2026

THE RAIN - MAKER

Method for Triggering Rain

After this method was applied, rain fell even in some of the driest regions of the world



The image shows a mobile ring-nozzle spray unit, directly beside a body of water

Method, technology and background
As of 2026

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Prologue – Why I Created this Documentation

Around 25 to 30 years ago, I saw a programme on television that has stayed with me to this day. The programme showed a team of researchers who had set up several metal pipes, about six to nine metres high, in a desert region. At the upper end of these pipes there were very fine spray nozzles. Water, possibly seawater, was pumped up through the pipes and finely atomised at the top. A large part of the water already evaporated in the air. After this method had been used for a certain time, the programme showed that rain began to fall in the region concerned. The simplicity of this approach impressed me greatly at the time.

For many years, this memory remained in the background. In recent years, however, it has taken on a new urgency for me. The increasing lack of rain and the ever longer periods of drought and heat in Great Britain and in large parts of Europe worry me greatly. The year 2026 in particular, in which Great Britain experienced the hottest summer since records began, has heightened this concern even further. Low water levels in rivers such as the Wye, Severn, Usk and Avon, together with falling reservoir levels, have led to restrictions on water use for millions of people. Agriculture is suffering from parched soils and crop losses, forests, heathland and moorland are coming under increasing drought stress, and the risk of wildfires is rising. The consequences are therefore no longer confined to nature, but equally affect the economy, supplies and the population. [25, 26, 27]

Out of this concern, I remembered the television programme from back then and began to search the internet specifically for comparable methods. In doing so, I came across the Swiss inventor Hans Hangartner and his “Method for causing rain”. To my surprise, I found indications that Hangartner had used his method very successfully over many years in various very dry regions of the world. My attention was drawn in particular to his trial in the Indian state of Gujarat in 1988, where, after years of drought, heavy rainfall set in again during his stay. [3, 5, 6]

This discovery was the actual reason for me to gather the available information and to create the present documentation “The Rain-Maker”. My aim is to present the method in an understandable way, to document the work and field trials of Hans Hangartner, to bring together historical sources and precipitation data, and at the same time to show how a modern mobile test installation could be built.

At the centre of this, for me, is a simple but important question: if such a method was used in some of the driest regions of the world and rain repeatedly fell afterwards, why should it not also be tested and used in Great Britain under today’s climatic conditions? Since the trials of that time, both the climate and the technical and meteorological possibilities have changed considerably. In my view, we should therefore not dwell too long on the theoretical question of whether the method is possible or not. What matters would be to start the trial under today’s conditions with scientific supervision and to observe what actually happens. Only a practical field trial can show what effect unfolds under real conditions. Should it turn out that the method works, its benefit for agriculture, forests, rivers and water supply, and not least for combating global warming, could be of great significance. Who does not know it – the remarkably soothing cooling effect when, after a long period of heat or drought, sustained rain finally sets in: within a very short time, ambient temperatures drop markedly, and not least the previously strongly heated ground also cools down noticeably. I could well imagine that precisely this method of “rain-making” could help, through deliberately triggered rainfall, not only to prevent periods of heat and drought, but also to counteract increasing global warming.

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Estimated reading time from Prologue to Conclusion and Outlook: approx. 17 minutes

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1. Introduction – Climatic Changes in Great Britain and Europe

Great Britain and large parts of Europe have been experiencing a noticeable shift in climate for several years. Dry periods occur more frequently, last longer and are accompanied by pronounced heat. Summers such as 1976, 2018, 2022, 2025 and above all 2026 have shown how severely persistent drought can affect the landscape, the economy and the population. The summer of 2026 was the hottest since records began, with a lack of rain not seen since 1836. [25]

This development is particularly visible in rivers and reservoirs. In July 2026, England received only 7 per cent of its usual rainfall. Rivers such as the Wye, Severn, Usk and Avon carried extremely little water, and around 23 million people were affected by restrictions on water use. In October 2026, more than 80 per cent of England was in drought status, parts of southern England even in “severe drought” since 15 October; likewise Wales and eastern Scotland. [24, 26, 27]

Agriculture is also directly affected: if grass on pastures and meadows no longer grows sufficiently during dry phases, farmers have to buy in feed or reduce livestock numbers – with consequences for prices. In addition, persistent drought increases the risk of wildfires: parched soils and dried-out vegetation form a breeding ground for rapidly spreading fires – a phenomenon that Great Britain experienced many times in the summer of 2026. [25, 26, 27]

The electricity supply is also increasingly coming under pressure. A considerable part of British electricity production still comes from gas-fired power stations, some of which depend on river water for their cooling. In times of low water levels and high water temperatures, their operation can be restricted. Since Great Britain also obtains electricity via subsea cables from continental Europe, where the same problems exist, electricity could become scarce during long periods of drought and heat. [28]

Alongside the economy, the population is also coming into focus. The UK Health Security Agency (UKHSA) estimates that the heatwaves in May and June 2026 alone caused 2,877 additional deaths in England. Older people and people with pre-existing conditions are particularly at risk. [29] In persistent heat, the risk of health complications rises, especially when bodies and living spaces can no longer cool down even at night. [29]

Against this background, the question of whether and how the formation of precipitation could be deliberately supported during dry periods is gaining in importance. Or would it even be conceivable that precipitation, or rather rain, could be deliberately “generated” during such dry periods? The present documentation presents a method that has existed for decades but has never yet been tested and used systematically and with scientific supervision:

So-called “Rain-Making” by means of a mobile spray-nozzle unit.

In simplified terms, the underlying principle can be described as follows: over the heated land, moist air rises and condenses at altitude into clouds; the now drier air flows back to the water surface and absorbs moisture there again. In short: in targeted rain triggering, water – for example from a lake, river or sea – is evaporated in order to set the described cycle in motion and to increasingly intensify it. **This process can be imagined as a large, powerful engine: the method of targeted rain triggering is the key that starts it.**

2. Origin of the Method – Hans Hangartner

The method presented here goes back to the Swiss inventor Hans Hangartner, born in 1921 as the son of a Swiss dairyman who had emigrated to Transylvania in Romania. At the age of twelve, he came to Switzerland with his family, where the family at times lived in great poverty. Hangartner worked in the mechanical engineering sector, but was throughout his life a self-taught tinkerer with a keen interest in natural phenomena. [4, 5]

By his own account, he studied thermals, the physics of evaporation, weather maps, and wind and ocean currents intensively. According to his own statement, he received a decisive impetus in 1977 from insights into the refrigeration physics of ice production, which led him to the basic idea of his later method. [4, 5]

On 1 June 1989, Hangartner filed patent CH 679 262 A5 with the Swiss Federal Institute of Intellectual Property, entitled “Verfahren und Vorrichtung zum Bewirken von Regen” (Method and device for causing rain). The patent was granted on 31 January 1992. It describes both the method – the evaporation of seawater sprayed into warm, dry air in order to stimulate precipitation – and an associated, easily transportable device. [3]

Hangartner did not stop at merely filing the patent, but tested his method in practice over decades – and in some of the driest places in the world. His missions took him to Morocco, Mauritania, Israel, Tunisia, Togo, Namibia, the West African Sahel zone and India, among other places. To the great joy of the population, rain did in fact set in afterwards each time. Local experts consistently confirmed these precipitation events – although whether they could be causally attributed to the rain-maker experiment could not be conclusively clarified scientifically. What is certain, however, is this:

The rain fell, and the temporal connection between experiment and precipitation remained striking and remarkable. [4, 5]

I do not know whether it was the recurring doubts of experts about the effectiveness of his method that prompted Hans Hangartner in June 1988 to venture once again into the Indian state of Gujarat – a region in which a severe drought demonstrably prevailed from 1985 to 1988 – in order to prove there once more that his method can actually produce rain. The correspondent of the Tages-Anzeiger, who accompanied the experiment on site, reported on 27 July 1988 on the first proper rain in four years. [5, 6, 7, 8]

And yet the recognition he deserved never came during his lifetime. For the fundamental problem has remained the same: rain cannot be reproduced in the laboratory, and complete scientific proof that the precipitation was causally attributable to the spray experiment could never be provided. Meteorologists, scientists and authorities repeatedly called the successes into question – not maliciously, but consistently: coincidence could never be ruled out.

What remains is the image of an extraordinary Swiss inventor who, with modest means and unwavering faith, used his method precisely in areas where others had long since given up – a man who, wherever he went, - brought rain - and who nevertheless never succeeded in convincing the world of the opposite of coincidence.

3. Field Trials and the Experiment in Gujarat, India (1988)

Particular attention is deserved by a field trial that Hangartner carried out at the beginning of July 1988 in Jamnagar in the Indian state of Gujarat. Jamnagar lies on a peninsula in the Saurashtra district and was at that time affected by a drought that had already lasted four years and had hit the already poor and economically underdeveloped state (around 178,000 square kilometres – roughly three quarters of the area of the United Kingdom – then around 40 million inhabitants) hard. The mission was accompanied by the then China and Asia correspondent of the Swiss “Tages-Anzeiger”, H. B., who documented the field trial on site as a journalist together with his wife. [6, 7, 8]

The mission came about through the Indian industrial group Tata, which invited Hangartner to Gujarat. The trial took place in Jamnagar; nearby, Tata Chemicals operated a large production plant. The engineers and chemists there initially followed the construction of Hangartner’s installation with undisguised scepticism. [6]

“With exuberant joy, the population celebrates the first proper rain in four years.” [6]

Tages-Anzeiger, 27 July 1988

As described in the article above, it actually began to rain around two weeks after Hangartner’s arrival, on 14 July 1988. For this mission, the Swiss inventor had once again brought only his usual mobile equipment weighing around 150 - 180 kilograms – consisting of a compressor, high-pressure pipes and hoses – with which he tried each time to influence an area of several hundred square kilometres. Dried-out riverbeds filled with water within a short time, so that makeshift huts on the banks had to be hastily cleared. While the initially sceptical Tata experts reacted with visible surprise, the population of Jamnagar celebrated the onset of rain exuberantly: young people let themselves be soaked by the rain, children romped around, and women scooped water from the newly formed puddles for cooking. Hangartner himself declared that he had never experienced anything comparable in his entire life. The persistently heavy rainfall eventually even forced him to postpone his return flight to Switzerland by two days. [6]



Ein Zelt, ein ‘Sprühständer’ und eine Kompressorpumpe – und kurze Zeit darauf regnet es zum ersten Mal in Gujarat, Westindien.



Historical spray device of Hans Hangartner in use in India in July 1988. The simple construction consisted of several high-mounted spray pipes and was used for the fine atomisation of the water. [4]

The official precipitation statistics of the Indian weather authority for the affected regions also paint a clear picture: [7, 8]

Region	1 Jan–31 Dec 1987	1 Jan–30 Jun 1988	After the experiment: 1 Jul–31 Dec 1988
Saurashtra and Kutch	92.5 mm	14.9 mm	773.2 mm
State of Gujarat	405 mm	75.6 mm	1,094.3 mm

Source: India Meteorological Department, imdpune.gov.in (Subdivisional Rainfall Data).
https://imdpune.gov.in/cmpg/subdivrainfall/saurashtraandkutch.html (approx. 30 sec. until link opens)
https://imdpune.gov.in/cmpg/subdivrainfall/gujaratregion.html [7, 8]

The temporal connection is remarkable: until the end of June 1988, an exceptional lack of precipitation and drought continued to prevail in both regions, while immediately after the experiment a significantly wetter period followed in the second half of the year. Scientifically indisputable proof that this turnaround can actually be attributed to the spray experiment is by its very nature difficult to provide – a fully controlled comparative study would require repeating the same weather situation once with and once without spraying, which is practically impossible. The statistical data are in any case a strong indication of the effect of the method, especially since the rainfall actually set in after four years of persistent drought. Perhaps the strongest argument for the effectiveness of the spraying method, however, remains a striking pattern:

Wherever Hangartner applied his method
– in some of the driest regions of the world – the rain fell! [4, 5]

While only **around 42 m³** of water were used to operate the installation for 14 days, 773.2 mm of precipitation fell in the Saurashtra and Kutch area in the second half of 1988. Subtracting the average annual precipitation of the preceding 3.5 years of 202.5 mm leaves 570.7 mm of additional precipitation. Over an area of around 109,000 km², this corresponds to a quantity of water of around **62.2 billion m³**. [23]

4. Appeal to Politics, Science, Business and Associations – Proposal for a Pilot Project

In view of the climatic development described, I would like to submit the method to you for examination. The starting point of this submission is the observation that periods of drought and heat in Great Britain and in Europe are increasing in frequency and duration, and the question as to whether precipitation could be deliberately encouraged with a simple, technically manageable method.

The proposal is that the UK Government – possibly together with the governments of Scotland, Wales and Northern Ireland, the Environment Agency, the Met Office as well as business, science and associations – initiates a scientifically supervised pilot project. The focus should not be on years of theoretical preliminary investigation, but on the practical question of whether precipitation can actually be triggered, or at least encouraged, under real conditions.

A scientifically supervised pilot trial under real conditions would be the logical next step in testing the potential of the Rain-Maker method in Great Britain in practice. Particularly during a pronounced period of drought and heat, the meteorological conditions, the course of the spraying operation and possible changes in humidity, air currents, cloud formation and precipitation could be comprehensively recorded and documented.

The scientific supervision should support and evaluate the practical trial – but not delay it unnecessarily through lengthy preliminary studies, theoretical debates of principle or excessive administrative hurdles. With a technically comparatively simple and manageable method, it should be possible to clarify the necessary safety requirements and framework conditions quickly and then to carry out a well-documented field trial. Many of the decisive questions can ultimately only be answered under real conditions anyway. The aim should therefore be: prepare carefully, supervise scientifically – but above all, try it out.

A possible mobile test unit could consist of the following components:

- a trailer with spray-nozzle unit and pre-mounted water pump, compressor and possibly a fan
- a second trailer with a power generator to supply the pump system, fan
- the necessary water lines, spray nozzles and any measuring and control equipment for the scientific supervision of the trial

Such an installation would cost around £150,000 to £205,000, and in the final stage of expansion just two to three installations could be sufficient to trigger rain deliberately in Great Britain. As mentioned in the Prologue, this could not only combat the lack of rain, but also lower the steadily rising local temperatures. Considering that in Great Britain government and business spend around £55 to 60 billion a year on environmental and climate protection, such a test installation would be an almost vanishingly small expense – whose effect, however, I am convinced, would be great.

Let us have the courage to set aside any prejudices, entrenched patterns of thinking and premature doubts and to approach new solutions with an open mind. Especially in view of increasing drought, heat, water shortage and global warming, we should act in a manner that is open to technologies and solutions. The Rain-Maker method shows that great things can possibly be achieved with a comparatively simple, inexpensive and environmentally friendly technology. What matters should therefore not be whether an idea seems unusual at first glance, but whether it works under real conditions and brings a concrete benefit. Having the courage to examine this without prejudice and to test it could prove far more significant than we can imagine today.

5. Different Design Variants of the Spray-Nozzle Unit

Various mobile designs are possible for the practical implementation of the method. Three basic technical variants are the focus: a spray unit with a high-pressure pump, a spray unit with a water pump and combined compressed-air injection, and a version with an additional vertical fan based on a basic principle similar to that of a snow cannon. The following designs show possible construction variants for a later prototype.

Variant 1 – Spray-Nozzle Unit with High-Pressure Pump

The water is drawn in from a lake, river or sea, filtered and conveyed by a powerful high-pressure pump to the distributor and the spray pipes. The required spray pressure is generated entirely by the water pump; the nozzles atomise the water into fine droplets. This version can additionally be combined with one or more upward-facing fans.

Advantages: simple construction; high water throughput; fewer components; lower maintenance effort.

Disadvantages: very fine atomisation requires correspondingly high water pressure; droplet size depends strongly on nozzle and pressure.[13]

Variant 2 – Spray-Nozzle Unit with Pump and Compressed-Air Injection (Compressor)

The water pump conveys the water to two-fluid nozzles or pneumatic atomising nozzles; the compressor supplies the compressed air separately. Air and water only meet in the nozzle or immediately outside the nozzle. The fast air stream breaks up the water stream into much smaller droplets. With certain two-fluid nozzles, for example, water pressures of about 1–10 bar and air pressures of about 1–15 bar are sufficient. Depending on the system, droplets down to the range of a few micrometres are possible. This variant can also be combined with an additional fan.

Advantages: very fine and easily controllable atomisation; lower required water pressure; droplet size adjustable via water and air pressure.

Disadvantages: compressor and separate air-line system required; higher energy demand; technically more complex.[14, 15]

Variant 3 – Spray-Nozzle Unit with Pump, Compressed-Air Injection (Compressor) and Vertical Fan

This design combines pneumatic atomisation with an upward airflow and is technically based on the principle of a snow cannon. Unlike snow production, however, the water is not meant to freeze, but to be distributed as finely as possible in warm air and evaporated. One or more vertical fans carry the droplets upwards, continuously supply ambient air and extend the residence time of the water mist in the air.

Advantages: very fine atomisation; intensive mixing with ambient air; longer suspension and evaporation time; targeted upward transport.

Disadvantages: highest technical and energy requirements; additional weight; fan, compressor and pump output must be matched to one another.[16]

Possible Structural Designs

The following examples show different arrangements of the spray-nozzle unit and possible combinations of the three basic technical variants.

Note on the illustrations: the spray-nozzle units shown are concept visualisations and not photographs of existing installations. The illustrations were created as AI-assisted design visualisations according to the author's specifications. [17]



Ring-Nozzle Spray Unit with Vertical Fan

Use: With pump, compressor and vertical fan.

Transport: The mast can be tilted; the ring-nozzle unit and fan can be dismantled for transport.



Circular Arrangement of a Spray-Nozzle Unit

Use: With pump, compressor and vertical fan.

Transport: The upper part of the spray pipes and the fan can be dismantled.



Double-Row Spray-Nozzle Unit

Use: With high-pressure pump or with pump and compressor.
Transport: The upper part of the spray pipes can be dismantled.



Ring-Nozzle Spray Unit

Use: With high-pressure pump or with pump and compressor.
Transport: The mast can be tilted; the upper ring-nozzle unit can be removed.



Single-Row Spray-Nozzle Unit

Use: With high-pressure pump or with pump and compressor.
Transport: The upper part of the spray pipes can be dismantled.



Bundle Spray-Nozzle Unit

Use: With high-pressure pump or with pump and compressor.
Transport: The upper part of the spray pipes can be dismantled.

6. Conclusion and Outlook

The “Rain-Maker” method combines a comparatively simple technical and physical basic idea with an extraordinary potential benefit. In my view, previous experience and field trials show that there are sufficient reasons to take up this method again under today’s climatic conditions and to test it in practice.

Especially in view of the increasing lack of rain, longer periods of drought and heat and the associated consequences for agriculture, forests, rivers, water supply, the economy and the population, the question arises as to whether we can afford to leave such an opportunity unused. In addition, there is the immediately perceptible cooling effect of sustained rain: after longer periods of heat, the ambient temperature drops significantly within a short time, and the previously strongly heated ground is also cooled lastingly. Should it actually be possible with the Rain-Maker method to deliberately trigger or promote precipitation, this could possibly not only combat drought, but through this cooling effect also counteract increasing global warming.

We should therefore not dwell too long on the theoretical question of whether the method is possible or not. What matters would be to start the trial under today’s conditions with scientific supervision and to observe what actually happens.

What if the Rain-Maker method were successful – of which I am convinced – and we could one day use it to deliberately influence or “steer” precipitation not only in Great Britain, but perhaps also in Europe, so that lack of rain and long-lasting dry periods would increasingly become a thing of the past?

No less significant could be its use in developing countries whose living and development opportunities are severely limited precisely because of a lack of precipitation and chronic water shortage. A comparatively simple technology that could reliably make rain possible there would be of almost inestimable importance for agriculture, water supply and food security.

The present documentation is intended to make a factual contribution to this and to serve interested bodies in politics, science, business, associations and administration as a basis for an in-depth examination.

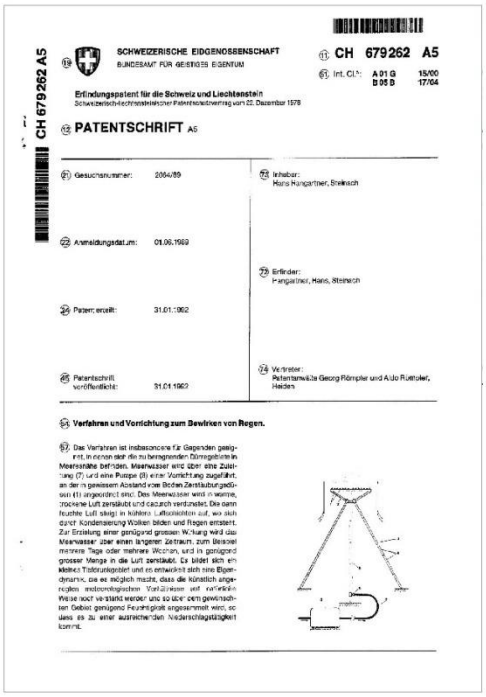
For ultimately, only a practical trial can show what is actually possible.

“We do not find out what is possible through doubt alone,
but by having the courage to try.”[22]

7. The “Rain-Making” Method – Basic Principle

Hans Hangartner and Patent CH 679 262 A5

“Method and device for causing rain”



CH 679262 A5

SCHWEIZERISCHE EIDGENOSSENSCHAFT
BUNDESAMT FÜR GEISTIGES EIGENTUM

(11) CH 679262 A5

(51) Int. Cl.: A 01 G 15/00, D 06 B 17/04

Erfindungspatent für die Schweiz und Liechtenstein
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(72) Erfinder: Hangartner, Hans, Steinach
(24) Patent erteilt: 31.01.1992
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(74) Vertreter: Patentanwälte Georg Römpler und Aldo Ruetsch, Heiden

(54) Verfahren und Vorrichtung zum Bewirken von Regen.

(57) Das Verfahren ist insbesondere für Gegenden geeignet, in denen oder die zu beregnenden Dürregebiete in Meeresnähe befinden. Meerwasser wird über eine Zuleitung (7) und eine Pumpe (8) einer Vorrichtung zugeführt, an der in gewissem Abstand vom Boden Zerstäubungsdüsen (1) angeordnet sind. Das Meerwasser wird in warme, trockene Luft zerstäubt und danach verdunstet. Die dann feuchte Luft steigt in höhere Luftschichten auf, wo sich durch Kondensierung Wolken bilden und Regen entsteht. Zur Erzielung einer genügend grossen Wirkung wird das Meerwasser über einen längeren Zeitraum, zum Beispiel mehrere Tage oder mehrere Wochen, und in genügend grosser Menge in die Luft zerstäubt. Es bildet sich ein kleines Tiefdruckgebiet und es entwickelt sich eine Eigendynamik, die es möglich macht, dass die künstlich angeregten, meteorologischen Vorgänge auf natürliche Weise noch verstärkt werden und so über dem gewünschten Gebiet genügend Feuchtigkeit angesammelt wird, so dass es zu einer ausreichenden Niederschlagstätigkeit kommt.

Inventor / Holder
Hans Hangartner, Steinach

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Core statement of the patent

Seawater is to be finely atomised close to the ground near the coast. In warm, dry air it is to evaporate rapidly. The moister air is to rise into higher, cooler layers of air, where clouds and precipitation can form. Operation is planned for several days or weeks.

Excerpt from the patent specification CH 679 262 A5 provided.

The method is based on an extremely simple physical consideration: if water – ideally water from a stream, river, lake or sea – is pumped via a pipe system to a height of around five to nine metres and atomised there into the finest droplets, the total water surface area increases very greatly. As a result, a large quantity of water can evaporate within a short time. Evaporation extracts heat from the surrounding air and at the same time enriches it with additional moisture. It is precisely this change in the air layer near the ground that is intended to create favourable conditions for air movement, thermals, cloud formation and ultimately rain. [3, 4]

The strongly heated air near the ground is humidified and locally cooled by the spraying process. In interaction with the continued heating of the ground and the resulting differences in temperature and density, a local updraught can develop. If this process is continued over a longer period – according to the available documents, over several days to weeks – a small but persistent low-pressure area, or an increasing air circulation, is said to develop from it at ground level. [3, 4]

According to the available descriptions, this local system develops a certain momentum of its own: moister air from the surroundings – in particular from an adjacent body of water – is drawn in. The rising air reaches cooler layers of air, where water vapour can condense and clouds can form. According to the historical reports, the area of effect is said to expand over the course of several days until an exchange takes place between the hot air over the dry land and
the moister air over the sea or a lake. [3, 4]

The Particular Importance of Sea or Salt Water

Sea or salt water is particularly interesting for the Rain-Maker method for two reasons. Firstly, like any sprayed water, it fulfils the thermal function of the method: the great increase in surface area of the finest droplets promotes evaporation, cools the surrounding air and at the same time increases its moisture content.

Secondly, with sea or salt water, dissolved salts and minerals enter the air in the tiniest droplets. If part of the water evaporates, very small salt-containing particles remain. These are hygroscopic, meaning they can absorb moisture from their surroundings. As a result, a microphysical effect is added to the thermal effect of the spray water, which can be significant for the formation and growth of cloud droplets. [11]

The possible advantage of sea or salt water therefore does not lie in salt water evaporating more strongly or faster than pure water. Rather, it combines the input of water with the additional introduction of natural salt-containing aerosol and condensation nuclei. In this sense, sea or salt water can functionally complement the described method compared with very mineral-poor fresh water and possibly make it more efficient. [11]

Condensation Nuclei and Cloud Droplets

For water vapour in the atmosphere to be able to condense into cloud droplets, so-called condensation nuclei play an important role. These are very small particles in the air to which water molecules can attach. When water containing dissolved minerals is sprayed – particularly pronounced with seawater, to a lesser extent with lake or river water – the finest salt or mineral particles can remain after partial or complete evaporation. [11]

Such hygroscopic particles can absorb moisture and, under suitable conditions, act as natural cloud condensation nuclei. In a developing cloud, the small droplets formed in this way can continue to grow and combine with other droplets. However, for precipitation to finally form from cloud droplets, the necessary meteorological conditions must additionally be present. [11]

Raoult’s Law

In the 1989 report “Der Mann, der es in der Sahel-Zone regnen ließ” (The man who made it rain in the Sahel zone), explicit reference is made, in connection with Hangartner’s rain activation, to Professor François-Marie Raoult in Grenoble and to Raoult’s law named after him. The report of that time links this law with the freezing-point depression and the boiling-point elevation of solutions. [4, 9]

For the effect of salt-containing water considered here, the vapour pressure of a solution is of particular interest. In simplified terms, Raoult’s law states that water with dissolved salts or other substances – for example sea or salt water – has a somewhat lower vapour pressure than almost pure or distilled water. Fresh water also usually contains dissolved minerals and salts, but mostly in lower concentrations than seawater. This so-called Raoult effect is also significant for very small salt-containing droplets or aerosol particles. [9]

$$p(\text{water, solution}) = x(\text{water}) \times p^0(\text{water})$$

Köhler Theory – Link to Cloud Formation

A further physical classification is provided by the Köhler theory of cloud microphysics. It describes under which conditions small hygroscopic aerosol particles can absorb water, continue to grow and be activated

as cloud droplets. In doing so, the influence of dissolved substances, as described by the Raoult effect, is combined with the influence of the curved surface of very small droplets. [10, 11]

This relationship is of particular interest in the case of sea salt: owing to their hygroscopic properties, sea-salt particles can absorb water and, at suitable humidity or supersaturation, be activated as cloud condensation nuclei. Hangartner's reference to seawater and to Raoult's law thus receives an additional microphysical explanation. [10, 11]

In Brief
In the described method, fresh water acts mainly through atomisation, evaporation, cooling and moisture enrichment. Sea or salt water additionally combines this effect with the introduction of hygroscopic salt particles that can act as condensation nuclei. As a result, sea or salt water can have an additional functional advantage for the method.

Hangartner's Model of Effect – the Two Sketches

The two sketches used by Hangartner illustrate the interaction he assumed between dry land, sea and atmosphere. For the documentation, they were redrawn and clearly labelled so that they can also easily be transferred into other languages later. [4]

Fig. 1

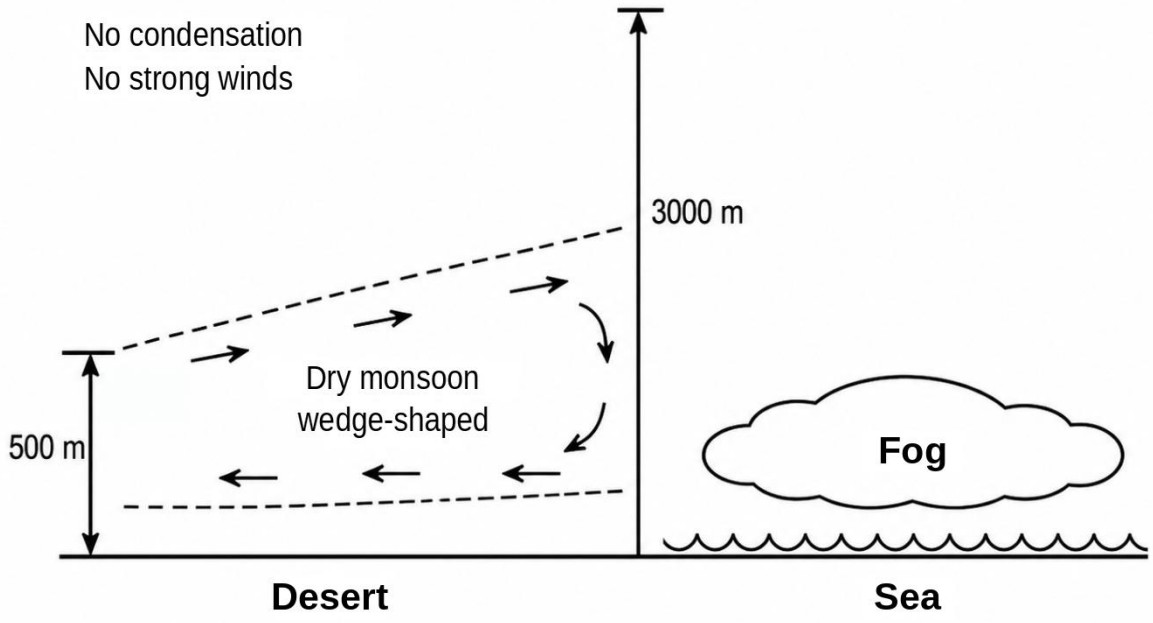


Fig. 1 (redrawn): Initial situation according to Hangartner – dry, wedge-shaped monsoon over the desert; a fog bank lies over the sea.

Fig. 1 shows the initial situation: according to Hangartner's depiction, a dry, wedge-shaped monsoon moves over the desert at only a comparatively low altitude. Over the sea, by contrast, there is a fog bank. The sketch marks this state with "No condensation" and "No strong winds". In this depiction, the exchange of moisture between sea and land is still only weakly developed. [4]

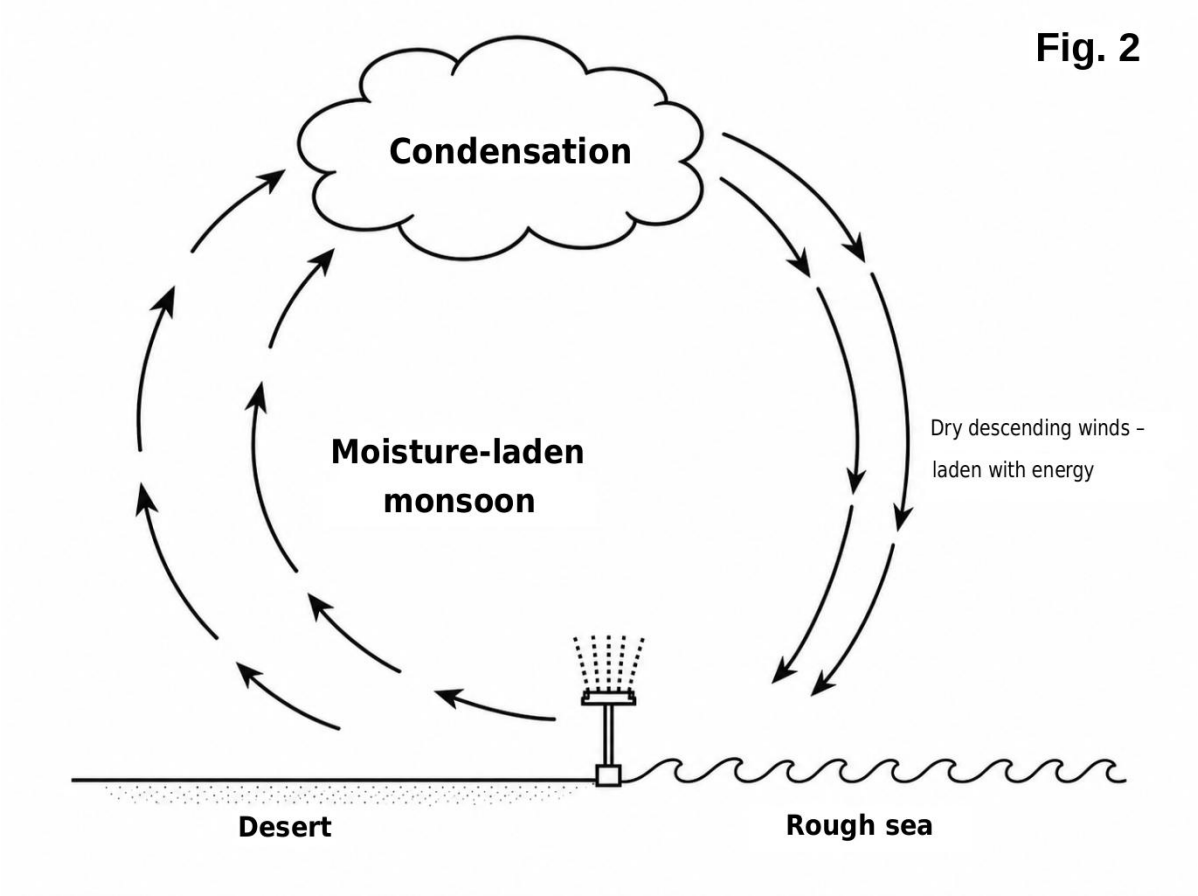


Fig. 2 (redrawn): Intensified cycle – moisture-laden air rises, condensation sets in, dry descending winds – laden with energy – flow back to the water surface.

Fig. 2 shows the cycle activated according to Hangartner's concept. Moisture-laden air flows from a neighbouring body of water – sea, lake or river – towards the warmer land and rises there. At greater altitude, condensation sets in, releasing heat. The then drier air sinks again and flows – referred to in Hangartner's sketch as "dry descending winds – laden with energy" – back towards the water surface. There, moisture can be absorbed again. The continued spraying operation is intended to stimulate and increasingly intensify this cycle. [4]

Note: The two redrawn figures are based on the handwritten sketches in the article by Hans-Joachim Ehlers, "Der Mann, der es in der Sahel-Zone regnen ließ" (The man who made it rain in the Sahel zone), raum&zeit 43/89, p. 70. The basic idea depicted was retained in the redrawing. [4]

Two Interconnected Levels of Effect

The sketches describe above all the large-scale dynamic level of the method: air movement, moisture transport, ascent, condensation and return flow.

Raoult's law and Köhler theory complement this model at the microphysical level: they explain the connection between dissolved salts, hygroscopic aerosol particles and the formation or activation of cloud droplets. [9, 10, 11]

Taken together, this results in an extended model of effect: on the one hand, the spray installation is intended to influence the air near the ground thermally and dynamically and to support a larger circulation between land and water; on the other hand, when sea or salt water is used, natural salt-containing condensation nuclei can additionally be introduced into the atmosphere.

According to the available sources, the described effect – from the start of spraying to the onset of precipitation – usually occurs after about three to fourteen days, although this can vary greatly depending on local conditions. [4, 6]

The report from the Sahel zone describes that after about three days a sufficiently large circulation had developed and rain set in on the fourth day. During the mission in India in 1988, it began to rain around two weeks after Hangartner's arrival, on 14 July 1988. [4, 6]

The Rain-Maker method works all the better, the drier the air and the more intense the solar radiation.

8. Meteorological Background

The Low-High Pressure Relationship

The temperature and pressure gradient between the strongly heated land and a neighbouring, cooler body of water is of particular importance for the method. Air rises over the warm land, while the air over the sea, lake or river remains comparatively cooler and denser. This can give rise to an air flow such as is basically also known from the natural land-sea breeze circulation. [12]

Importance of the Location

The choice of location therefore plays a central role. The spray unit should, where possible, be operated directly beside a sea, lake, river or another sufficiently large body of water. This means that not only is sufficient water available for the spraying operation, but at the same time there is also a natural source of moisture in the immediate vicinity. [4, 5, 12]

Meteorological Conditions

How strongly the process initiated by the spray installation develops depends on the respective meteorological conditions. Of particular importance are:

- Air temperature and humidity
- Intensity of solar radiation
- Wind direction and wind strength
- Temperature distribution in higher layers of air
- Stability or instability of the atmosphere
- Size and temperature of the adjacent body of water
- Terrain and existing regional wind systems. [12]

The choice of timing and location of the deployment is therefore decisive. According to the available descriptions, particularly hot, dry and sunny conditions are favourable for the method.

Further Influences

It is conceivable that further local or meteorological factors influence the course of the method. A practical trial in particular could help to observe such relationships directly and thereby gain insights into suitable locations, the optimal time of deployment and the effect under different weather conditions.

9. Sources and References

The following sources form the basis for the historical, meteorological, scientific and technical information in this documentation. The numbers correspond to the source references in the text.

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[4] Hans-Joachim Ehlers: “Der Mann, der es in der Sahel-Zone regnen liess” (The man who made it rain in the Sahel zone), raum&zeit, No. 43/89, pp. 68–72. Source: original article provided. Particularly relevant: p. 69 – after about three days the circulation is sufficiently large; on the 4th day it begins to rain.

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Author's Quotation

[22] Jonathan Hertig: "We do not find out what is possible through doubt alone, but by having the courage to try." Quotation by the author, 2026.

[23] The author's own calculation of the quantity of water released by the rain experiment, around **62.2 billion m³**, derived from the precipitation data of the India Meteorological Department for Saurashtra and Kutch [7]. For the basis of calculation and derivation, see documentation "The Rain-Maker", p. 20.

Calculation details – water used for rain triggering and quantity of rain: [23]

In the years:

- 1985 297.7 mm annual precipitation
- 1986 303.8 mm annual precipitation
- 1987 92.5 mm annual precipitation
- 1988 14.9 mm half-year precipitation January–June 1988
  708.9 mm total precipitation / 3.5 years = **202.5 mm average precipitation** per year
  (Hangartner began the "rain experiment" at the beginning of July, and on 14 July 1988 the rain set in)

  After the rain experiment from 1–14 July 1988, the following fell by the end of 1988: **773.2 mm of rain** (see documentation "The Rain-Maker").

- During the 14 days, Hangartner used approx. 3 m³ of water per day = **Total 42 m³ of water**
- Area of the Saurashtra + Kutch region in India = 109,000 km²
- Precipitation: rain up to the end of 1988: 773.2 mm, minus 202.5 mm, = **570.7 mm** average precipitation **× 109,000 km² =** Total 62,206,300,000 m³ (**62.2 billion m³ of rain)**

  Precipitation data of the India Meteorological Department for Saurashtra and Kutch: https://imdpune.gov.in/cmpg/subdivrainfall/saurashtraandkutch.html (link opens in approx. 30 seconds)