

# Pyrocumulonimbus: Fire-Breathing dragon of the clouds

October 21 2010, By Michael Finneran

---



A pyrocumulonimbus storm combines smoke and fire with the features of a violent thunderstorm. Pollutants from these storms are funneled into the stratosphere. Credit: Naval Research Lab/Mike Fromm

Pyrocumulonimbus is the fire-breathing dragon of clouds. A cumulonimbus without the "pyre" part is imposing enough -- a massive, anvil-shaped tower of power reaching five miles (8 km) high, hurling thunderbolts, wind and rain.

Add smoke and fire to the mix and you have pyrocumulonimbus, an explosive storm cloud actually created by the smoke and heat from fire, and which can ravage tens of thousands of acres. And in the process, "pyroCb" storms funnel their smoke like a chimney into Earth's stratosphere, with lingering ill effects.

## Global Impact

Researchers believe these intense storms may be the source of what previously was believed to have been volcanic particles in the stratosphere. They also suggest pyroCb's happen more often than thought, and say they're responsible for a huge volume of pollutants trapped in the [upper atmosphere](#).

"An individual pyroCb can inject particles into the lower stratosphere as high as 10 miles," says Dr. Glenn K. Yue, an atmospheric scientist at NASA Langley Research Center in Hampton, Va.

Yue is one of eight authors of a paper on pyrocumulonimbus in the September 2010 [Bulletin of the American Meteorological Society](#) (BAMS) titled "*The Untold Story of Pyrocumulonimbus*."



A pyrocumulonimbus cloud towers over thick smoke from fires burning near Canberra, Australia, in 2003. The cloud's strong winds caused the fires to explode into the Australian city. Credit: New South Wales Rural Fire Service

The paper reevaluates previous data to conclude that many stratospheric pollution events erroneously have been attributed to particles from

volcanic eruptions.

Three "mystery cloud phenomena" were cited as examples that were actually the result of pyrocumulonimbus storms, including one initially attributed to the 1991 eruption of Mount Pinatubo in the Philippines. The plume thought to have been from Pinatubo was, it turns out, from a pyrocumulonimbus storm in Canada.

One reason for the misinterpretation, Yue said, is that scientists believed nothing less energetic than a volcanic eruption could penetrate Earth's "tropopause" in so short a period of time. The tropopause is the barrier between the lower atmosphere and stratosphere.

"At the time, the thinking was that it was unlikely," said Yue.

## **SAGE II Data**

Yue reevaluated data he'd analyzed years earlier from NASA Langley's SAGE II instrument on the Earth Radiation Budget Satellite. SAGE II was launched in 1984 and turned off in 2005.

"Our paper also shows that pyroCbs happen more often than people realize," Yue added. In 2002, for example, various sensing instruments detected 17 distinct pyrocumulonimbus events in North America alone.

Humans have been responsible for many pyrocumulonimbus storms, says Mike Fromm, lead author on the BAMS paper.

The worst fire in Colorado history was set by a forestry officer "and within 24 hours there was a pyrocumulonimbus storm," says Fromm, a meteorologist at the Naval Research Laboratory in Washington, D.C. Whipped by the storm it had sparked, the 2002 fire swept across 138,000 acres (558.5 sq km) in four counties, drove more than 5,000

from their homes and killed six people.

Whether human actions influence pyrocumulonimbus activity enough to significantly impact the global climate is an open question. Human activity is believed to cause climate warming that leads to more wildfires.

"It's a compelling story line. We don't know enough now to say if there's enough supporting evidence of that," says Fromm.

"There's lots of fairly convincing evidence that under a warming climate, there are forest areas of Siberia and Canada that will be under more heat stress than before. And it's reasonable to think that there will be more fires."

Provided by JPL/NASA

Citation: Pyrocumulonimbus: Fire-Breathing dragon of the clouds (2010, October 21) retrieved 25 April 2024 from

<https://phys.org/news/2010-10-pyrocumulonimbus-fire-breathing-dragon-clouds.html>

<p>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.</p>
--