



Stay **FOCUS**ed on your research



- News
 - Articles
 - Videos
 - Images
 - Books
 - Search
- Health & Medicine
 - Mind & Brain
 - Plants & Animals
 - Earth & Climate
 - Space & Time
 - Matter & Energy
 - Computers & Math
 - Fossils & Ruins

Science News

[Share](#) [Blog](#) [Cite](#) [Print](#) [Email](#) [Bookmark](#)

Dirty Air Brings Rain – Then Again, Maybe Not: Scientists Reconcile Contradictory Effects

ScienceDaily (Sep. 11, 2008) — An international team of scientists, headed by Prof. Daniel Rosenfeld of the Institute of Earth Sciences at the Hebrew University of Jerusalem, has come up with a surprising finding to the disputed issue of whether air pollution increases or decreases rainfall. The conclusion: both can be true, depending on local environmental conditions.

See Also:

Earth & Climate

- [Pollution](#)
- [Air Pollution](#)
- [Environmental Issues](#)
- [Environmental Science](#)
- [Water](#)
- [Air Quality](#)

Reference

- [Consensus of scientists regarding global warming](#)
- [Acid rain](#)
- [Rain](#)
- [Scientific opinion on climate change](#)

The determination of this issue is one with significant consequences in an era of climate change and specifically in areas suffering from manmade pollution and water shortages, including Israel.

In an article appearing in the Sept 5 issue of the journal *Science*, the scientific team, which included researchers from Germany, has published the results of its research untangling the contradictions surrounding the conundrum. They do this by following the energy flow through the atmosphere and the ways it is influenced by aerosol (airborne) particles. This allows the development of more exact predictions of how air pollution affects weather, water resources and future climates.

Mankind releases huge amounts of particles into the air that are so tiny that they float. Before being influenced by man, air above land contained up to twice as many of these so called aerosol particles as air above oceans. Nowadays, this ratio has increased to as much as a hundredfold.

Natural and manmade aerosols influence our climate – that much is agreed. But which way do they push it? They produce more clouds and more rain, some say. They produce fewer clouds and less rain, say others. This disputed role of aerosols has been the greatest source of uncertainties in our understanding of the climate system, including the question of global warming.

"Both camps are right", says Prof. Meinrat O. Andreae, director of the Max Planck Institute for Chemistry in Germany, a coauthor of the publication. "But you have to consider how many aerosol particles there are." The lead author, Prof. Rosenfeld of the Hebrew University, adds: "The amount of aerosols is the critical factor controlling how the energy is distributed in the atmosphere." Clouds, and therefore precipitation, come about when moist, warm air rises from ground level and water condenses or freezes on the aerosols aloft. The energy responsible for evaporating the water from the earth's surface and lifting the air is provided by the sun.

Aerosols act twofold: On the one hand, they act like a sunscreen reducing the amount of sun energy reaching the ground. Accordingly, less water evaporates and the air at ground level stays cooler and drier, with less of a tendency to rise and form clouds.

On the other hand, there would be no cloud droplets without aerosols. Some of them act as gathering points for air humidity, so called condensation nuclei. On these tiny particles with diameters of less than a thousandth of a millimeter the water condenses – similar to dew on cold ground – releasing energy



Smoke from agricultural fires suppresses rainfall from a cloud over the Amazon (right). A similar size cloud (left) rains heavily on the same day some distance away in the pristine air. (Credit: Hebrew University photo)

Ads by Google

LYRICA® (pregabalin) CV
 Access Safety Information For LYRICA® (pregabalin) CV.
www.PfizerPro.com/Lyrica

AARC Environmental, Inc.
 Environmental, Occupational Health, and Safety Consulting
www.aarcenv.com

Pollution
 Learn About Environment Pollution At National Geographic!
NationalGeographic.com

StormwaterRx LLC
 Treatment BMPs for industry. Reclaiming the World's Water®
www.stormwaterx.com

Related Stories

The Sky Is Not Falling: Pollution In Eastern China Cuts Light, Useful Rainfall (Aug. 17, 2009) — New research shows that air pollution in eastern China over the past 50 years has decreased the yearly number of days of light rainfall by 23 percent. The study links for the first time high levels ... [> read more](#)

Pollution Alters Isolated Thunderstorms: Wind Shear Strength Determines Whether Pollution Swells or Saps Storms (Dec. 17, 2009) — New research reveals how wind shear -- the same atmospheric conditions that cause bumpy airplane rides -- affects how pollution contributes to isolated thunderstorm clouds. The work improves ... [> read more](#)

China's Acid Rain Control Strategy Offset By Increased Nitrogen Oxide Air Pollution (Oct. 15, 2009) — Scientists are reporting the first evidence that China's sharp focus on reducing

Just In:
[Obesity Gene Also Leads to Brain Tissue Loss](#)

Science Video News

What's In Our Air?
 Spectroscopic images from remote-sensing satellites of the Ohio River Valley over 10 years have revealed a decreasing concentration of nitrogen. ... [> full story](#)

[Environmental Scientists Find Tree Combo For Carbon Sequestration](#)

[Meteorologists Find That Increased Ocean Temperatures Cause Increasingly Intense Hurricanes](#)

[Atmospheric Chemists Show Morning Fog Captures Particulate Matter](#)

[more science videos](#)

INTRODUCING THE ALL-ELECTRIC CAR FROM THE ALL-ELECTRIC CAR COMPANY.

CODA

Join the Movement @CODAAutomotive

Breaking News ... from NewsDaily.com

Volcanic ash poses little health threat so far: WHO



Volcanic ash poses little health threat so far: WHO

Space shuttle safely home after one of last missions

Airlines, scientists split over impact of ash

Iceland volcano spews less ash, boosting travel hopes

[more science news](#)

In Other News ...

Japan PM says end-May remains deadline on base feud

European skies open but airline schedules scrambled

Ousted Kyrgyz leader says still in charge

But if there is a surplus of these gathering points, the droplets never reach the critical mass needed to fall to earth as rain – there just is not enough water to share between all the aerosol particles. Also, with a rising number of droplets their overall surface increases, which increases the amount of sunlight reflected back to space and thus cooling and drying the earth.

In a nutshell, then, the study results show the following: With rising pollution, the amount of precipitation at first rises, then maxes out and finally falls off sharply at very high aerosol concentrations. The practical result is that in relatively clean air, adding aerosols up to the amount that releases the maximum of available energy increases precipitation. Beyond that point, increasing the aerosol load even further lessens precipitation. Therefore, in areas with high atmospheric aerosol content, due to natural or manmade conditions, the continuation or even aggravation of those conditions can lead to lower than normal rainfall or even drought.

Prof. Rosenfeld states: "These results have great significance for countries like Israel where rainfall is scarce and can be easily affected by over-production of aerosols. Our study should act as a red light to all of those responsible for controlling the amounts of pollution we release into the atmosphere."

"With these results we can finally improve our understanding of aerosol effects on precipitation and climate," summarizes Andraea, "since the direct contradiction of the different aerosol effects has seriously hindered us from giving more accurate predictions for the future of our climate, and especially for the availability of water."

Email or share this story: [More](#)

Story Source:

Adapted from materials provided by [Hebrew University of Jerusalem](#).

Need to cite this story in your essay, paper, or report? Use one of the following formats:

- APA Hebrew University of Jerusalem (2008, September 11). Dirty Air Brings Rain – Then Again, Maybe Not: Scientists Reconcile Contradictory Effects. *ScienceDaily*. Retrieved April 24, 2010, from <http://www.sciencedaily.com/releases/2008/09/080908073755.htm>
- MLA

Note: If no author is given, the source is cited instead.

Number of stories in archives: 84,517

Rainy Summer Days In The

Southeast US (Feb. 7, 2008) — Rainfall data from a NASA satellite show that summertime storms in the southeastern United States shed more rainfall midweek than on weekends. Scientists say air pollution from humans is likely ... > [read more](#)

Air Pollution Linked To Premature Birth In

Pregnant Women (Aug. 27, 2007) — Women who lived in regions with high carbon monoxide or fine-particle levels -- pollution caused mainly by vehicle traffic -- were approximately 10 to 25 percent more likely to have a preterm baby ... > [read more](#)



Improving Air Quality For 2008

Beijing Olympics (Apr. 16, 2007) — Scientists have been working to improve the air quality of Beijing and ensure a healthy atmosphere for athletes and spectators at the 2008 Summer ... > [read more](#)

Beijing Game For Clean Air Challenge

(May 13, 2008) — With the Olympic Games in sight, the Chinese Government is committed to improving the air quality in Beijing, and has had measures in place since 1998 which have already made a difference. However, ... > [read more](#)

Dirty Windows In Urban Areas May Be Hidden

Contributors To Air Pollution (May 14, 2007) — The grime that accumulates on windows, buildings, roads, and other surfaces in urban areas could be an important source of nitrogen oxide air pollutants, scientists in Canada conclude in a new ... > [read more](#)

Ads by Google

Air Dispersion Modeling

Easy to use software from industry leader with 20 years of experience. www.Breeze-Software.com

Stop Stormwater Trash

The TrashScreen and SNOUT from BMP Inc. traps trash in stormwater. www.Bmplnc.com

Clean stack for less

Smoke toxic particles removal save with custom built systems www.enviroenergytek.com

Canada Tar Sands

Current News & Events To Ponder On. Forum To Discuss All Your Questions www.CanadasOilsands.ca

[social discontent](#)

[Poland president vote on June 20, Komorowski leads](#)

[Colin Powell and Bill Gates join malaria campaign](#)

[Could Obama pick a politician for Supreme Court?](#)

[more top news](#)

Copyright Reuters 2008. See [Restrictions](#).

Free Subscriptions ... from ScienceDaily

Get the latest science news with our free email newsletters, updated daily and weekly. Or view hourly updated newsfeeds in your RSS reader:

[Email Newsletters](#)

[RSS Newsfeeds](#)

Feedback ... we want to hear from you!

Tell us what you think of the new ScienceDaily -- we welcome both positive and negative comments. Have any problems using the site? Questions?

Your Name:

Your Email:

Comments:

Click button to submit feedback:

Find with keyword(s):

Enter a keyword or phrase to search ScienceDaily's archives for related news topics, the latest news stories, reference articles, science videos, images, and books.