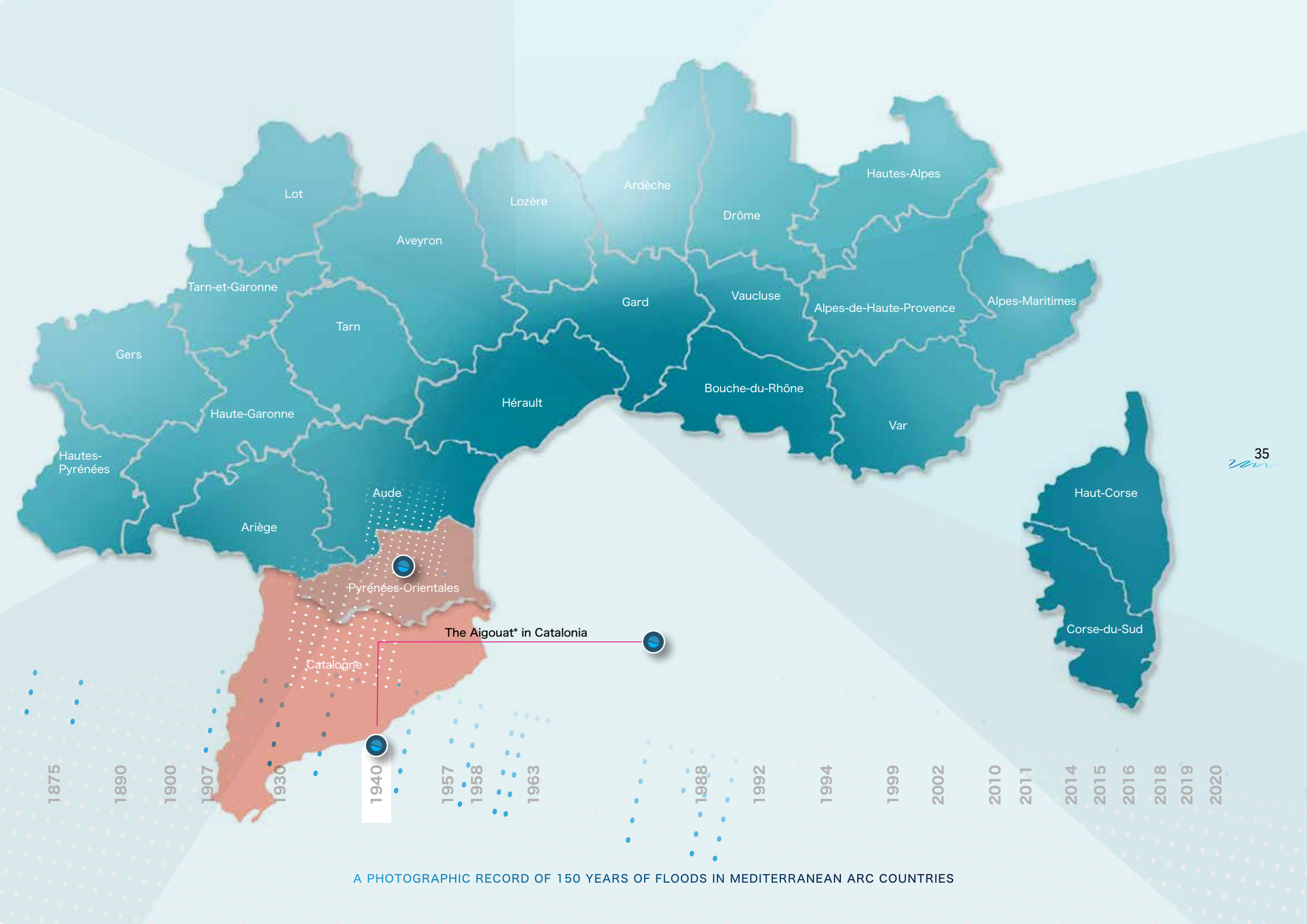
10 years after the floods in South-West France, Catalonia was next to experience a major event. It occurred between 16 to 20 October 1940, in political circumstances that hid it from national news coverage.

On the French side, the Tech, Têt and Agly river valleys were inundated with record rainfall, estimated by Maurice Pardé*, head of flood research, to be more than 1,000 mm on 17 October alone at St Laurent-de-Cerdans and totalling 1,930 mm in 5 days.

The floods resulted in 57 deaths, half of them in Amélie les Bains, on the banks of the Tech.

On the Spanish side of the Pyrenees, the loss of life was worse, with more than 200 deaths recorded in Girona.







N° 65 L'usine du Pas du Loup avant et après la crue de 1940. Cliché ET1



A hydro power plant in the Tech river valley destroyed by the surge of water after having initially resisted, resulting in a devastating tidal wave rushing down the valley when it suddenly gave way.

Photo: ET1, source ONF/RTM 66.



Amélie-les-Bains après la crue. Des ouvriers instalAmélie les Bains after the floods. Labourers setting up a cable system to supply the town's right bank while a group of curious onlookers watch the work near the ruined casino.

Photo: N. Castagne, source ONF/RTM 66.

The Aiguat caused numerous landslides on steep slopes which were geologically fragile, as here, in the Tech valley where the RN 15 main road was blocked.*

Photo: E.T.I, source ONF/RTM 66.



Amélie les Bains – Palalda. The railway bridge after the flood. The bolted rails remain suspended in mid-air.

Photo: Claire Guyot, source ONF/RTM 66.



June 1957, the Guil in the Queyras

The French Alps are prone to what is referred to as the “Retours d’est”, or easterly rain-laden weather fronts that spill over from the Italian side of the Alpine chain and, subject to temperature, can bring snow or rain.

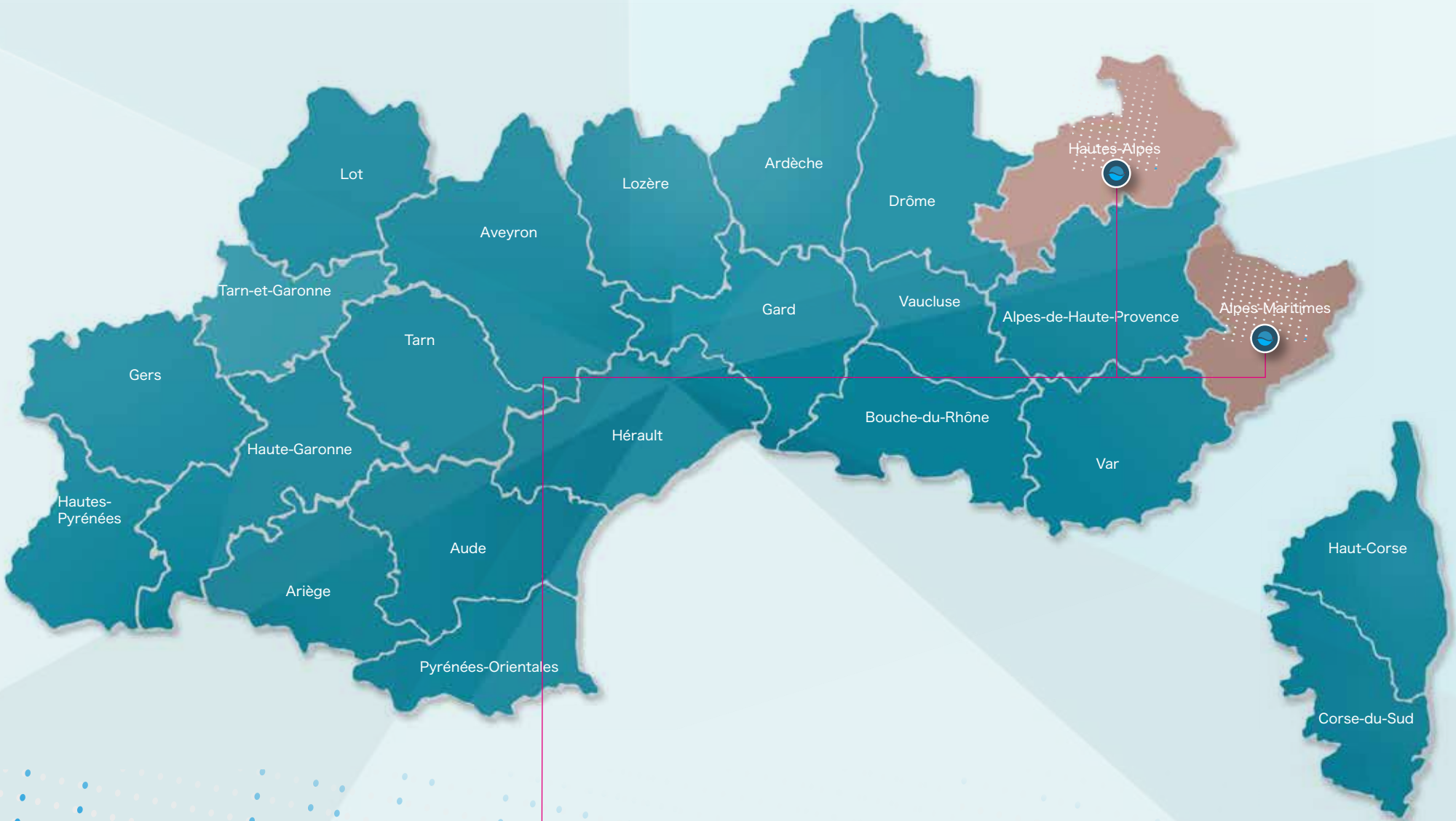
In June 1957, downpours peaking on 13 June fell on several mountainous areas of the Tarentaise, the Alpes-Maritimes and especially, the Queyras (05), at the head of the Guil river catchment, which feeds the Durance.

The rain also coincided with a thaw in the thick mountain snow-caps that remained after a long winter. The Queyras was completely cut off and much of the infrastructure was destroyed, including the railway line and many bridges. Villages were engulfed by torrential floods loaded with solid material.



Built on an alluvial fan, the village of Ceillac was choked with rubble dumped when the Cristillan River, an affluent of the Guil, flooded.

*Hautes-Alpes Departmental Archives
Ref. 14FI_00376_0056.*



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Eye-witness account

“ The memories are etched in our minds”
People started shoring up the riverbanks in the upper part of the village but it was pretty futile. The gabions* that we laid were immediately swept away. We looked worriedly at the sky, waiting for the slightest bit of blue sky, hoping that the rain and drizzle would finally stop. People ran through the village shouting, “the river’s about to break its banks any minute”.

Very quickly, we knew that the Cristillan was going to flood and we got out before anyone was injured. We took refuge in La Clapière with the livestock.

By the evening, debris jams* had formed upstream of the village and we couldn’t stop the river flooding Ceillac. When the bridge gave way, the water poured over each side.

Next day, civil defence helicopters came to take the women and children and we took our first ever flight! The water stayed for 13 days and there were torrents in three different places.

We never expected that.

It took all summer to clean up the mess in the village but we kept our spirits up thanks to assistance from the Civil defence.”



Incredibly thick layers of rubble in Ceillac.

Hautes-Alpes Departmental Archives

Ref. 14FI_00376_0085.

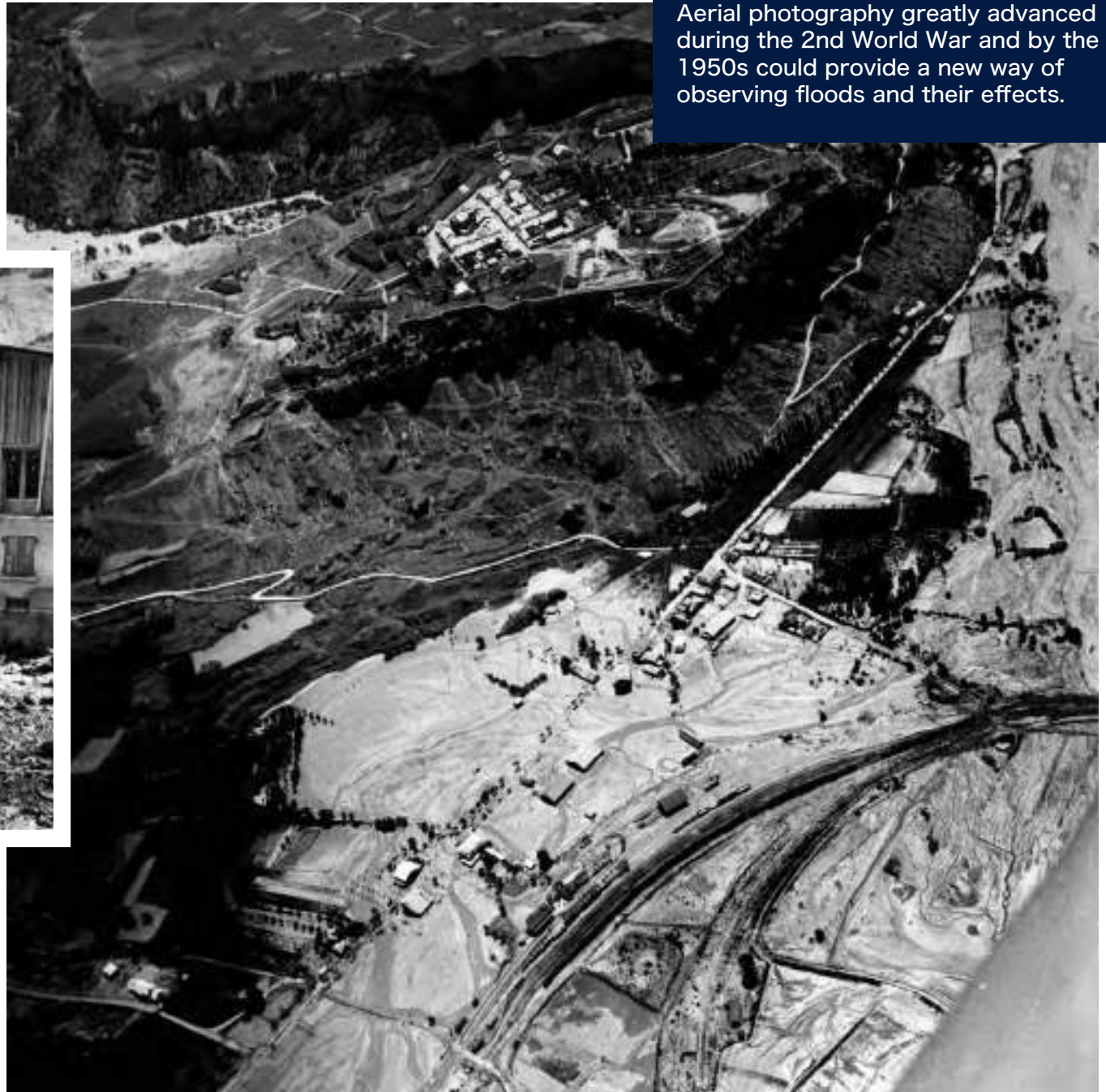
House foundations scoured away by floodwaters from the Guil.*

*Hautes-Alpes Departmental Archives
Ref. 14FI_00376_0069.*



Aerial view of the confluence of the Guil and the Durance, at Guillestre.

*Hautes-Alpes Departmental Archives
Ref. 14FI_00376_0073.*



Aerial photography greatly advanced during the 2nd World War and by the 1950s could provide a new way of observing floods and their effects.

September and October 1958, the Gard

Two new major floods caused the biggest loss of life in the 20th century in France, since the Tarn disaster of 1930.

The fiercest of these floods happened on 29 September and was triggered by heavy downpours in the Cévennes (429 mm in 48 hours at St Jean du Gard). 35 people died, including 21 motorists, 18 of whom perished in the Gardonnenque (see page 14) between Boucoiran and St Chaptes, on 30 September.

There was huge damage at Alès, especially at the Pré St Jean, and 4 bridges were destroyed at Ners, St Jean du Gard, Labaume and Cendras.

Forty-five towns and villages were hit by the floods and millions of hectares of crops lost. The cost of the damage amounted to 80 billion francs.

Rain fell again on 3 and 4 October (150 mm at Génolhac, in 2 days) causing another fierce flood, albeit less severe than before.

42

No sooner back in power, General De Gaulle visited the Department to show his solidarity with the victims of the flood and local elected officials.



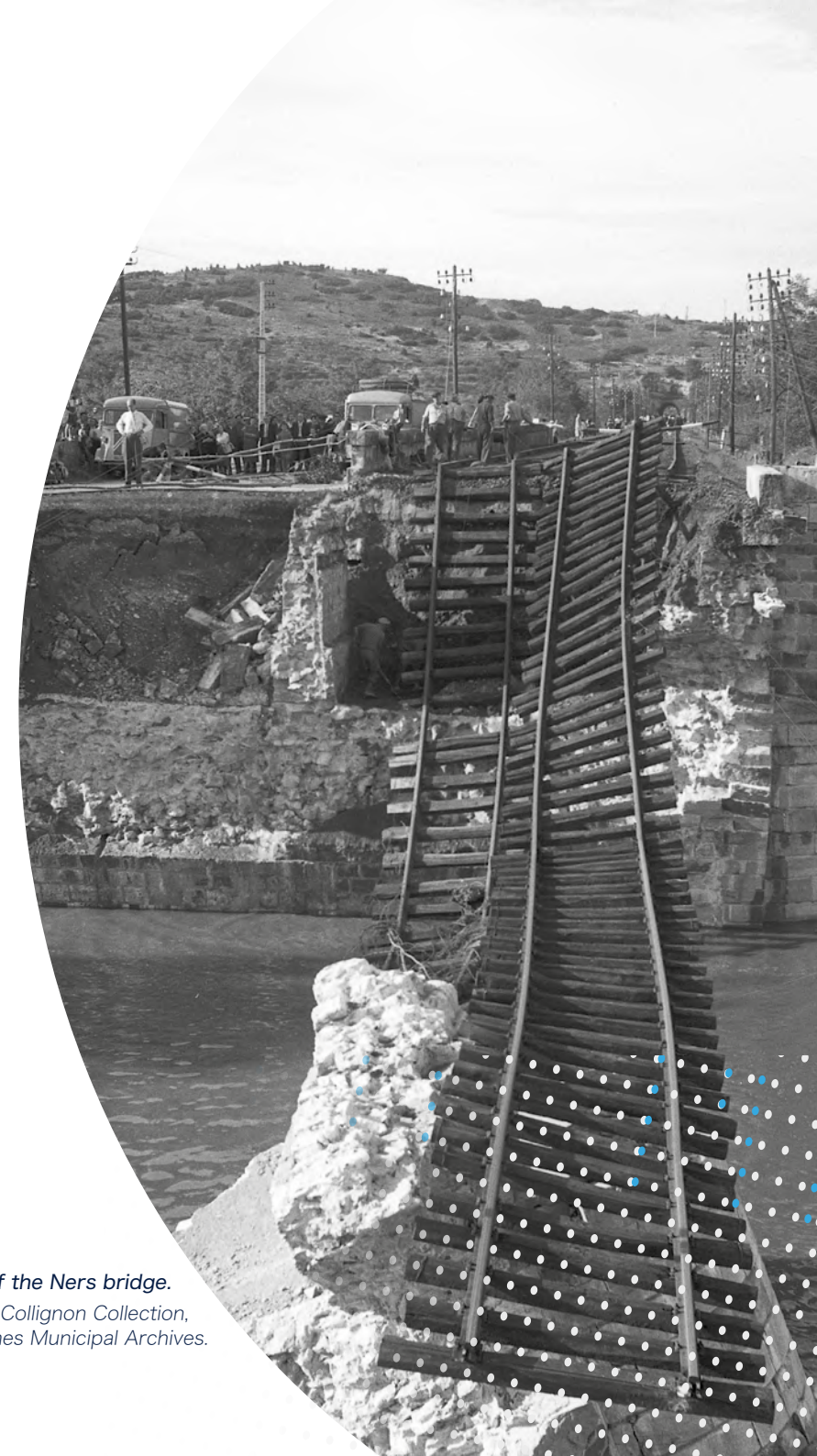
The Gardon River at Collias...

Photo: Georgette Grazioli.



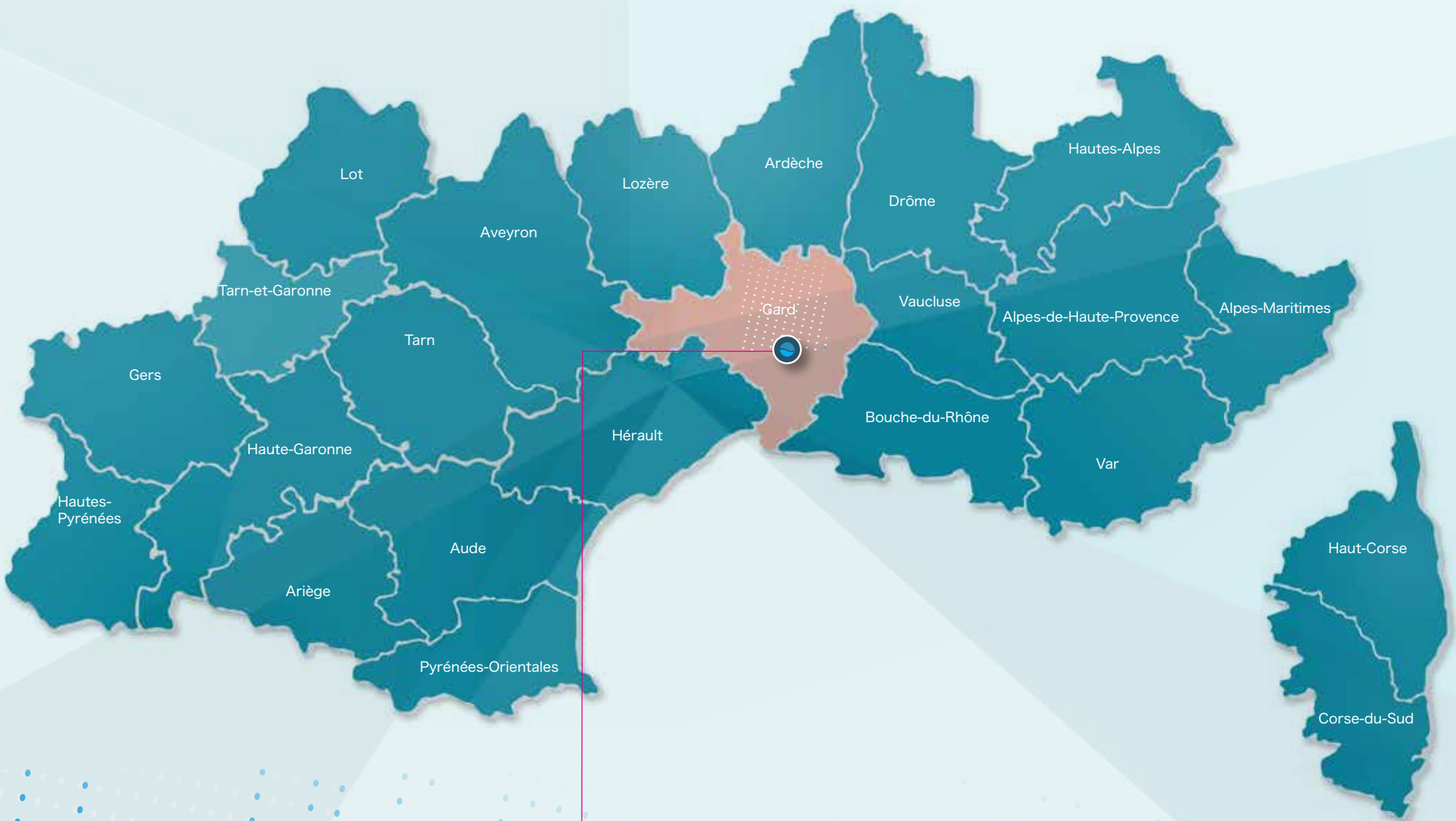
...Remoulins...

Photo: Paul Boyer



Remains of the Ners bridge.

Photo: Hervé Collignon Collection,
Nîmes Municipal Archives.





*The Gardon River at Montfrin.
Hervé Collignon Collection, Nîmes
Municipal Archives.*



*Le Vidourle à Sommières.
Fond Hervé Collignon,
archives municipales de Nîmes.*

*The Vidourle at Sommières.
Hervé Collignon Collection, Nîmes
Municipal Archives.*



45
van

*The St Jean du Gard bridge destroyed by the Gardon River
and view of the bridge today, which contains lighter
coloured stone dating back to repairs
to its highest arch.*

*Photo: Hervé Collignon Collection,
Nîmes Municipal Archives
Photo: Jean-Marc Décombe.*



November 1963, the Ardèche and the Gard

In 1963, two major weather events hit the Departments of the Ardèche, Gard and Hérault.

Firstly, on 3 August, a severe thunderstorm caused the Doux River to breach its banks at Lamastre (07), washing away the Retourtour bridge.

In November, heavy rains swamped the Gard and Hérault.



The Doux River at Lamastre (07) on 3 August at 6.30pm. The Retourtour bridge is entirely submerged then later washed away.

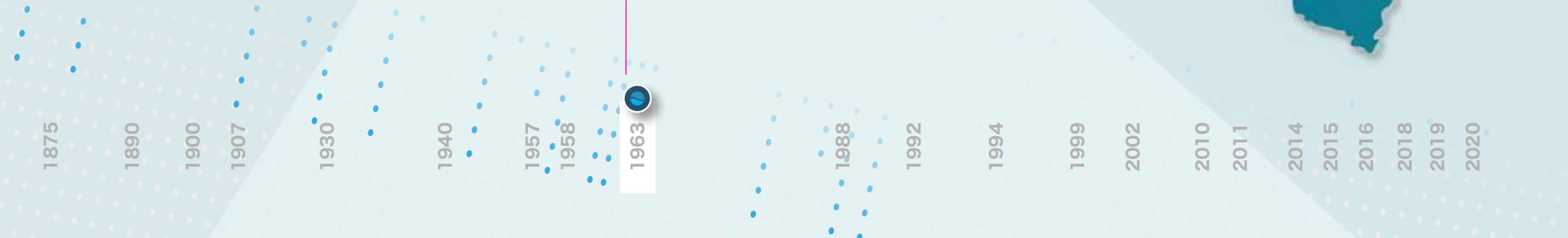
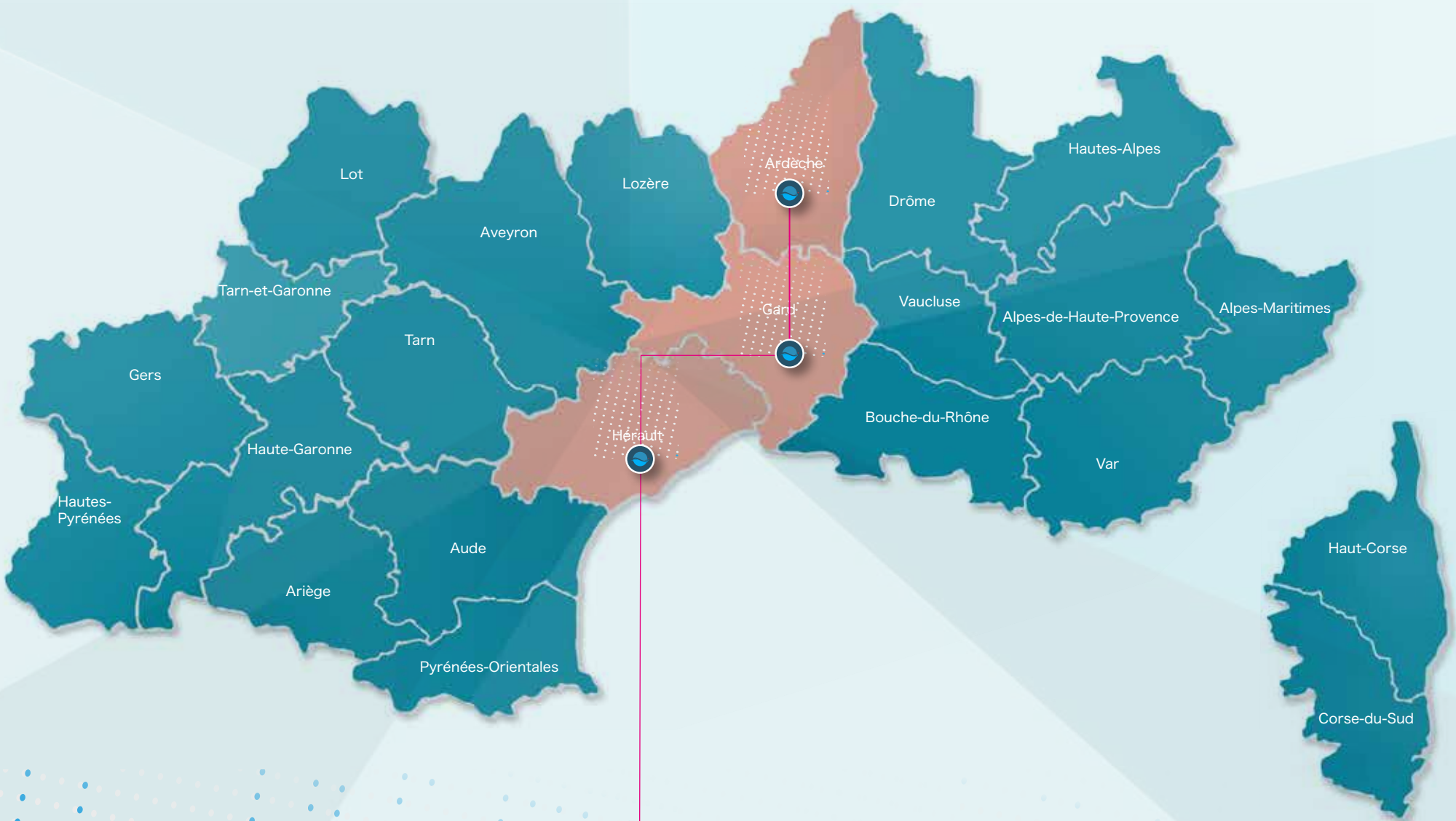
Sources: SPCGD*



The Vidourle also breached a dyke and flooded St Laurent d'Aigouze (30) where the scene shows clean-up operations.

Hervé Colignon Collection, Nîmes Municipal Archives.





A PHOTOGRAPHIC RECORD OF 150 YEARS OF FLOODS IN MEDITERRANEAN ARC COUNTRIES



Nîmes city centre is especially vulnerable to flooding due to the layout of its water system.

The city sits at the foot of a limestone plateau (the Plateau de Garrigues) where thalwegs*, which are mostly dry, descend the slopes, cross the city and join the Vistre, a small coastal river.

They are known locally as “Cadereaux” and were

Covered over in the 1950s for public hygiene reasons and to create new roads for the rising number of vehicles. They consequently disappeared from view but revived rather suddenly during the night of the 4 to 5 November, for the first time since 1915.

The city centre underwater.

Hervé Colignon Collection, Nîmes Municipal Archives.



*Flooding on Avenue Georges Pompidou.
Underneath the road is the Cadereau d'Alès which was
built over in the 1950s. The image is almost certainly the
newspaper photographer, Hervé Collignon,
who stopped briefly here in his Renault Dauphine.*

*Hervé Collignon Collection,
Nîmes Municipal Archives.*

October 1988, Nîmes again

The underground rivers, or Cadereaux, of Nîmes had been quiet since 1963 (see page 46) but reawakened with astounding ferocity on the morning of 3 October 1988.

An extremely heavy thunderstorm unleashed some 400 mm of rainfall in just a few hours on the Plateau des Garrigues.

Torrents of water ploughed through the city centre which the French population viewed in stunned silence on the evening television news, with cars piled up and turbulent currents sweeping away everything in their path.

Only 9 people died but an unsubstantiated rumour which remains today referred to several dozen victims.

Since then, the city centre and wider urban area has undertaken immense flood prevention projects to reduce the risk in the city.

These have been coupled with awareness raising campaigns and fostering a risk awareness culture towards flooding among the local population (installation of flood level markers, school activities, measures to make private and public buildings less flood-prone, etc.).

The Cat'Nat'

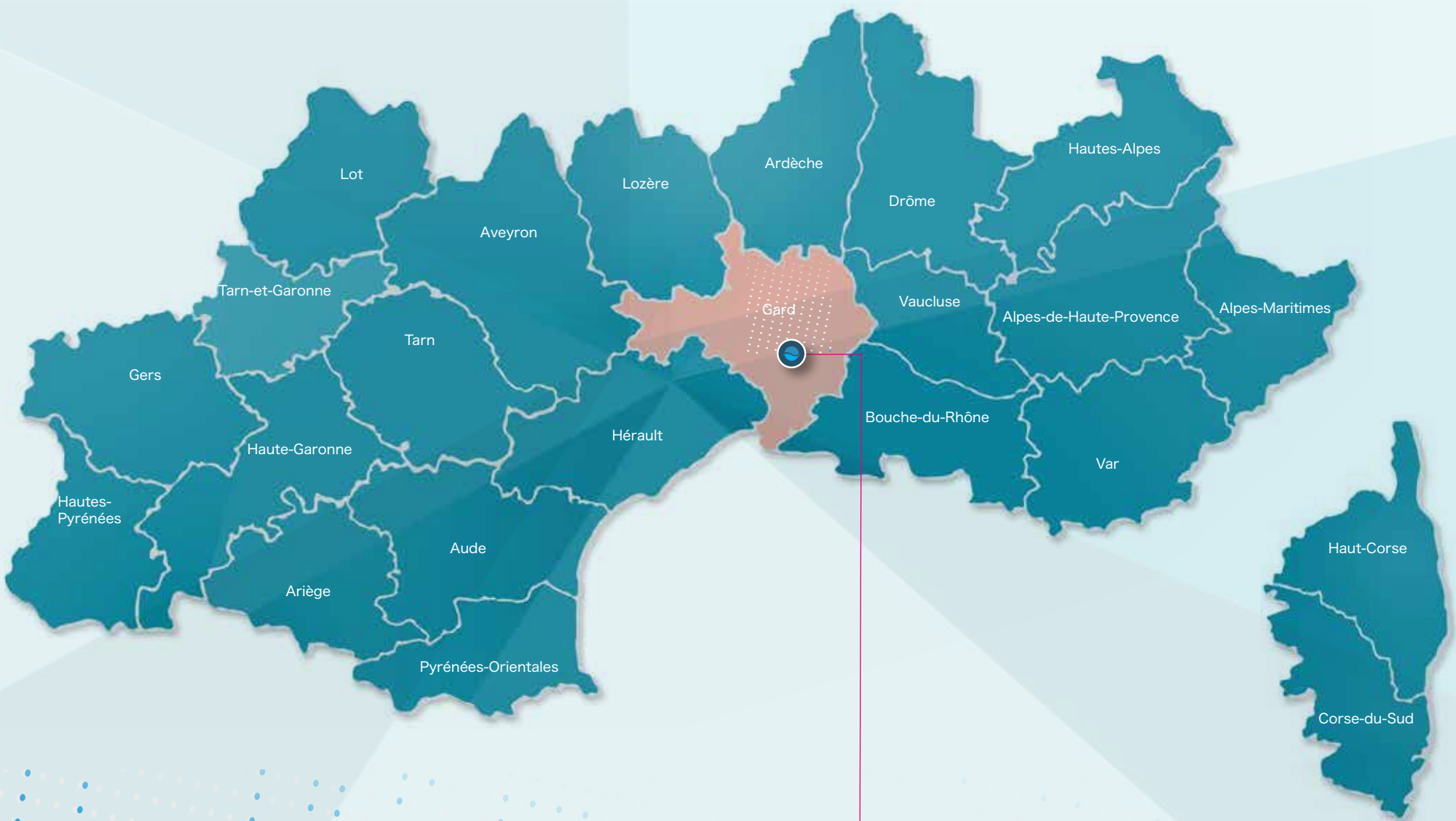
The flooding Nîmes was the first major event to be declared a major natural disaster, triggering state compensation for damage suffered by the victims.

The declaration system, nick-named **"Cat'Nat"** by the insurers was introduced in 1982 by Haroun Tazieff, who was tasked by the government at the time to address major hazards. It was based on mutual support between insurance holders whether or not they were exposed to natural hazards.



Place de la Maison Carrée flooded.

Photo: Georges Mathon.





*Place de la Maison Carrée and Avenue du Général Perrier in 1988.
(photo: Georges Mathon) and now (photo: Jean-Marc Décombe).*



*Rue Pépin le bref.
Photo: Georges Mathon.*



A tangle of cars at the corner of Rue de la Madeleine and Rue de l'Etoile
 (photo: Georges Mathon),
 in 1988 and now
 (photo: Jean-Marc Décombe)

September 1992, Vaison la Romaine

Four years after the spectacular images of flooding in Nîmes, France awoke dumbfounded by pictures of the Ouvèze unleashed on Vaison la Romaine (84) and its floodwaters submerging the town's Roman bridge.

In just a few hours, the storm dumped 300 mm of rain on the Ouvèze's upstream tributaries, such as the Toulourenc, which triggered a huge flood-wave that travelled along the river all the way to its confluence with the Rhône at Sorgues sur Ouvèze. Many other villages such as Bédarrides were badly damaged and 38 deaths were recorded.

There was also a substantial flood of the Ardèche River on the same day.

Left: The Roman bridge seen from upstream on the day after the flood. The Ouvèze engulfed it but it held firm. A pinch-point between two rocky outcrops where the Roman bridge is built caused the river to rise 17 metres above its bed and created a huge maelstrom downstream.

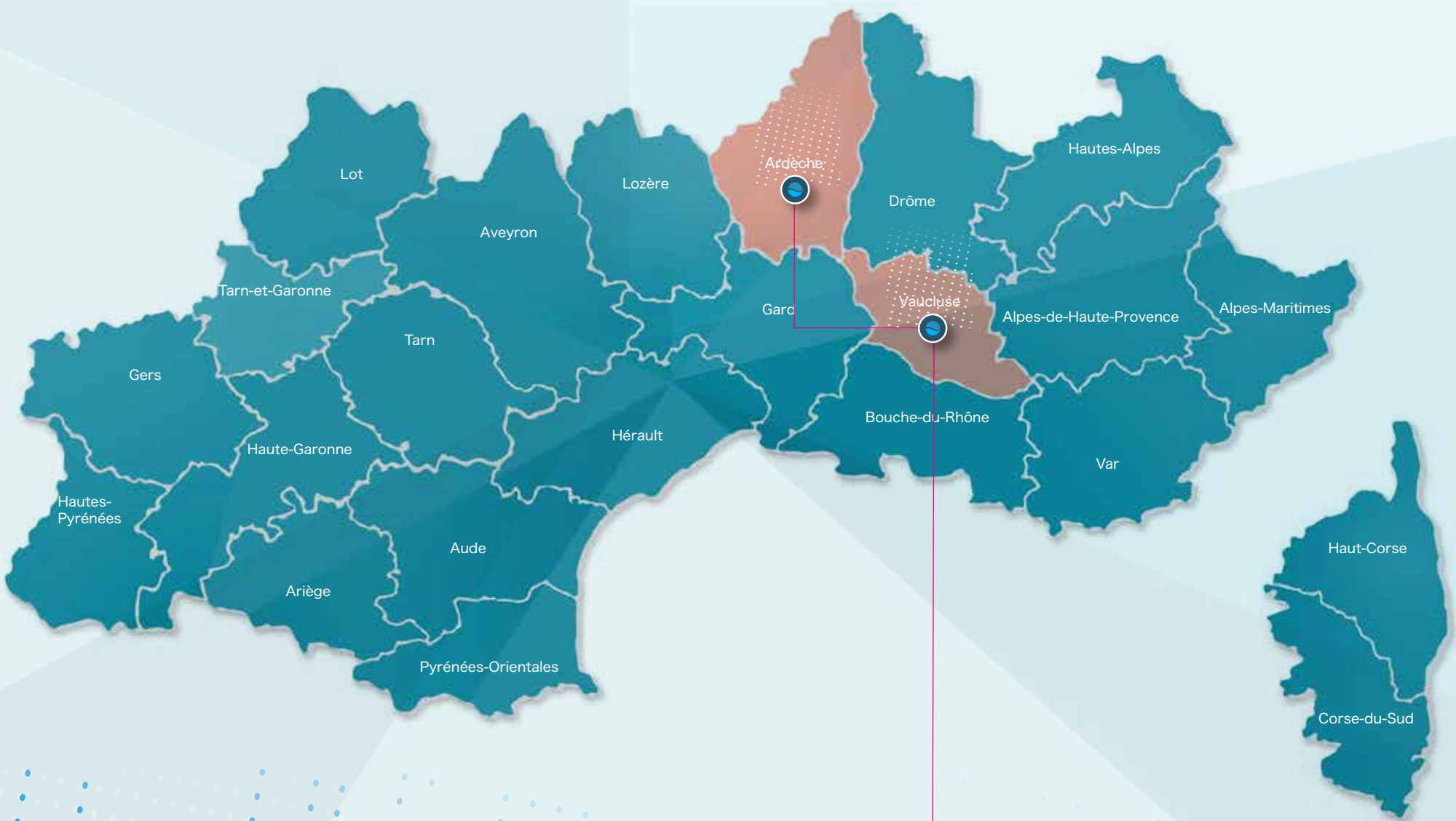
Photo: SDIS 84, source: Cyprès*

Right: The damage was worst just downstream of the Roman bridge.

Housing estates, campsites, shops and business units built on the Ouvèze floodplain, or even the streambed* could not withstand the surging water.*

Photo: SDIS 84. Source: Cyprès.*





A PHOTOGRAPHIC RECORD OF 150 YEARS OF FLOODS IN MEDITERRANEAN ARC COUNTRIES

Vaison la Romaine's experience accelerated consideration given at the time to land-use in flood-prone areas.

This resulted in the "Barnier Acts" of 1995 (named after the Minister of the Environment) which among various measures introduced Risk Prevention Plans (PPRI*). These land-use planning documents, appended to the Local Plan (LP*) set building regulations based on flood risks from rivers breaching their banks.

The "A Cœur Joie" voluntary service centre, on the confluence* of the Lauzon and the Ouvèze was completely wrecked but thankfully with no loss of life. The brown flood lines* on the walls show how high the water rose.



Photo: SDIS* 84. Source: Cyprès.



A supermarket totally destroyed downstream of the Roman bridge.

Photo : SDIS 84. Source: Cyprès.*

November 1994, the Var River

In autumn 1994, torrential rain swept across South West France.

Starting in the Cévennes and Languedoc, it reached the Alpes de Haute Provence and Alpes Maritimes by 5 November.

All rivers in these areas, such as the Asse, Verdon, Durance, Esteron, Loup, Siagne, Roya and Paillon, were gorged with water but especially the Var River which wreaked the most havoc.

The Var's floodplain*, from its confluence with the Vesubie River to where it meets the sea, between Nice and St Laurent du Var, is densely built-up, especially with business premises and public buildings. Nice-Côte-d'Azur Airport, built on landfill in the sea was also flooded and closed for several days.

58

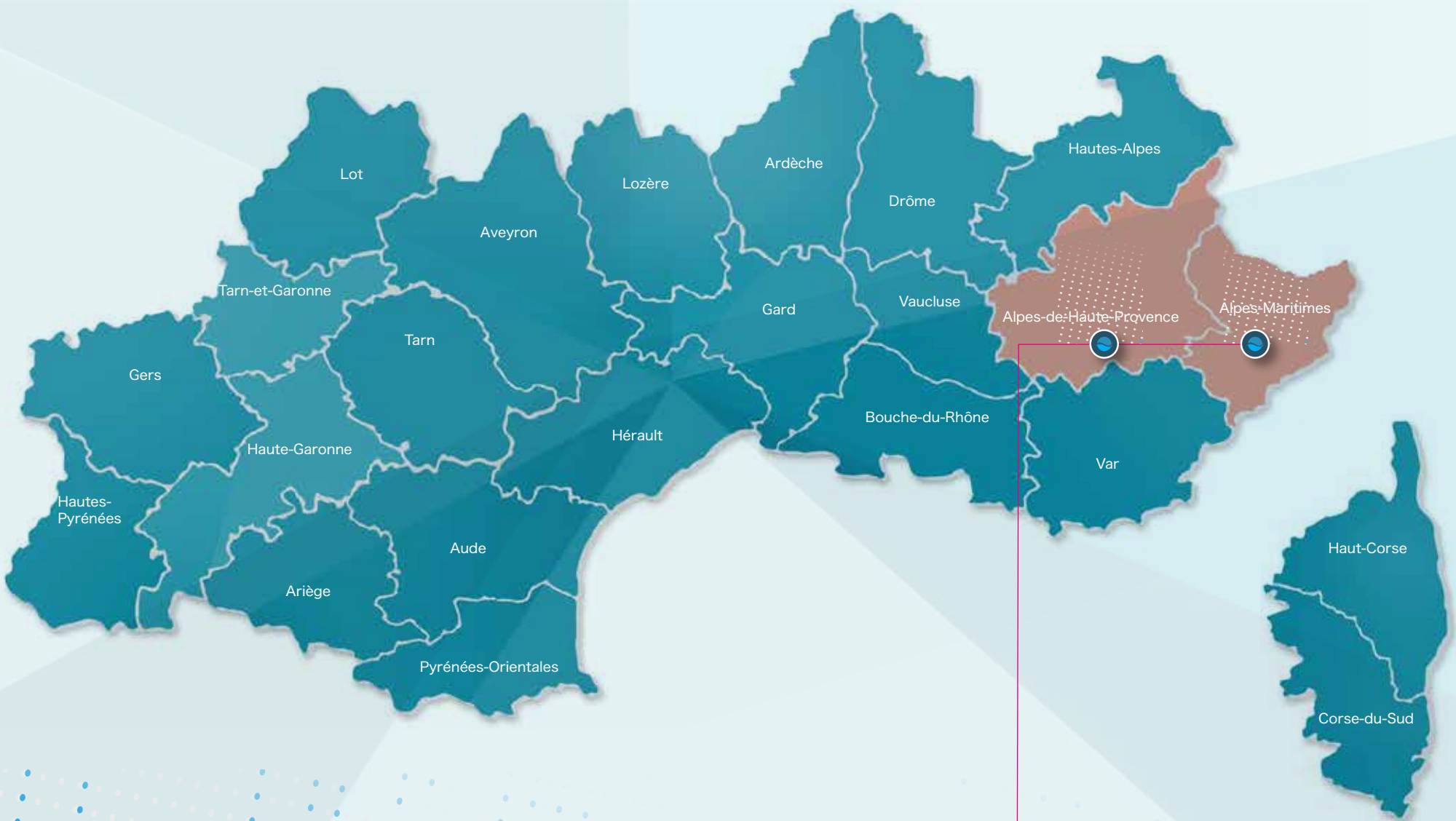


In the afternoon of 26 June, there had already been a brief but intense downpour in the area around Grasse (06).

The La Siagne, a small coastal river quickly burst its banks and flooded residential areas, especially Auribeau sur Siagne.

Damage at Auribeau sur Siagne..

Photo: SISA.*





Scouring on the banks of the Var (06).*

*photo: RTM*06.*



Transport infrastructure was severely affected throughout the river catchment,
such as here at Puget-Théniers (06)
where the road and railway line were washed away.*

Photo: RTM 06.*

November 1999, the Aude

Rainfall on 12 and 13 November 1999 was exceptional not only in terms of its extent but also by its length and intensity.

It spread to the Tarn, Pyrénées Orientales, Hérault and especially the Aude, where cumulative rainfall in 24 hours reached colossal proportions (622 mm at Lézignan, in Corbières).

The results of these downpours on the Department were dramatic. 35 people died, 438 municipalities were flooded, road and rail networks were destroyed while drinking water, electricity and telephone services were down for days.



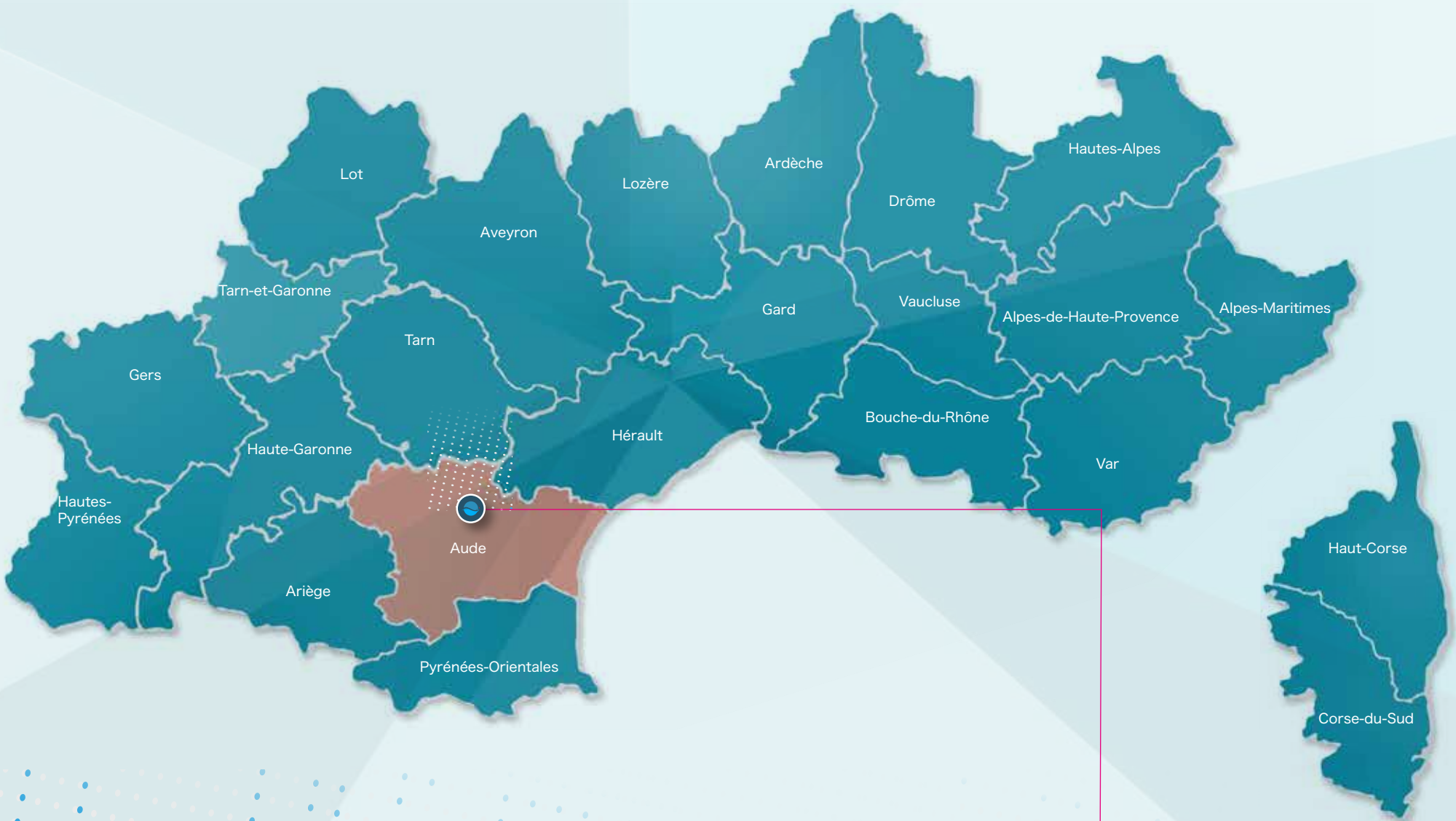
The Aude River flooding a housing estate at Cuxac d'Aude (11).

The Narbonne ring-road and Aude plain flooded.

The remains of a railway bridge at Sallèles d'Aude.

The RD 6113 road cut off by the Orbieu River, at Villedaigne, in Corbières.

Sources: DDTM 11.*



September 2002, record-breaking floods in the Gard

In late afternoon on Sunday 8 September 2002, torrential rain began falling on the Gard Department as well as parts of neighbouring Vaucluse and Ardèche.

It was the start of a major “Mediterranean episode”

By evening, all the rivers in the area (Gardon, Cèze, Vidourle, Vistre, Ardèche, etc.) had reached stormflow and were already wreaking havoc on life and property between surface runoff and burst banks.

On Monday 9, after a relatively calm period in the early morning, it rained again after lunch. The ground was saturated so the rivers overflowed, this time even more powerfully.

Cumulative rainfall over the two days was off the dial: 684 mm near Anduze and around 400 mm at Collias, while levels were more moderate in the High Cévennes. The toll was horrendous: 23 dead and more than 800 million euros of damage in the Gard.

More than 90% of towns and villages in the Gard were affected.



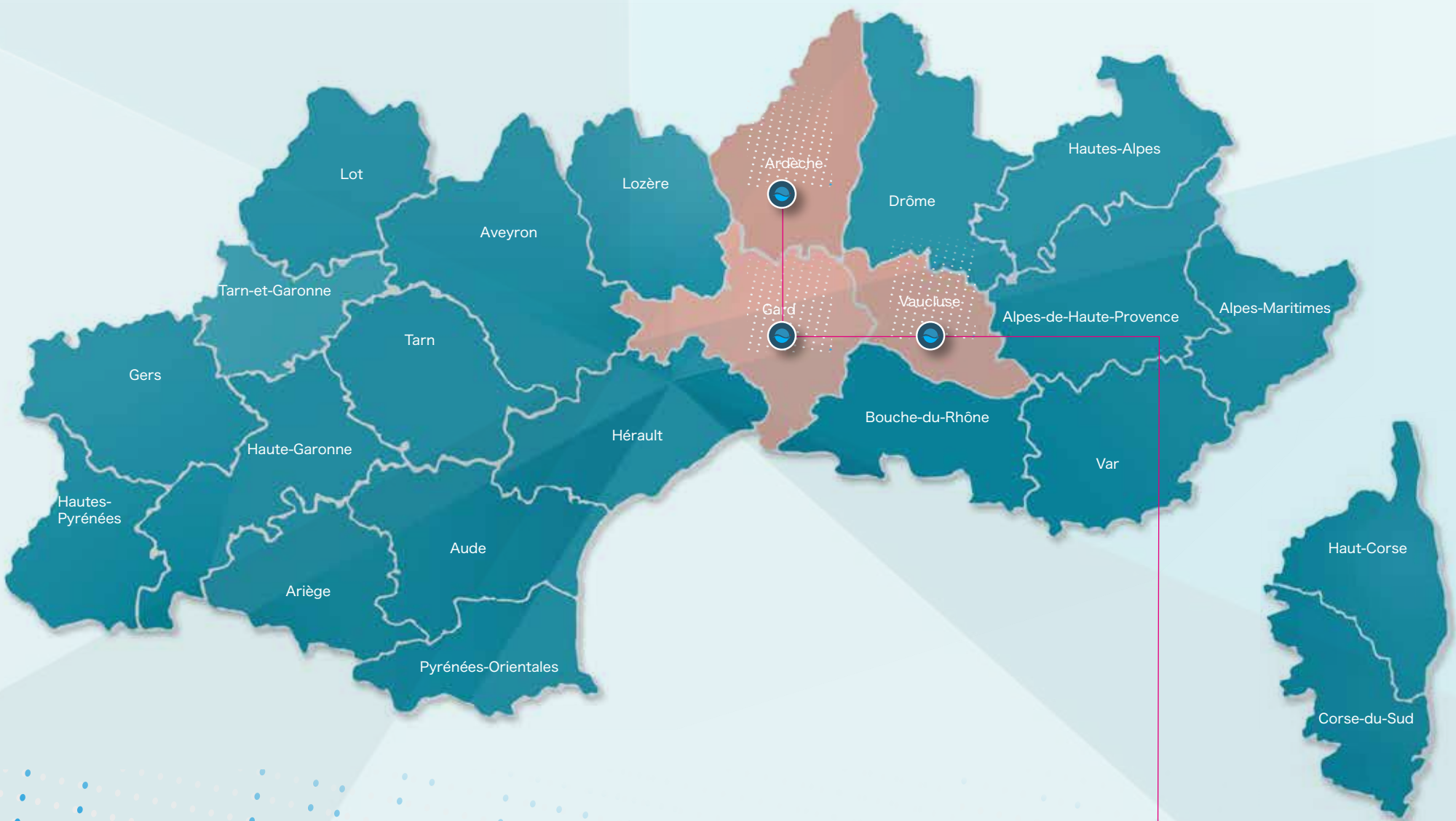
The Gardon at the Pont du Gard on 9 September. At low water, none of the bridge's piers even touch the water.

Photo: Jean-Pierre Méger.

Runoff is at the root of any flood. Either concentrated or spread out, it first engulfs usually dry land before flowing into water courses, causing them to overflow. Here, near Anduze, the results were particularly spectacular, creating short-lived waterfalls cascading down the slopes.

Photo: Yvan Diebold.





A PHOTOGRAPHIC RECORD OF 150 YEARS OF FLOODS IN MEDITERRANEAN ARC COUNTRIES

Aramon lies 7 km across a wide alluvial plain from the Gardon and was, until the CNR* reconfigured the river, prone to frequent floods by the Rhône. One arm of the river even ran alongside the town.

To protect itself from the flood waters, Aramon built a flood barrier around the south and west sides of the town. It consists of stone near the town centre but becomes an earth bank further out. When the CNR* built their large dykes, they cut Aramon off from the Rhône and its flood waters stopped short of the town, while the authorities ceased maintaining the earth banks.

By the evening of 9 September 2002, the peak flood waters had reached the Lower Gardon and the confluence, squeezed into a narrowed riverbed. The flood water could only partially reach the Rhône, so the rest breached the right bank and flowed right up to the earth dyke. It was broken in 7 places and the water surged through, devastating recently built housing estates. Many of them were bungalows and dozens of homes were flooded in the middle of the night. Unfortunately, 5 people were killed and a large part of Aramon was flooded by the Gardon, perhaps for the first time in its history and definitely since the last few hundred years.



66

Collias sits just outside the Gorges du Gardon and the village has suffered a lot from floods, especially a small housing estate built on the river's streambed* which was literally razed to the ground.



Top right: Remoulins, a little further downstream, also felt the full force of floodwaters from the Gardon. Here, the road to Uzès is blocked by an enormous debris-jam and the Statue of the Madonna collapsed.*

Photo: Paul Boyer.

Opposite: Remains of houses built in the Ron de Fabre district in Collias.

Photo: Michaël Esdourrubailh.



Flooded housing estate in Aramon.

Photo: Christian Gellet.

The Gard and Ardèche were not the only Departments to experience the flooding. Rainfall amounting to almost 400 mm fell on the west of Vaucluse triggering the Rieu to flood at Piolenc.

Photo: CYPRES.



June 2010, major new flooding in the Var

Having already experienced heavy rains in 2009, in Sainte Maximime and Cogolin on 18 September and 22 October respectively, the Department of the Var was hit by major flooding in 2010 which threw plans for the forthcoming tourist season into turmoil.

Given its extensive tree cover, forest fires are the department's main concern (the Var is mainland France's second-most wooded Department after the Landes), especially since the immense forest fires of 2003 in the Massif des Maures. During the night of 14 to 15 June there was a downpour that continued all day on the 15th. While all the department's river catchments were affected (Grappeau, Préconil, Giscle, etc.), the Nartuby River, a tributary of the Argens, saw the bulk of the rain. The Dracény district in Draguignan paid the highest price where surface runoff and rivers bursting their banks led to death and destruction.

These events marked the start of a decade of frequent major floods (2011, 2014, 2018 and 2019), similar to past events in the local area in 1929, 1933 and 1934, albeit falling short of the historic floodwater levels reached on 6 July 1827.



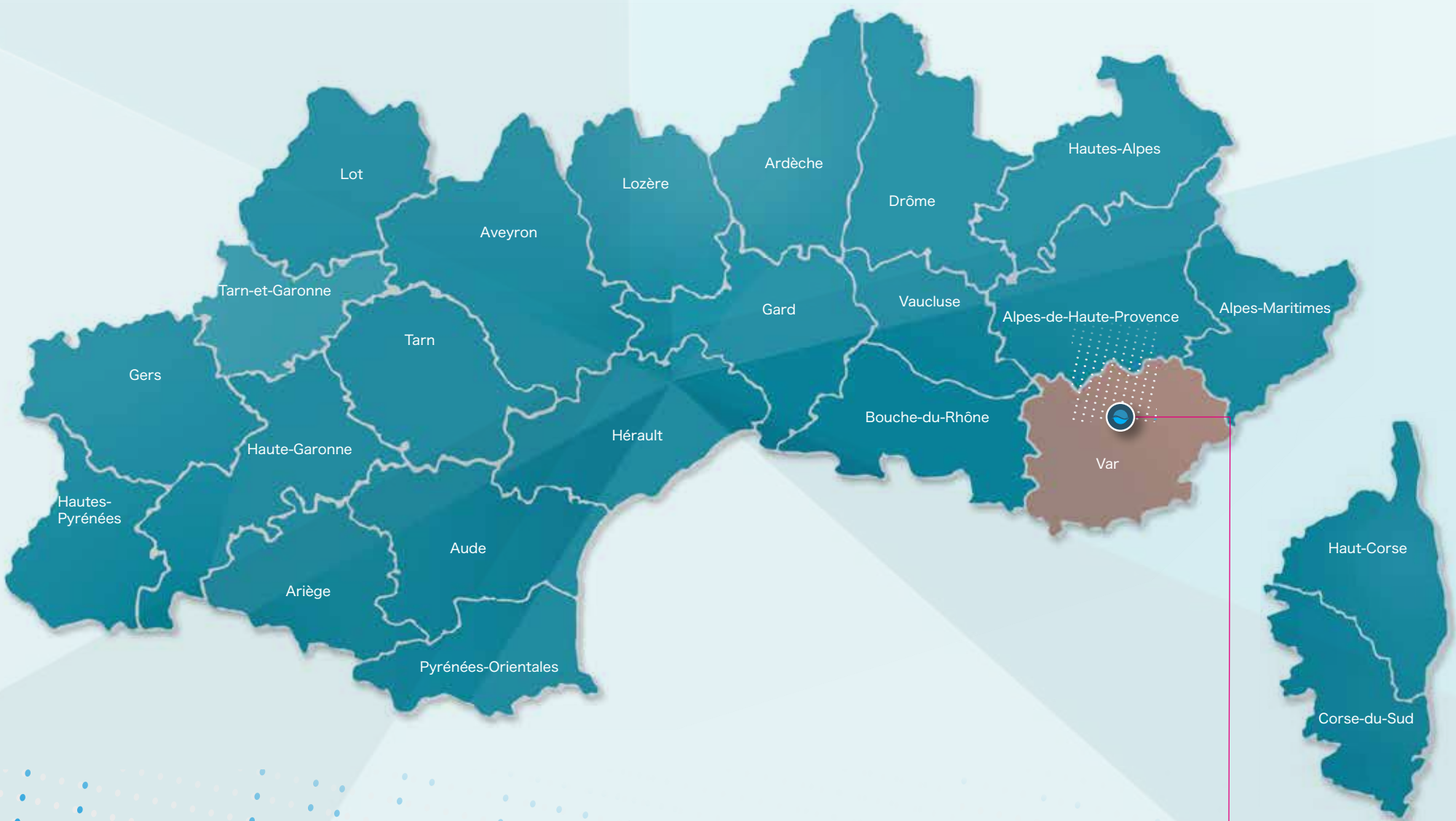
Serious damage to the ground floor of this apartment block following a flood of the Préconil River in Sainte Maximime on 18 September 2009.

photo: DDSIS* 83



The swollen Nartuby River on 15 June 2010 flowing through the centre of Trans en Provence.

Photo: Trans en Provence Town Council.



A PHOTOGRAPHIC RECORD OF 150 YEARS OF FLOODS IN MEDITERRANEAN ARC COUNTRIES

Tourism, a key economic activity in the local area, was significantly affected.

Many tourism facilities, especially highly vulnerable campsites and holiday chalets were badly hit.



A campsite at Fréjus, after flooding from the Argens River.

Photo: Sébastien Gominet/ IRMA.



Boulevard de la Liberté, in Draguignan.

Photo: Trans en Provence Town Council.

Riverbank scouring*
on the Nartuby at La Motte.

Photo: DDTM* 83.



2011, a second wave in the Var and elsewhere

Similarly to 1907, The French part of the Mediterranean Arc experienced a series of acute rainy periods that spread throughout the area.

Beginning on 12 to 15 March, the rain fell especially on the Aude, Tarn and Hérault. On 1 to 5 June, it was the turn of PACA and in particular, the Queyras (05) where the downpours doubled up with a "Retour d'Est".

Thereafter, heavy thunderstorms hit the South West, on 12 July while, finally, in autumn following torrential rain in the Montpellier area on 31 October, further prolonged rain from 1 to 9 October fell on the entire Mediterranean Arc, especially the Var and Alpes Maritimes where catastrophic flooding occurred once again. The Argens River, together with other water courses such as the Giscle and Siagne began to flood.

Finally, it was the turn of the Pyrénées Orientales to experience the floodwaters on 12 to 21 November.

72



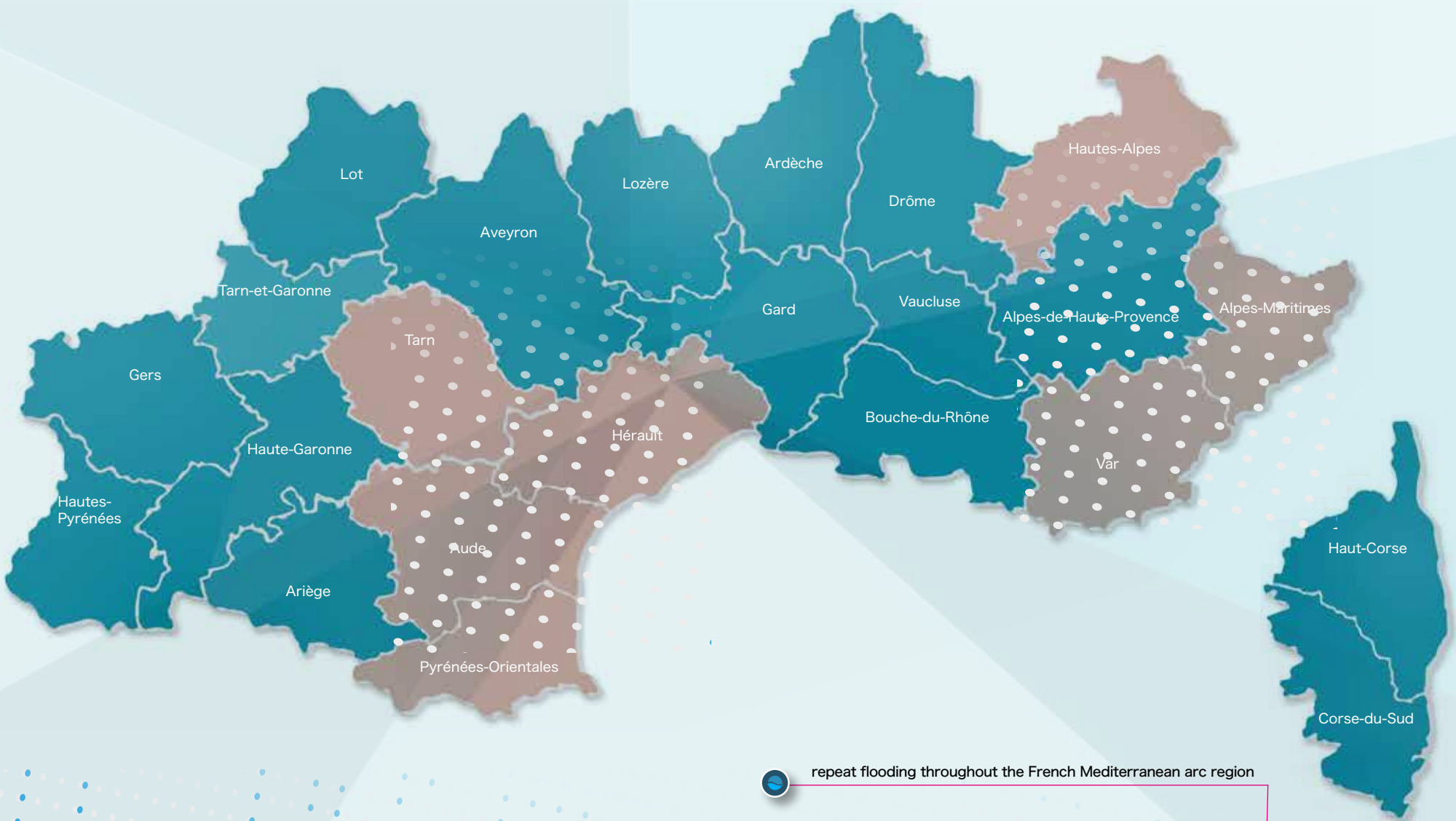
The Orb in spate at the Pont-Vieux bridge in Béziers (34) on 16 March.

Photo: EPTB Orb and Libron.*



Homes flooded by the Argens on 6 November.

Photo: Gendarmerie Nationale, Var police force.



repeat flooding throughout the French Mediterranean arc region

2011

A PHOTOGRAPHIC RECORD OF 150 YEARS OF FLOODS IN MEDITERRANEAN ARC COUNTRIES



Sorède (66), at the foot of the Albères hills, flooded on 21 November.

Photo: ONF/RTM* 66.

Port Grimaud and the marina flooded by the Giscle on the same day.

Photo: SDIS* 83.





Brignoles (83) flooded once again by the Caramy River on 6 November.

Photo: Gendarmerie Nationale, Var police force.

2014, a repeat of 1907, or 2011?

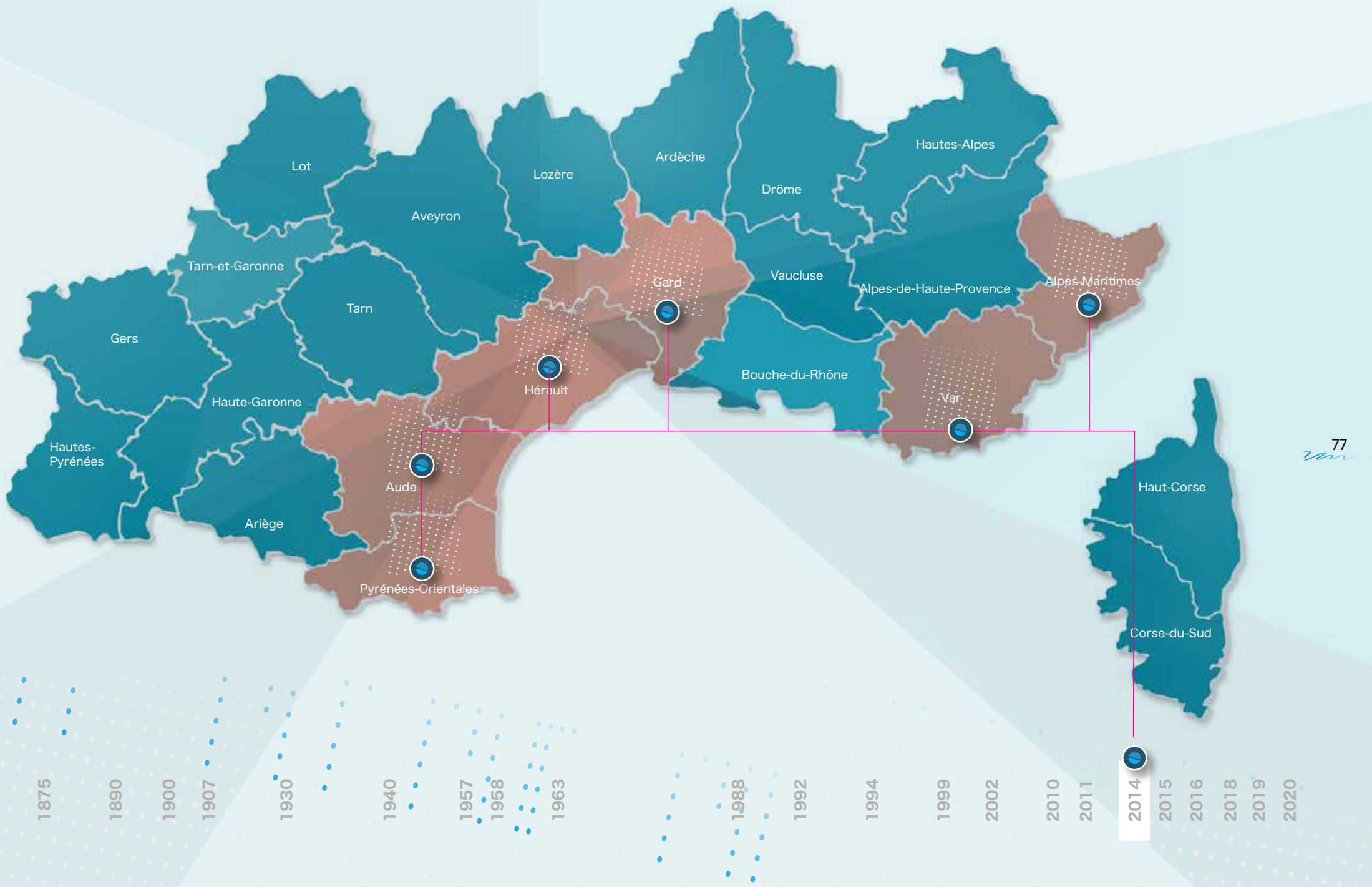
2014 was particularly trying for South East France. In January, the Var was again affected by severe flooding, as had been the case in 2010 and 2011.

In June, the area of Grasse was hit and in September and November, a series of 'Mediterranean Episodes' targeted the Gard (especially 16 to 20 September and 9 to 10 October), the Hérault, the Alpes Maritimes (again), the Aude and finally the Pyrénées Orientales. It was a reminder, albeit to a lesser extent, of the series of floods in 1907.



The Lez flooding the streets of Montpellier, in October

Photo: Christian Carmona.



A PHOTOGRAPHIC RECORD OF 150 YEARS OF FLOODS IN MEDITERRANEAN ARC COUNTRIES



The Grabieux, a tributary of the Gardon River, flooded a residential area in Alès on 17 September.

Photo: Dorian Décombe.



Then, once again, on 10 October, heavy rainfall triggered new flooding such as here, at Sanilhac (30), where a river posed a severe threat to this detached house.

Photo: DDTM* 30.



A house engulfed by floodwaters from the Real Collobrier, at Collobrières (83) on 19 January.

Photo: Collobrières Town Council.

October 2015, deluge on the Côte d'Azur

Following 2 days of heavy rain, a powerful, but very localised thunderstorm struck the area of Cannes on 3 October, cascading down in a highly built-up area.

The surface runoff that followed was hugely destructive, killing 20 people. Small coastal rivers, such as the Bague and the Loup all flooded at terrifying speed.

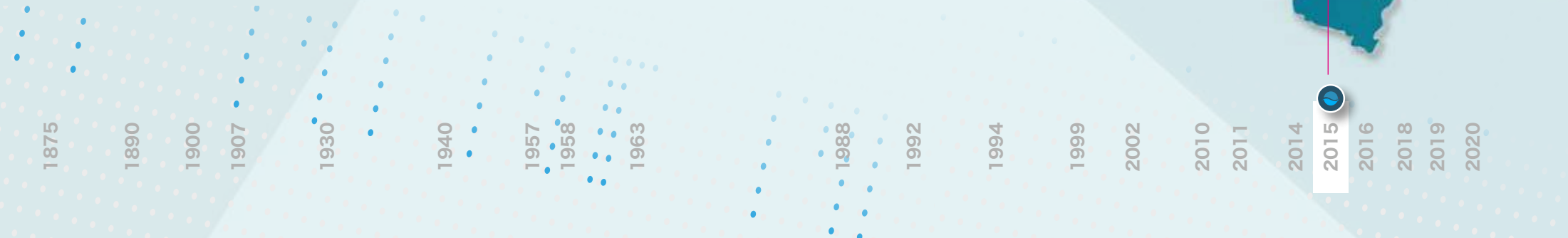


A gigantic debris-jam
on the Bague River, at Biot.*

Photo: DREAL PACA.

*A tangle of mixed debris and vehicles on the
banks of the Bague, at Biot.*

Photo: DREAL PACA.



A PHOTOGRAPHIC RECORD OF 150 YEARS OF FLOODS IN MEDITERRANEAN ARC COUNTRIES

The events highlighted a specific weakness to flooding, in the form of underground car parks which were increasingly popular in the basements of apartment blocks. Unfortunately, they turned into death traps for residents who rushed to save their vehicles from the floodwaters, some of whom drowned.

CCTV cameras, a new eye on the streets

Over the last ten years lots of municipalities have installed CCTV networks. They also capture scenes when floods hit their peak, such as here, in Cannes city centre.



Photo: Cannes City Council.



A car park in Cannes, after the floods.

Photo: Sylvain Charaud, Laetitia Bomperin.

Mobile homes at a campsite. The green letter "V" indicates that the mobile home has been inspected in the search for victims.

Photo: DREAL PACA.



2016, Corsica

Corsica is a well-known and popular holiday destination but is no stranger to the risk of torrential floods.

The island's sharp, steep relief combined with heavy rainfall so typical of the Mediterranean climate, lends itself to impressive flash floods that rush down the slopes to the coastline. For example, peaking at 2,706 metres, Monte Cinto is the "Island of Beauty's" highest point, and lies just 25 km from the sea. Yet, much of the coastline, long abandoned by the Corsicans because it was marshy and wet, has been built on, especially for tourism. As a result, the risks have grown and the local area is far more vulnerable to flooding. 2016 highlighted this weakness which had already been demonstrated by previous floods.

One example was All Saints Day, in 1993, when the whole island was hit, especially in the Alta Rocca. Many people lost their lives.

The famous Genoese bridge, Spin'a Cavallu, on the Rizzanese River, at Sartène, bore the brunt but resisted, as it had in 1892.

The 23 September 1974 marks another sad memory, when a heavy thunderstorm triggered a flash flood* of the Restonica River, at Corte, where it swept away a group of young campers, killing ten of them.

More recently, the Gravone River burst its banks on 21 December 2019, flooding Ajaccio Airport, while on 11 June 2020, again in Ajaccio, the Cannes and Salines neighbourhoods were flooded by surface runoff in a repeat of events on 29 and 30 May 2008.

2016

Heavy rain fell on the island on 23 and 24 November 2016, then again on 19 and 20 December. The first storm dumped in excess of 300 mm of rain on Castagniccia. The retail park at Furiani, south of Bastia, was badly damaged by surface runoff and a small river, the San Pancrazio, which flooded.

The second wave of rain hit the whole island.



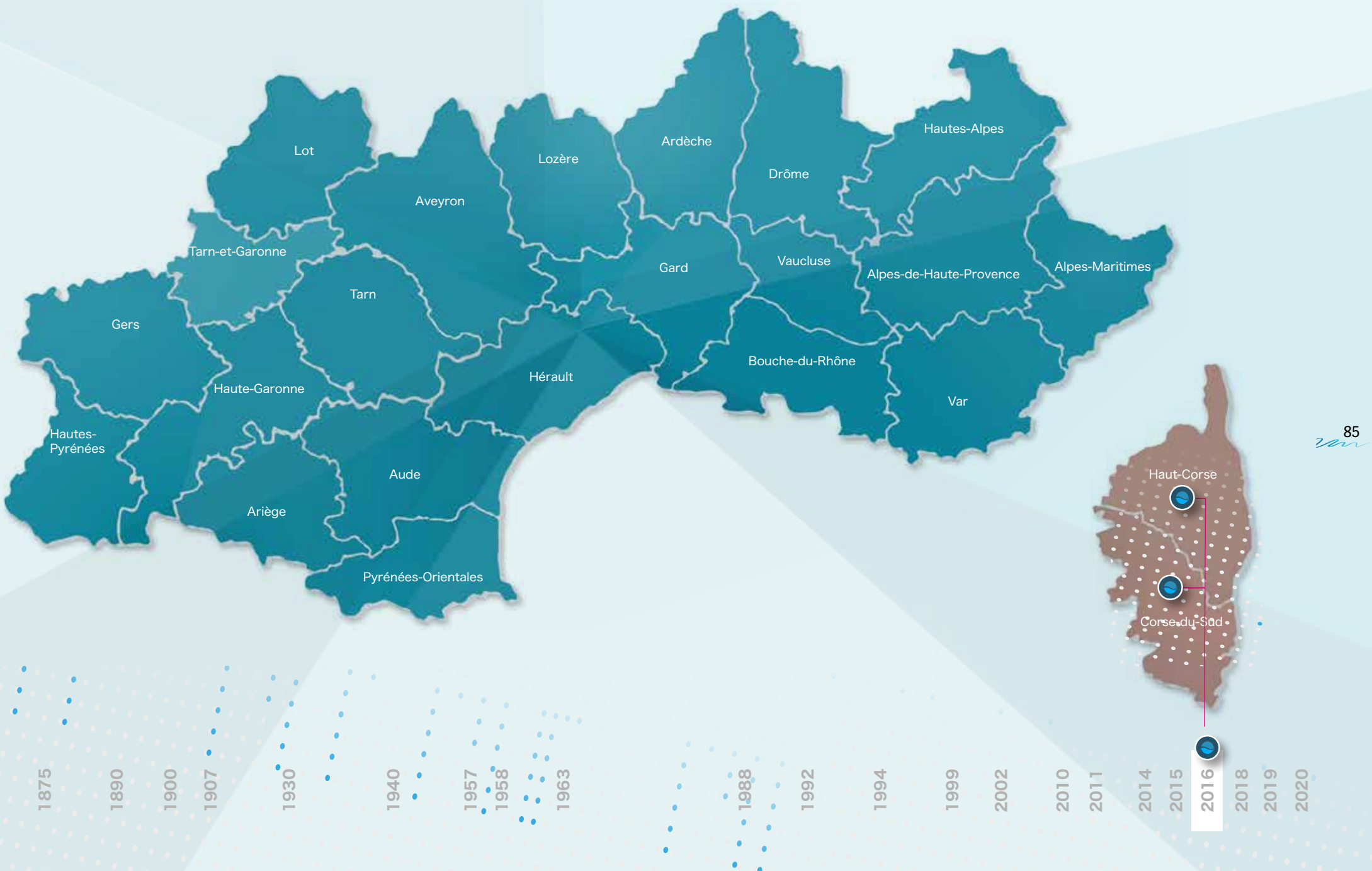
All Saints Day 1993: A housing estate devastated by a flood of the Cavu River, at Sainte Lucie de Porto Vecchio (municipality of Zonza), at the foot of the Alta Rocca mountains.

Photo: Pierre-Antoine Fournil

The Cannes district, in Ajaccio, which was flooded on 29 and 30 May 2008.

Photo: Greater Ajaccio Council Association





A PHOTOGRAPHIC RECORD OF 150 YEARS OF FLOODS IN MEDITERRANEAN ARC COUNTRIES

Ajaccio flooded again here in the Salines district on 11 June 2020.

Photo: Greater Ajaccio Council Association.

St Florent was flooded on 24 November and again on 19 and 20 December when the Aliso and Poggio rivers broke their banks. A local resident decided to mark the level of the first flood with a touch of wry humour by painting a scene on his garage door.

Flood markers constitute one of the most valuable records to remember floods. In 2003, a set of acts of Parliament, called the "Risk Acts", made it mandatory for municipalities to conserve or, if required, display the highest known flood levels (PHEC).

A standard design was then introduced nationwide for these new flood markers.



Example of a flood marker illustrating the standard.

national design, installed by the EPTB Gardons.*



*A marker recording the flood
of 24 November 2016 when
the Poggio River flooded
at St Florent.*

Photo: Carine Chaléon.



October 2018, the Aude strikes again

On 15 October, almost 20 years after the disaster of 1999, the Department of the Aude once again experienced major flooding.

14 people lost their lives and the area was totally shattered. Fortunately, widespread use of smartphones, social networks and 24-hour news channels meant that this was one of the most talked-about floods of its kind and a hot topic for the general public.

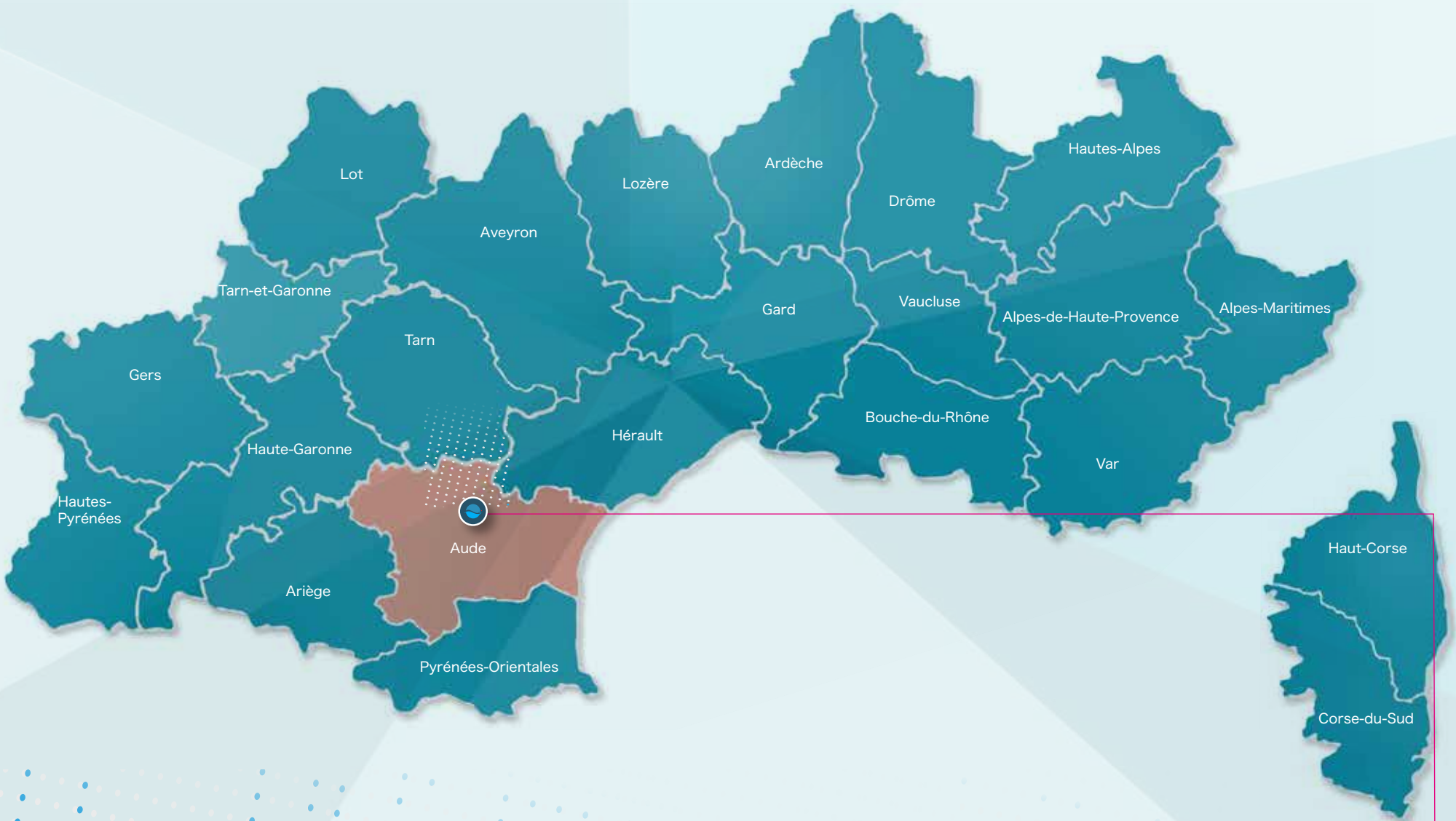
88

van

At Villalier, the RD 620 road was cut off by the Orbiel when it flooded. Sadly, a truck driver lost his life.

Photo: Sébastien Gominet/IRMA.*





A PHOTOGRAPHIC RECORD OF 150 YEARS OF FLOODS IN MEDITERRANEAN ARC COUNTRIES

*The remains of Villegailhenc bridge,
swept away when the Trapel River flooded.*

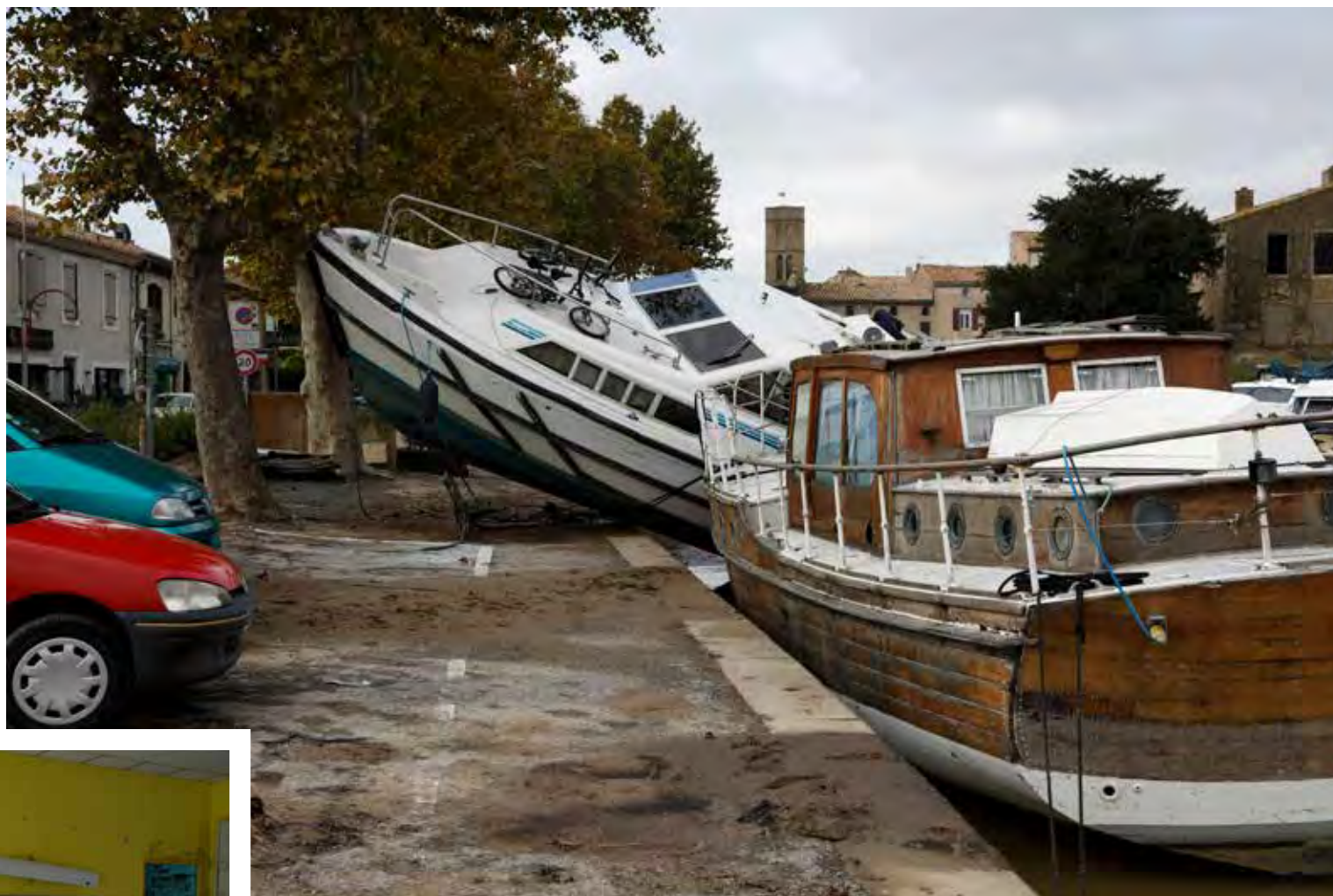
Photo: Sébastien Gominet/IRMA.*



Trèbes was at the epicentre of the floods where boats were literally thrust out of the Canal du Midi but the town was also hit by torrential rain.

At Conques sur Orbiel, flood lines marking the walls in this classroom show how high the water rose.

Photo: Sébastien Gominet/IRMA.*



2019, from Perpignan to Nice

1900, 1907, 2011, 2014, etc.

Autumn 2019 once again heralded a series of “Mediterranean episodes” throughout the Mediterranean Arc region.

It began with Marseille, the Aude, the Pyrénées Orientales and especially Hérault which were all in the firing line on 23 October.

On 3 November, Storm Amelie brought heavy rain to the Bouches du Rhône, in particular (Marseille and the Etang de Berre).

On 23 and 24 November, it spread across the Alpes Maritimes and Var (causing the Argens River to flood), Vaucluse, the Gard and the Ardèche.

On 1 December, the Côte d’Azur, the Argens valley and South-East Vaucluse also bore the brunt of the deluge.

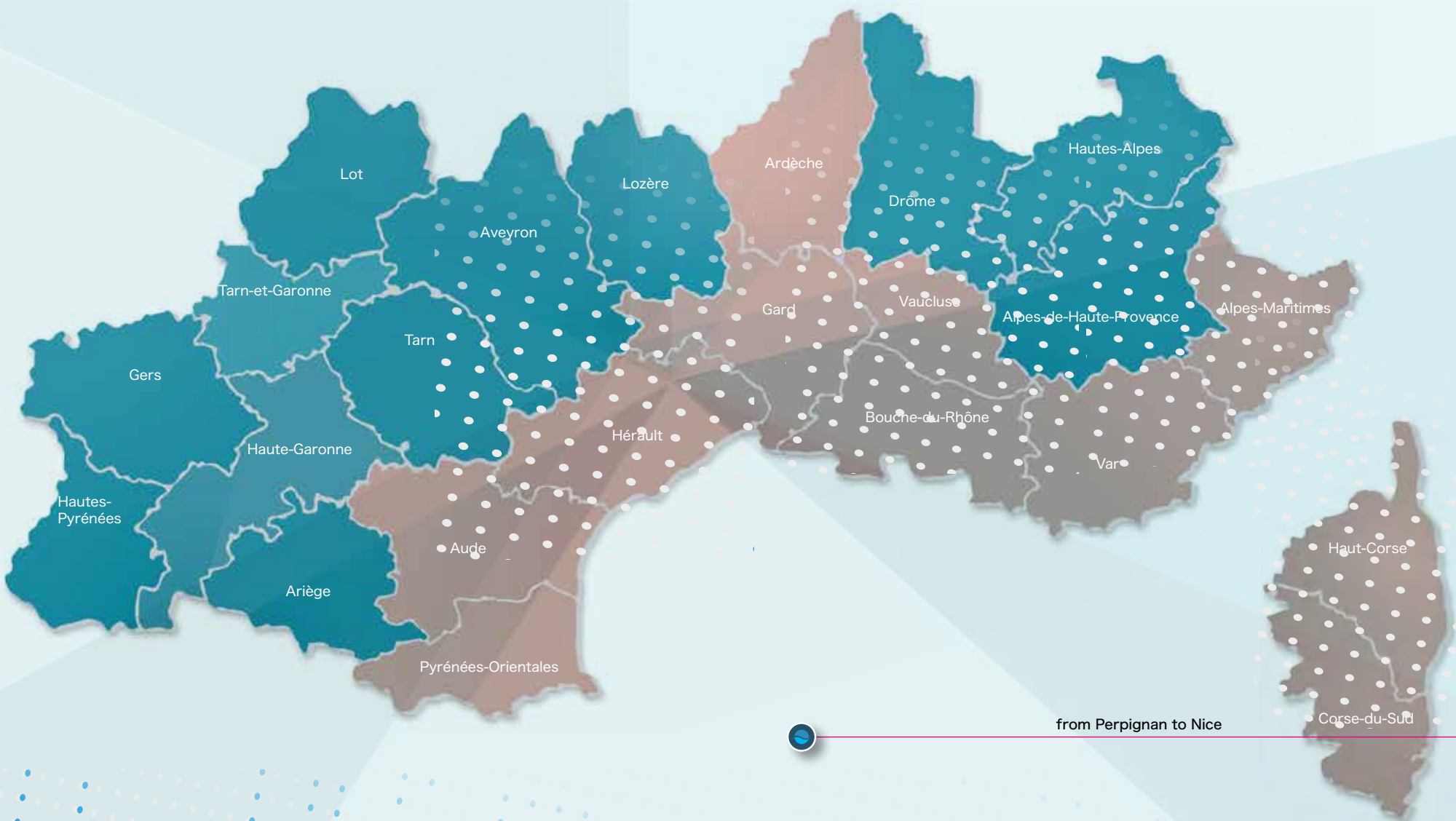
The soggy autumn finally ended on 20 December, in South-East Vaucluse and Corsica.



Flood lines on a fence at Monblanc, near Béziers (34).
The Thongue, a small tributary of the Hérault River,
broke its banks on 23 October.*

*It was however at Béziers and its suburbs, especially
Villeneuve les Béziers, that a coastal river, the Orb,
caused extensive damage and even worse, loss of life.*

Photos: SMBFH .*



A PHOTOGRAPHIC RECORD OF 150 YEARS OF FLOODS IN MEDITERRANEAN ARC COUNTRIES



*The Calavon in spate at Apt (84) on 1 December.
Photo: Jean-Marc Faday / Saignon Photographic Club.*

*Mandelieu la Napoule (06)
ravaged once again on 1 December.
Photo: mairie de Mandelieu.*

*Le Muy (83), on the confluence of the Argens
and Nartuby (foreground) rivers,
newly flooded on 24 October.*

The Argens River flooded again on 24 November.

Photo: Camille Moirenc.





2020, Gloria

Storm Gloria flew in on 22 January 2020 and battered the coastlines of Occitanie, PACA and Corsica.

Apart from the gusts of wind that caused direct damage it also triggered storm surges and sizeable wave trains that can flood coastal areas.

Coasts are honeypots of human activity where tourism infrastructure or holiday complexes and are especially vulnerable.

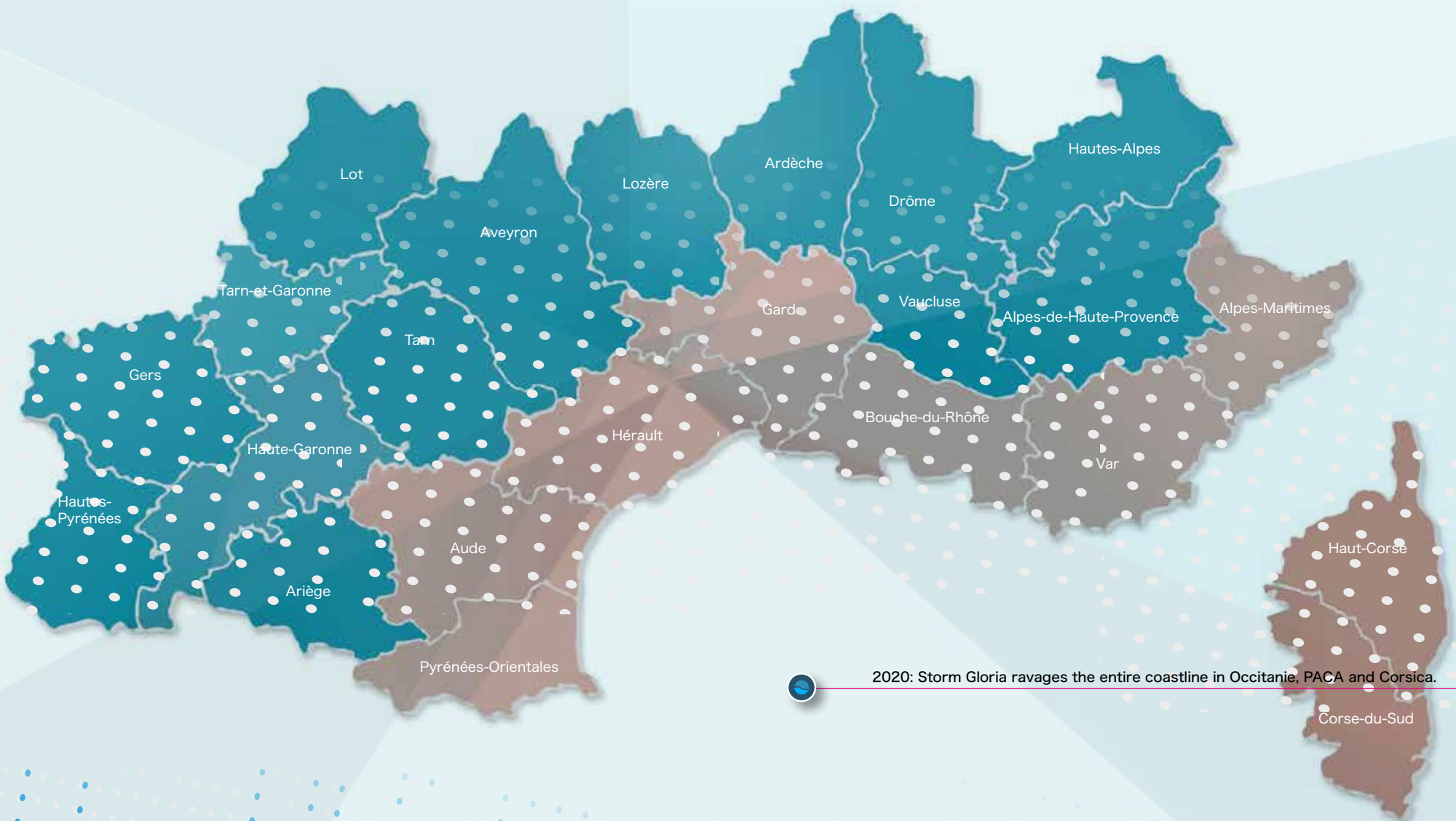
Ever since Storm Xynthia and the Faute sur Mer disaster, in the Vendée, on 27 and 28 February 2010, coastal flooding has risen up the public authority agenda, in terms of land management.



Seafront homes at Racou Beach, Argelès-sur-Mer (66), once again overcome by the waves and sea foam.

*Photos: BRGM**







Storm Gloria generating storm waves that batter a sea wall in Sète (34), sending spray high into the air.

Photo: Occitanie Regional Council.



The storm, combined with heavy rain, also caused rivers to burst their banks, such as the Aude here in Carcassonne, on 23 January.

Photo: Jean-Marie Aversenq, SMMAR
EPTB* Aude.*

Elsewhere in the Mediterranean

ITALY

When you mention Italy and flooding, the infamous “acqua alta” immediately spring to mind, the tidal peaks that regularly cover the streets and squares of Venice, as happened in January 2020, to a much greater degree than usual.

People also remember the vast floods in the Pô Valley or the River Arno which, in November 1966, seriously damaged cultural and architectural heritage in the city of Florence. The flood also killed 34 people in Tuscany, including 17 in the capital. Yet, while Italy has a Mediterranean climate, apart from the Padano Plain, it is entirely mountainous (Alps and Appenines) and as such, experiences torrential flooding on an almost annual basis.

Added to this, the country's relief and geology are also a virtual breeding ground for spectacular landslips and landslides (frane).

Flood risks are particularly accentuated on the coastal fringes where surface runoff from the hills and mountains descends on densely populated areas below with startling ferocity. Genoa and the Ligurian coast are particularly vulnerable and regularly experience catastrophic flooding as happened in 1970, 2010, 2011, 2014 and more recently in 2019

comme cela a été le cas en 1970, 2010, 2011, 2014 et plus récemment en 2019.



The Tanaro, a tributary of the Pô, in flood, engulfing the town of Garessio in the Piedmont, on 5 November 1994. These floods caused 69 deaths throughout the Piedmont and seriously damaged many hard-working communities.

Photo: Luciano Locci. "November 1994, L'alluvione. Le radici di una catastrofe".

SPAIN

Standing between the Atlantic and Mediterranean, Spain and the entire Iberian Peninsula are prone to extreme rainfall events.

Steeply sloping landscapes lend themselves to torrential floods that occur in many of its regions (Pyrenees, Cantabria, Sierra Nevada, etc.)

Land use varies greatly between densely built-up coasts and sparsely populated inland areas (with the exception of Madrid), meaning that most of the damage is experienced in coastal areas.

As a result, some major urban centres have radically altered their landscapes, such as Valencia. Following a major flood of the Turia, a coastal river that flows through the city, on 13 to 15 October 1957, the authorities decided to divert the river. The old riverbed is now a wide green corridor called the Turia Gardens where a number of sports and cultural facilities were built.

Other extreme weather events have hit both Spain and France, such as the Aiguat in 1940 (see page 34) and the floods of 26 to 28 August 1983 which affected the entire Basque Country.

Autumn 2011 was a particularly rainy and destructive period in Spain, France and Italy, as was the case, more recently, in 2019 when Catalonia, Valencia, Murcia and Madrid all suffered major flooding.

Finally, another memorable event was the Biescas disaster on 7 August 1996 which claimed the lives of 87 people in a campsite in this town in Aragon, at the foot for the Pyrenees.



While we have our “Cévenol episodes” in France, the Spanish have a similar phenomenon called “**Gota fría**”, which mainly occurs in the autumn. Gota fría can sometimes combine with another weather event called **DANA** (Depresión Aislada en Niveles Altos, or high-altitude isolated depression). This happened in October 2018, several days after the floods in the Aude, when sudden heavy downpours triggered major flooding on the Mediterranean coast and in Majorca.

Terrassa (Catalonia), after the devastating flood of the Riera de les Arenes which killed 351 people on 25 September 1962.

Photo: J. Altimira

Elsewhere in the Mediterranean

GREECE AND THE BALKANS

With its steep mountain sides plunging into the sea, narrow coastal bands and frequently sprawling cities, such as Athens, the Balkans and Greece have also experienced their fair share of catastrophic floods.

One of the most recent was in May 2014 which caused huge damage in Serbia and Bosnia-Herzegovina, while on 15 November 2017, floods ravaged the town of Mandra, 50 kilometres west of Athens.

THE MAGHREB

102 This part of North Africa has a very varied climate, coupled with exceptionally high relief (such as the Atlas mountains) bordering the Mediterranean Sea and Atlantic coastline. In between lie densely populated cities providing the Maghreb with all the ingredients for torrential flooding on a regular basis.

Many cities in Morocco have been frequent victims to flooding, such as Rabat, le Rif or the Marrakesh area where the Ourika, a popular river for tourists, regularly experiences flash flooding often on a monumental scale, as was the case in 1995 and 1999.

In Algeria, rural areas such as Kabylie are often hit by flash floods such as in November 2018, while large cities, such as Algiers, are vulnerable to wadis suddenly flooding. The district of Bab-el-Oued (the River Gate) is especially vulnerable and on 10 November 2001, hundreds of people lost their lives.

Finally, Tunisia is also prone to torrential rainfall. Indeed, Cap Bon was hit by exceptionally heavy rains in 22 September 2018, which resulted in huge damage to the Greater Nabeul area.



The flooded streets of Mandra (Greece) on 15 November 2017.

Photo: Forecast Weather Greece.



Sidi Slimane (Morocco) during a flood of the Beth Wadi on 23 to 25 November 2002.

Photo: Le Matin.

Y A PAS PHOT'EAU !

In 2019, the Inter-regional Mediterranean Arc Flood Unit organised a photo competition in conjunction with the MAYANE Association. The aim was to inform the general public and regional authorities about the range of flood risks that exist in the 23 Departments of the Mediterranean Arc region.

A jury of 18 experts awarded prizes for the 5 best photos in each of 3 themes.

THEME 1

Water, the source of floods

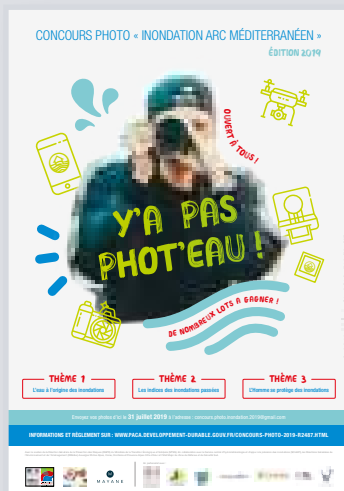
THEME 2

Clues from floods of the past

THEME 3

Society protecting itself from flooding

The competition was free to enter and participants could use all types of photographic equipment (digital and traditional cameras, smartphones, tablets or drones). Here are the 15 prize-winners with comments from the photographers.



THEME 1

Water, the source of floods

First prize: THE STORM IS COMING



"After a mild, sunny afternoon in late winter (almost 20°C on 10 March 2013), the air became increasingly unstable towards the end of the day, indicating sudden showers or storms were on their way. I decided to go the hamlet of Saint Salvayre (Alet les Bains, Aude), where I saw a series of spectacular thunderstorms moving between the plain and the Upper Aude Valley. Although the storm cells weren't especially powerful, my camera and tripod were nevertheless battered by the elements, including rain, sleet and strong gusts of wind."

Dorian DZIADULA

Equipment: Canon 450D,
Sigma 17-70mm lens,
42 second exposure, ISO 100, f5
aperture, tripod and wireless remote control

Second prize: RESTONICA



"These photos were taken in the Spelunca and Restonica Gorges, in Corsica, during summer 2018. I used a waterproof camera case. These rivers are so beautiful, revitalising and peaceful but they can become dangerous and destructive raging torrents. A few days before, on a river further upstream, the Zoicu Canyon flooded and five people were killed."

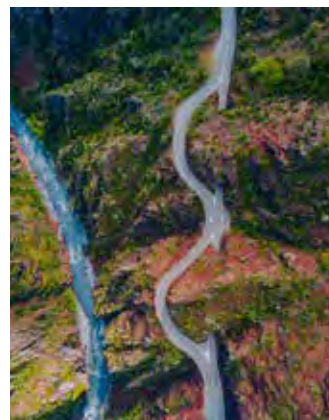
Grégory BRU

Equipment: Large domed liquid eye waterproof camera case designed for surfing, Nikon D7200 digital SLR, with Tokina 10-17mm wide-angle fisheye lens.

Third prize: SPELUNCA



FOURTH PRIZE: ERO(UG)ION



"This aerial photo was taken in the amazing Daluis Gorges, in the hills behind Nice. The gorges are the result of erosion by the Var River and there are some great ripple marks in the rocks. The photo spotlights the historic impact of the Var, sculpting and shaping the red rock to look more like immense canyons in America as well as the way people have intervened to tame this unique landscape."

Dimitri WEBER

Equipment: DJI Mavic Pro drone.

Fifth prize: LONG EXPOSURE ALONG THE BRAGUE



"It was a lovely sunny day, so I went for a walk with my camera along the banks of the Brague River, between Valbonne and Biot (06).

I was looking for tiny details that would really make my photos stand out. I paced up and down the riverbank, crouched down, turned around and compared angles to plan my camera shots. I finally settled in

this spot, where some pebbles formed a small natural weir that was bathed in lovely colours and light and reflections that really appealed to me.

I set my camera down on its tripod, chose the settings and clicked the shutter. When I looked at the photo it was just at the height I wanted. Result!"

Julien FERRI

Equipment: Body: Canon 60D, Canon 18-135 mm lens, tripod, ND400 filter.
Settings: Focal length 120 mm, F/13, ISO 100, exposure time: 30 sec.

THEME 2

Clues from floods of the past

First prize: TRANSMISSION



"I'd already seen these flood markers out walking on the banks of the Lez River (34). When I heard about the photo competition and the theme, I instantly thought of this site, with its especially high flood markers. They were so high that my imagination ran riot. I would be underwater if it flooded!

I got my two sons, Louis and Simon, to pose, the elder son telling this little brother about it, hence the title, transmission."

Nicolas CATTIN

Second prize: An amusing and resilient memory of the November 2016 flood at St Florent (2B)



"On 7 July 2018, it was the first day of our holidays in Corsica. My family, or "pinzuti" as the locals would call us, went for a walk in Saint Florent. We chanced upon a reminder of the horrendous floods from November 2016. As a civil servant on holiday, it was the most amusing and resilient example of the national flood marker database. Fortunately, there was just material damage which is now nowhere to be seen in the town."

Carine CHALEON

Equipment: Panasonic DMC-GX7.

Third prize: 1993 FLOOD

"A couple of words and a date carved in marble, resembling a tombstone, left as a mark of the passing of time on an old building in remembrance of a past event.

The black and white photo evokes the past and reminds us lessons we sometimes forget. The perspective in the camera shot focuses thoughts on the future, perhaps symbolising transmission to future generations. Overall, the photo provides an artistic and poetic appraisal of flood markers that link the floods of the past and prevention today."



Jean-Luc LEBLANC

Equipment: Nikon camera body

Fourth prize: Puddles on drenched land



"The Huveaune is a small coastal river that flows into the sea in the bay at Marseille and after a long period of rain, the banks were saturated and could take no more water. The wind, which was whipping up waves in the background and would take some time to dry out the ground. The photos were taken during a strong bout of Mistral after an extended period of wind from the south east."

Hélène VACELET

Equipment: Nikon D750 with Nikon 24-70mm f2.8 lens



Fifth prize: AFTER THE FLOOD OF THE RIEUMASSEL

"A storm cell sat above Grabels (34) on the night of the 6 to 7 October 2014, over the small Rieumassel river catchment. 6 hours of heavy uninterrupted rain followed and as day broke, members of the local consortium visited the hardest hit areas. The first image that stuck in our minds were the homes struck by the flood, with flood water lines

ranging from a few centimetres to several metres high and the mud caked on the walls and floors. The second image shows dozens of cars swept away by the floodwaters, piled up on top of each other or wrapped around trees. It just shows the sheer power of the flood."

Anne BOURSIAC, SYBLE*

THEME 3

Society protecting itself from flooding

First prize: REPROFILING THE ROYÈRES FLOOD BANK AT CHARLEVAL

"The photo was taken during building work to reprofile the Royères flood bank at Charleval (13). It was one of a series of tasks to reconfigure a 15-km long inter-municipal flood protection system along both banks of the Durance.

The flood protection work stood out because it combined efforts to reinstate the river's profile by drawing back the dykes from the riverbed and banks. This resulted in a countryside feel to the photo rather different to the typical landscape found along the riverbanks.

A little anecdote: It was chatting with the bulldozer driver in the photo that I learned about the deft skills needed to profile the embankment so spectacularly and efficiently, like this. Faced with the task, he profiled almost 20,000 m² of dykes!"

Bertrand JACOPIN, SMAVD*

Second prize: STORM IN THE MEDITERRANEAN



"It was March 2018, on the Plage des Sablettes, at La Seyne sur Mer

I was walking with a couple of friends at La Seyne sur Mer (83) when the Mistral, a powerful south-easterly wind, started to blow.

It was March and there was virtually no one on the Plage des Sablettes which accentuated the flat calm sea that we contemplated in front of us. Suddenly, gusts of wind threw a breaker against the boulders of the sea wall.

Now the peace was transformed into a chaotic scene."

Martine OUDIN-CHAMARD-BOIS

Equipment: iPhone7

Third prize: CONTOUR



"This photo was taken at Marsillargues (34) for my studies.

In 2019, I completed my dissertation project for my landscape Designer degree at Versailles. The topic was managing water-related risks in the Camargue (salt and fresh water). First, I focused on the Vidourle River to judge what effect it

had on the local area. After studying the map, I walked along its banks as often as possible, from its source (at St-Hyppolite du Fort) to the sea (at Le Grau du Roi) and back again. These trips helped me understand and grasp the level of risk from water to the local area and ways to avoid them, anticipate them and remember them."

Corentin LEONARD

Equipment: Samsung A5 2016 smartphone.

Fourth prize: PILES



"The Cité Radieuse... but also solid is the feeling you get when you see the 34 nine-metre high piles designed by Le Corbusier in 1952.

Piles were initially used to enable architects overcome constraints imposed by the land, they free up the view as well as space and freedom of movement for people. Nowadays, they provide another dimension

making buildings seem unsinkable

The Cité Radieuse has nothing to fear despite being listed in a blue zone, "at risk" site in 2017, when the Huveaune PPRi Risk Prevention Plan, in Marseille."

Robin LECONTE

Equipment: Olympus OM-2, Olympus Zuiko 24mm lens,

FILM: Lomography Lady Grey B&W 400 35mm

Fifth prize: Codolet, sheltered



"The village of Codolet in the Gard was devastated by flooding in September 2002 and December 2003.

Protection against the floodwaters of the Cèze and Rhône Rivers is now guaranteed by a 3.5 metre-high, 2.5 km-long flood bank, skirting through vineyards and surrounding the village. When the Cèze flooded in November 2014, Codolet was cut off but not flooded unlike its neighbour, Chusclan."

Hélène VACELET

Equipment: Nikon D750 and Nikon 24-70mm f2.8 lens



Glossary

Aiguat: Flood in Catalan and Occitan dialects

Baseflow: Low-water level.

Bertin, Rose (1747-1813): fashion retailer and highly astute woman who worked for Queen Marie-Antoinette.

BRGM: French Geological Survey

CAPA: Greater Ajaccio Council Association

CNR: Compagnie Nationale du Rhône (Rhône River Management Authority).

Confluence: Place where two rivers meet to form a single channel

CPIE: French environmental education centre network

Flash flood*: Rapid rise in the flow of river

DDSiS: Departmental Directorate for Fire and Rescue Service

DDTM: Departmental Directorate for Land and Sea.

Debris dam: An object transported by a river that could obstruct the flow of water at a narrow point, such as a bridge. The name also applies to the natural dam that subsequently forms.

Debris flow: Mudslide dense enough to carry large boulders in suspension.

Debris line: The visible line indicating where flood waters reached their highest point.

DREAL: Regional Directorate for the Environment, Development and Housing.

EPTB: Etablissement Public Territorial de Bassin (Public river catchment authority).

Flash flood : rapid increase in the flow of a water bear

Floodplain: The widest area occupied by the river when it overflows its banks. It is defined by the largest recorded flood event.

Gabion: A robust steel cage commonly filled with stones and used in public works to protect riverbanks from scouring.

IRMA: French Institute of Major Hazards

Local Plan: Local land-use designation plan

Maurice Pardé (1893-1973): Eminent academic, innovative researcher and founder of Potamology*. Pardé conducted ground-breaking work to rank and define the features of flood events worldwide.

Meander: Bend in the channel of a river

ONF/RTM: French Forestry Commission/Restoration of Mountain Landscapes

PPR: Risk Prevention Plan

River catchment: The area in which drops of water all flow towards the same outlet (river, lake, sea or ocean).

Scouring: bank erosion by the mechanical energy generated by river flow.

SDIS: French Departmental Fire and Emergency Service

SISA: Siagne River and tributaries inter-municipal association

SMAVD: Durance Valley joint-planning association

SMAAR: Aquatic environments and rivers joint association

SMBFH: Hérault River Joint Association

SPC: Flood Forecasting Service.

Streambed: The channel occupied by a river at its annual mean flow.

SYBLE: Lez River basin consortium

Thalweg: A line formed between the two lowest points, either a valley or a streambed.

Acknowledgements

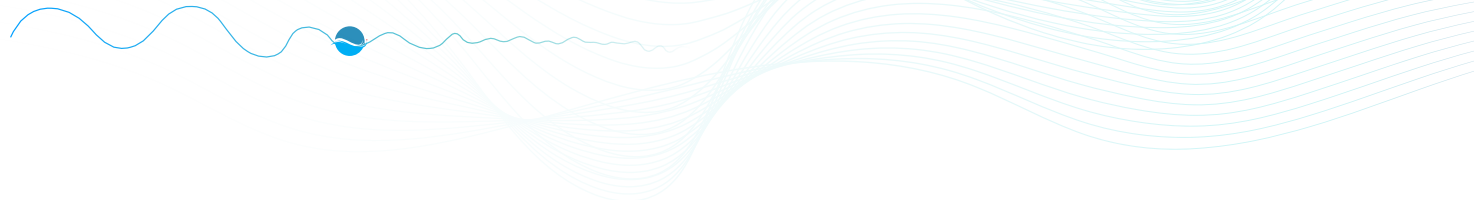
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and all those involved in proofreading.



*A small country road flooded by the Tarn in spring 1930.
National Library of France.*



A lot of water has flowed under the bridge since photography was officially invented in 1830, sometimes even over it!

The Mediterranean Arc region has experienced many floods captured on film, using cameras and we keep and pass down these photographs to the younger generations. The images capture the past, the relics of floods. Sometimes they provide proof of a forgotten reality but they remain the guardians of our collective memory. Photographs may have changed in their format over time but now they are widely used, especially with the advent of smartphones and social networks.

This book takes you on a journey through time, combining the history of major floods that have struck the South of France and the history of photography.



ISUDalea
- JEAN MARC DECOSME -