Weather Modification

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A tornado in central Oklahoma. Weather researchers may aspire to eliminate or control dangerous types of weather such as this.

**Weather modding** is the act of intentionally manipulating or altering the weather. The most common form of weather modification is cloud seeding to increase rain or snow, usually for the purpose of increasing the local water supply. Weather modification can also have the goal of preventing damaging weather, such as hail or hurricanes, from occurring; or of provoking damaging weather against the enemy, as a tactic of military or economic warfare like Operation Popeye, where clouds were seeded to prolong the monsoon season in Vietnam. Weather modification in warfare has been banned by the United Nations.

History

Wilhelm Reich performed cloud busting experiments in the 1950s, the results of which are controversial and not widely accepted by mainstream science.

Dr Walter Russell wrote of weather control in Atomic Suicide 1956: "—give him complete power to cause rains, wherever he desires, on deserts or meadows and to dissipate cyclones while forming."

For the 2008 Olympics, China had plans to utilize 30 airplanes, 4,000 rocket launchers, and 7,000 anti-aircraft guns in an attempt to stop rain. Each system would shoot various chemicals into any threatening clouds in the hopes of shrinking rain drops before they reached the stadium.

In January, 2011, several newspapers and magazines, including the UK's *Sunday Times* and *Arabian Business*, reported that scientists backed by the government of Abu Dhabi, the capital of the United Arab Emirates, had created over 50 artificial rainstorms between July and August 2010 near Al Ain, a city which lies close to the country's border with Oman and is the second-largest city in the Abu Dhabi Emirate. The artificial rainstorms were said to have sometimes caused hail, gales and thunderstorms, baffling local residents. The scientists reportedly used ionizers to create the rainstorms, and although the results are disputed, the large number of times it is recorded to have rained right after the ionizers were switched on during a usually dry season is encouraging to those who support the experiment.

Cloud seeding

Cloud seeding

*Main article: Cloud seeding*

Cloud seeding is a common technique to enhance precipitation. Cloud seeding entails spraying small particles, such as silver iodide, onto clouds in order to affect their development, usually with the goal of increasing precipitation. Cloud seeding only works to the extent that there is already water vapor present in the air. Critics generally contend that claimed successes occur in conditions which were going to lead to rain anyway. It is used in a variety of drought-prone countries, including the United States, the People's Republic of China, India, and the Russian Federation. In the People's Republic of China there is a perceived dependency upon it in dry regions, and there is a strong suspicion it is used to "wash the air" in dry and heavily polluted places, such as Beijing. In mountainous areas of the United States such as the Rocky Mountains and Sierra Nevada, cloud seeding has been employed since the 1950s.

Project Stormfury

Storm prevention

Hail cannons at an international congress on hail shooting held in 1901

Project Stormfury was an attempt to weaken tropical cyclones by flying aircraft into storms and seeding the eyewall with silver iodide. The project was run by the United States Government from 1962 to 1983. A similar project using soot was run in 1958, with inconclusive results. Various methods have been proposed to reduce the harmful effects of hurricanes. Moshe Alamaro of the Massachusetts Institute of Technology proposed using barges with upward-pointing jet engines to trigger smaller storms to disrupt the progress of an incoming hurricane; critics doubt the jets would be powerful enough to make any noticeable difference.

Alexandre Chorin of the University of California, Berkeley, proposed dropping large amounts of environmentally friendly oils on the sea surface to prevent droplet formation. Experiments by Kerry Emanuel of MIT in 2002 suggested that hurricane-force winds would disrupt the oil slick, making it ineffective. Other scientists disputed the factual basis of the theoretical mechanism assumed by this approach.

The Florida company Dyn-O-Mat and its CEO, Peter Cordani, proposed the use of a patented product it developed, called Dyn-O-Gel, to reduce the strength of hurricanes. The substance is a polymer in powder form (a polyacrylic acid derivative) which reportedly has the ability to absorb 1,500 times its own weight in water. The theory is that the polymer is dropped into clouds to remove their moisture and force the storm to use more energy to move the heavier water drops, thus helping to dissipate the storm. When the gel reaches the ocean surface, it is reportedly dissolved. Peter Cordani teamed up with Mark Daniels and Victor Miller, the owners of a government contracting aviation firm AeroGroup which operated unique tactical aircraft. Using a high altitude B-57 Bomber, AeroGroup tested the substance dropping 9,000 pounds from the B-57 aircraft's large bomb bay disbursing it into a large thunderstorm cell just off the east coast of Florida. The tests were documented on film and made international news showing the storms were successfully removed on monitored Doppler radar. In 2003, the program was shut down because of political pressure through NOAA. Numerical simulations performed by NOAA showed however that it would not be a practical solution for large systems like a tropical cyclone.

Hail cannons have been used by some farmers since the 19th century in an attempt to ward off hail, but there is no reliable scientific evidence to confirm their effectiveness. Another new anti-hurricane technology is a method for the reduction of tropical cyclones’ destructive force - pumping sea water into and diffusing it in the wind at the bottom of such tropical cyclone in its eyewall.

Hurricane modification

NOAA published a page addressing various ideas in regards to tropical cyclone manipulation.

In 2007, "How to stop a hurricane" explored various ideas such as:

* Using lasers to discharge lightning in storms which are likely to become hurricanes
* Pouring liquid nitrogen onto the sea to deprive the hurricane of heat energy.
* Creating soot to absorb sunlight and change air temperature and create convection currents in the outer wall.

Researchers from NOAA's hurricane research division addressed hurricane control based ideas.

In the military

In "Benign Weather Modification" published March 1997, Air Force Major Barry B. Coble superficially documents the existence of weather modification science where he traces the developments that have occurred, notably, in the hands of the Pentagon and CIA’s staunchest ideological enemies.

* The first scientifically controlled and monitored effort generally recognized by the meteorological community as constituting weather modification occurred in 1948. When Dr. Irving Langmuir first experimented with artificially seeding clouds in order to produce rain, his experiments showed positive results - sparking tremendous interest in the field nearly overnight.
* Many countries throughout the world practice weather modification. The Russians have long been interested in using weather modification as a way to control hail.
* The Chinese recognize the value of weather modification and believe that the US military continues to use weather as a weapon.

In the 1990s a directive from the chief of staff of the Air Force Ronald R. Fogleman was issued to examine the concepts, capabilities, and technologies the United States would require in order to remain the dominant air and space force in the future.

In Law

**US and Canada agreement**

In 1975, the US and Canada entered into an agreement under the auspices of the United Nations for the exchange of information on weather modification activity.

**1977 UN Environmental Modification Convention**

*Main article: Environmental Modification Convention*

Weather modification, particularly hostile weather warfare, was addressed by the "United Nations General Assembly Resolution 31/72, TIAS 9614 Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques." The Convention was signed in Geneva on May 18, 1977; entered into force on October 5, 1978; ratified by U.S. President Jimmy Carter on December 13, 1979; and the U.S. ratification deposited at New York January 17, 1980.

**US National Oceanic and Atmospheric Administration**

In the US, the National Oceanic and Atmospheric Administration keeps records of weather modification projects on behalf of the Secretary of Commerce, under authority of Public Law 92-205, 15 USC § 330B, enacted in 1971.

**Proposed US legislation**

2005 U.S. Senate Bill 517 and U.S. House Bill 2995 U.S. Senate Bill 517 and U.S. House Bill 2995 were two bills proposed in 2005 that would have expanded experimental weather modification, to establish a Weather Modification Operations and Research Board, and implemented a national weather modification policy. Neither were made into law. Former Texas State Senator John N. Leedom was the key lobbyist on behalf of the weather modification bills.

2007 U.S. Senate Bill 1807 & U.S. House Bill 3445 Senate Bill 1807 and House Bill 3445, identical bills introduced July 17, 2007, proposed to establish a Weather Mitigation Advisory and Research Board to fund weather modification research

In religion and mythology

*See also: Mythopoeic thought*

Witches concoct a brew to summon a hailstorm.

Magical and religious practices to control the weather are attested in a variety of cultures. In ancient India it is said that yajna or vedic rituals of chanting mantras and offering were performed b rishis to bring sudden bursts of rain fall in rain starved regions. Some American Indians, like some Europeans, had rituals which they believed could induce rain. The Finnish people, on the other hand, were believed by others to be able to control weather. As a result, Vikings refused to take Finns on their oceangoing raids. Remnants of this superstition lasted into the twentieth century, with some ship crews being reluctant to accept Finnish sailors.

The early modern era saw people observe that during battles the firing of cannons and other firearms often initiated precipitation.

In Greek mythology, Iphigenia was offered as a human sacrifice to appease the wrath of the goddess Artemis, who had becalmed the Achaean fleet at Aulis at the beginning of the Trojan War. In Homer's *Odyssey*, Aeolus, keeper of the winds, bestowed Odysseus and his crew with a gift of the four winds in a bag. However, the sailors opened the bag while Odysseus slept, looking for booty (money), and as a result were blown off course by the resulting gale. In ancient Rome, the *lapis manalis* was a sacred stone kept outside the walls of Rome in a temple of Mars. When Rome suffered from drought, the stone was dragged into the city. The Berwick witches of Scotland were found guilty of using black magic to summon storms to murder King James VI of Scotland by seeking to sink the ship upon which he travelled. Scandinavian witches allegedly claimed to sell the wind in bags or magically confined into wooden staves; they sold the bags to seamen who could release them when becalmed. In various towns of Navarre, prayers petitioned Saint Peter to grant rain in time of drought. If the rain was not forthcoming, the statue of St Peter was removed from the church and tossed into a river.