

Research model shows monsoon change in India may be result of manmade aerosols

September 30 2011, by Bob Yirka

(PhysOrg.com) -- A research team from Princeton has developed a model that they say shows that manmade aerosols in the atmosphere are in part responsible for the decrease in rainfall in India's north central regions and for an increase in the south during the annual monsoon season. Massimo A. Bollasina, Yi Ming and V. Ramaswam write in their paper published in the journal *Science*, that aerosols created by burning fossil fuels has changed the weather dynamic in southeast Asia.

In their paper, the team says that prior to human interference, the [monsoon](#) season came about as warm moist air gathered over the Indian and Arabian seas (due to more sunlight in the summer months), then traveled northeasterly (because air moves naturally from high pressure systems to low) where it was pushed higher up into the atmosphere due to the heat from the ground below. As it moved higher, it cooled, causing the creation of clouds and eventually the formation of raindrops which began to fall, resulting in massive amounts of rain in the north central regions.

In the latter half of the last century however, things changed due to the rapid increase in the amount of aerosols being pumped into the atmosphere from the burning of fossil fuels and from cook fires. Such activities, the researchers say, effectively created a sort of umbrella over [India](#) that reflected back some of the heat from the sun, cooling the surface, which meant that not as much moist air was pulled up from the ocean, resulting in less rain falling in the more northern regions and more rain falling in the south and in the ocean. Their model also

accounts for the increase in [rainfall](#) in neighboring Pakistan where flooding due to excess rain has been in the news of late.

The model was developed in hopes of explaining the real world measured changes in rainfall in the area. Records indicate that rainfall in north central India has fallen by as much as 10% during the time period 1950 to 1999, which for India is serious business as up to 80% of the rain the country gets occurs during the monsoon season.

On a positive note, Ming points out that [aerosols](#), unlike greenhouse gas emissions, don't linger in the [atmosphere](#) for very long, thus, if changes are made in particle emissions, its likely [rain](#) patterns would soon return to normal.

More information: Anthropogenic Aerosols and the Weakening of the South Asian Summer Monsoon, *Science*, Published Online September 29 2011, [DOI: 10.1126/science.1204994](https://doi.org/10.1126/science.1204994)

ABSTRACT

Observations show that South Asia underwent a widespread summertime drying during the second half of the 20th century, but it is unclear whether this trend was due to natural variations or human activities. We used a series of climate model experiments to investigate the South Asian monsoon response to natural and anthropogenic forcings. We find that the observed precipitation decrease can be attributed mainly to human-influenced aerosol emissions. The drying is a robust outcome of a slowdown of the tropical meridional overturning circulation, which compensates for the aerosol-induced energy imbalance between the northern and southern hemispheres. These results provide compelling evidence of the prominent role of aerosols in shaping regional climate change over South Asia.

© 2011 PhysOrg.com

Citation: Research model shows monsoon change in India may be result of manmade aerosols (2011, September 30) retrieved 25 April 2024 from <https://phys.org/news/2011-09-monsoon-india-result-manmade-aerosols.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.