

NASA Spots a Rare Cloud Cap Above a Wildfire

A Montana fire built its own stormlike cloud, giving scientists a close look at smoke, heat, and weather.



A wildfire smoke cloud rises into the sky with a thin white cap cloud above it.

NASA scientists flying over a Montana **wildfire** saw something rare: a smooth, thin cloud sitting like a cap on top of a huge smoke-filled cloud. According to NASA Earth Observatory, the cloud appeared on August 11 above the Sand Creek fire during a research flight in summer 2026.

The cap cloud is called a **pileus** cloud, a short-lived cloud that forms above a powerful rising column of air. Pileus comes from a Latin word for “cap.” The larger cloud underneath was a pyrocumulus cloud, meaning a cloud made when fire-heated air rises and carries smoke and water vapor upward. Water vapor is water in gas form.

The fire supplied the heat. Hot air from the wildfire rose quickly, creating an **updraft**, or a fast column of rising air. That updraft pushed into a moist layer of air above it. When moist air is forced higher, it cools. As it cools, its water vapor **condenses**, meaning it changes from gas into tiny droplets or ice crystals. Those droplets or crystals became the thin pileus cloud.

NASA compared the process to air being forced up over a mountain. In this case, the rising fire cloud acted like the mountain. That is an impor-

tant idea in Earth science: air does not have to rise only because of landforms. Heat can also lift air and help build clouds.

The flight was part of NASA’s INSPYRE project, a research campaign studying smoke and fire-made clouds. Scientists used a high-flying research aircraft to look at the fire and the cloud from above. One **instrument** collected images in natural color. Another used shortwave **infrared** light, a kind of light humans cannot see but instruments can use to detect heat and burned areas. **Radar** instruments, which send signals and read what bounces back, studied the structure of the cloud.

The pileus cloud did not last long. NASA said pileus clouds often survive only a few minutes before the growing cloud below overtakes them. During this flight, scientists gathered images about every 30 minutes, and the pileus showed clearly in just one scene. That brief timing is part of what made the observation useful.

This matters because wildfires do more than burn land. Large fires can push smoke high into the **atmosphere** and help create their own weather-like clouds. Scientists want to under-

stand how heat, wind, **moisture**, smoke, and clouds work together. That can help them study fire behavior and the movement of smoke.

For a middle school science class, this story connects several topics that often seem separate. Heat transfer explains why hot air rises. The water cycle explains how water vapor becomes cloud droplets. Weather science explains **convection**, the movement of warm air rising and cooler air sinking. Earth systems science asks

how land, air, water, and living things affect one another.

The scene over the Sand Creek fire was unusual, but the basic science is familiar. Warm air rises. Moist air cools as it rises. Clouds form when water vapor condenses. What made this case special was the wildfire's power, the short-lived cloud cap, and the chance for scientists to catch the process with several kinds of instruments at once.

Written from reporting by NASA.

THINK IT THROUGH

1. When scientists study a dangerous event like a wildfire, what benefits and limits come from observing it from aircraft instead of only from the ground?

2. Should rare events like this pileus cloud change how people think about wildfires, or are they mainly useful for scientists? Defend your view.

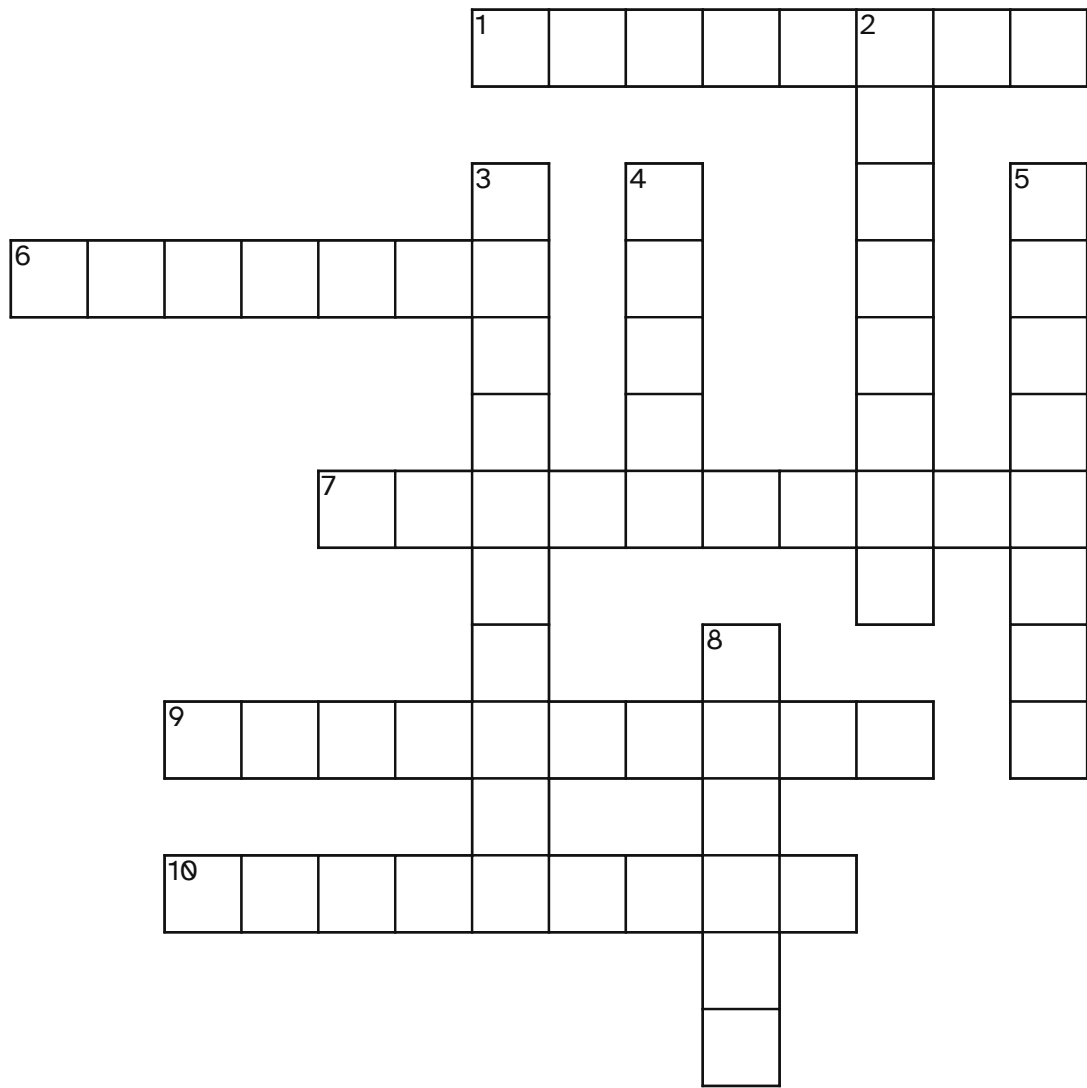
3. How does this story show that Earth systems are connected rather than separate subjects?

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T R D E D J F O R E I A E C Y O E A
A N I T P E R R U M P E N H I P F O
A O P I L E U S I O A I D S P H N E
C E C E N F O E I I M I N T E R O G
I N O T N F D U A S C F G M N W N P
N R N U P D R A F T T D R S P A E S
A A V T C E E A T U E N Y S A N T O
L D E I F A J N R R W R R H L C M Y
Y A C O N D E N S E S O R P N R R N
N R T P D R O D N S D R A C H U C E
A E I M T T N E H F S S R N E I M N
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H U N I N S T R U M E N T E U R T E

ATMOSPHERE CONDENSES CONVECTION INFRARED
INSTRUMENT MOISTURE PILEUS RADAR UPDRAFT
WILDFIRE

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ACROSS

- 1 Uncontrolled blaze spreading through forests or grasslands
- 6 Rapidly rising column of air
- 7 Scientific tool for measuring or observing
- 9 Process where warm air rises and cool air sinks
- 10 Turns from gas into tiny liquid bits or ice as it cools

DOWN

- 2 Invisible kind of light used to detect heat
- 3 Blanket of gases around Earth
- 4 Signal system that finds objects from returning waves
- 5 Water found in air or other materials
- 8 Smooth, thin cloud above a growing storm cloud

Where this came from

This article was written for 3andB from the reporting below. It is not a reprint — the wording is ours and the facts are theirs.

NASA

“Fire Cloud with a Pileus on Top”

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<https://science.nasa.gov/earth/earth-observatory/fire-cloud-with-a-pileus-on-top/>

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