Super Fog and Fires



Tuesday, February 2, 2021

Presented by: Tony Hurt

What is super fog?



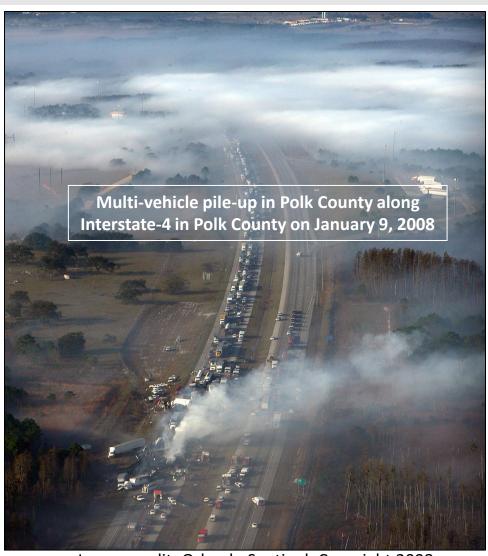


Image credit: Orlando Sentinel, Copyright 2008

- Super fog is described as a mixture of smoke, moisture from smoldering organic material, and fog lowering visibility below three meters (Achtemeier, 2003).
- Super fog is so dense in some cases that you would not be able to see your own hand in front of your face.
- Super fog creates very hazardous driving conditions.

How clouds form



A quick reminder on how clouds form will help in understanding super fog

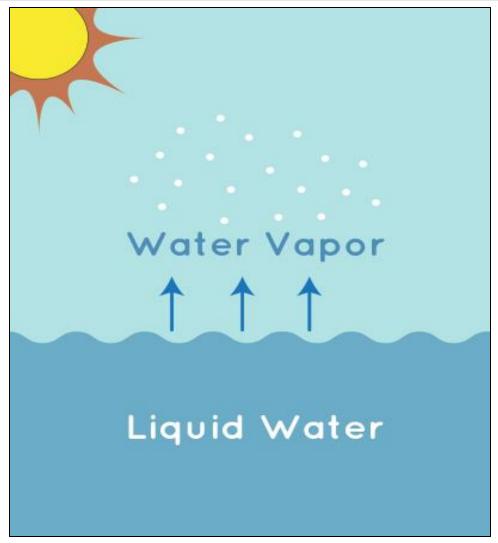
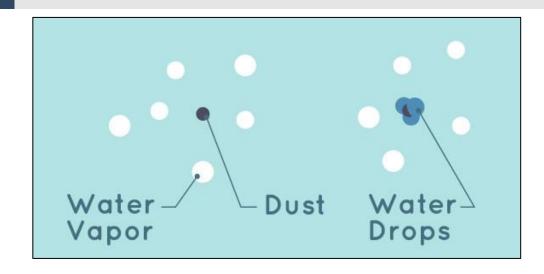


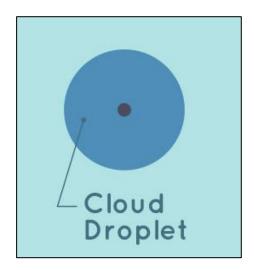
Image credit: NASA/JPL-Caltech/Alex Novati

- Heat causes some of the liquid water – from places like oceans, lakes and rivers – to change into an invisible gas called water vapor.
- This also applies to humid air over land.
- This process is called evaporation and it's the start of how clouds are formed.

How clouds form







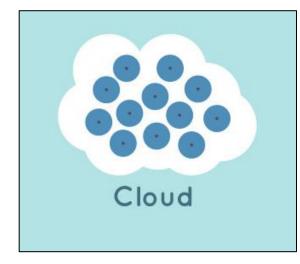


Image credit: NASA/JPL-Caltech/Alex Novati

- Dust, ash, or other particles floating in the air provide surfaces for water vapor to turn into water drops or ice crystals.
- 2. The tiny drops of water condense on the particles to form cloud droplets.
- 3. Clouds are made up of a bunch of cloud droplets bundled together with raindrops

Clouds and fog... Is there a difference?





Image credit: NASA/Ben Smegelsky

- Typically we think of clouds as being elevated up in the sky
- However, when conditions are right, a cloud can form at ground level, too. Then it's called "fog."
- If you've ever walked through fog, you've walked through a cloud.

How fires affect cloud/fog formation





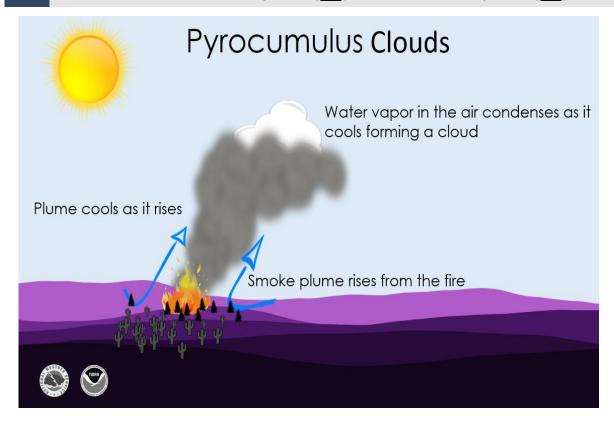
Image credit: NASA

- As mentioned earlier, air holds lots of tiny particles such as dust and pollen.
- Air also carries particles such as ash, soot, and smoke, which occur with fires.
- These particles increase the number of particles in the air that allow water vapor to form clouds and fog.

Atmospheric stability implications

Unstable atmosphere (↑) vs Stable atmosphere (↓): Which is conducive for Super Fog?





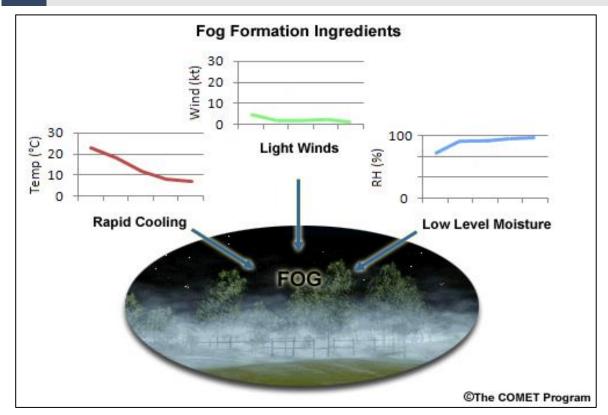


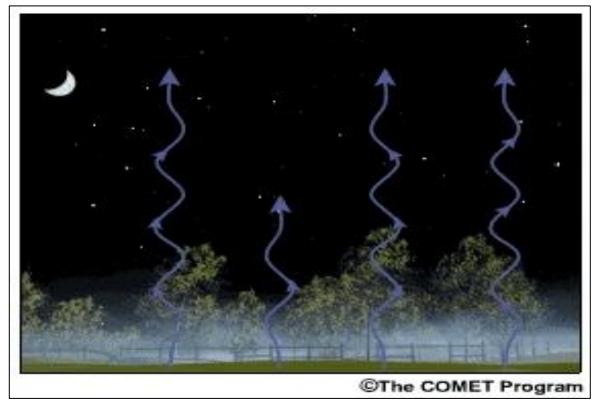
- An <u>unstable</u> atmosphere allows smoke/ash particles to rise vertically into the sky
 - Pyrocumulus clouds often form from heat/smoke originating from a fire
- Since the particles rise away from the ground, super fog is not favored
 - However, thunderstorms with increased lightning threat often exist

Atmospheric stability implications

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Unstable atmosphere (☐) vs Stable atmosphere (☐): Which is conducive for Super Fog?

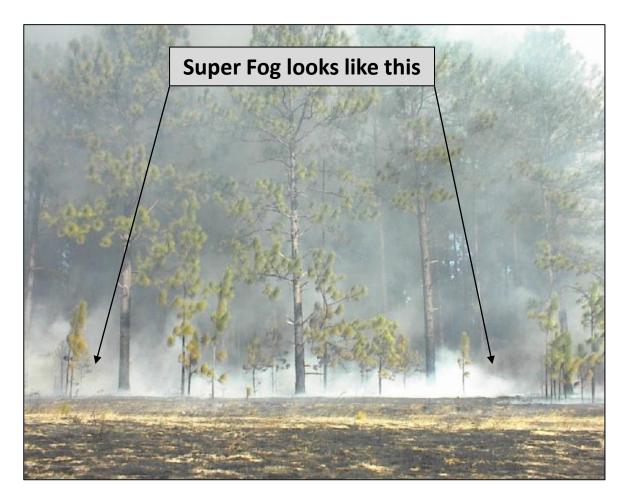




- A <u>stable</u> atmosphere prevents smoke/ash particles from rising vertically
 - Heat rises from the surface, forming a stable warm layer just above cooler surface air
 - Stable layer traps particles below it near the surface in cooler air, enhancing fog potential
- Since the particles remain near the ground, <u>super fog is favored</u>

Super Fog formation





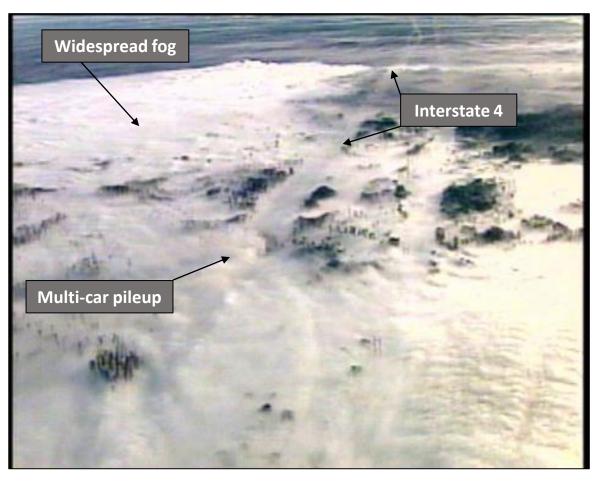
Reduces visibility to less than 10 feet

- As smoldering burns downward into increasingly <u>wetter</u> fuels, large amounts of <u>water vapor</u> are boiled off at high temperature.
- Upon reaching the surface, the hot, moist air cools rapidly, allowing the relative humidity to quickly go to 100% and the moisture to flash into a dense super fog.
- The super fog will persist if the surrounding air is already moist.

A tragic Florida example

Polk County, FL - Morning of January 9, 2008





Smoke combined with cool/stable night air to form super fog

- Multi-car pile-up occurred in Polk County along Interstate 4 during the morning of January 9, 2008.
- 70 vehicles involved, resulting in five fatalities and 38 injuries.
- Prescribed burn from the previous day contributed to dangerous conditions leading to the pile-up.

A tragic Florida example

Polk County, FL - Morning of January 9, 2008





Footage from above I-4 detailing extent of pileup and fog

Other smoke/fog accidents in Florida (Orlando Sentinel)

- March 8, 2000 -- Three killed, 21 injured during 22vehicle crash on Interstate 10 near Wellborn (east of Tallahassee).
- June 2, 2000 -- One killed, 12 injured during 14-vehicle pileup on Interstate 95 in Brevard County near State Road 520
- May 28, 2001 -- One killed, 14 injured in 20-vehicle pileup on Interstate 4 in Polk County near Haines City.
- May 7, 2006 -- Two killed and two injured during fivevehicle crash on Interstate 95 in Brevard County near Port St. John.
- March 13, 2007 -- Five people killed, three injured during 11-vehicle pileup on Florida's Turnpike in Osceola County near Kenansvile.

In Summary...



Super fog is <u>most common with cool/stable conditions</u>
<u>and light winds</u>; typically with high pressure over area

Super fog <u>severely restricts visibility</u>, generally less than
3 meters (10 feet).

Super fog <u>creates very hazardous driving conditions</u>.

Questions? Comments?



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