

Sketch the four stages of thunderstorm development in the boxes below. This is not an art project, but give it a decent effort. For each cloud sketch, include the arrows showing the direction of the air movement going on - both in the cloud and near the ground (include both updrafts and downdrafts). Show precipitation if there is any. If you are stuck, look at some pictures of these clouds on the internet for inspiration - grab one of the classroom computers if you need to.

For each stage refer to your notes. I drew each one of these stages during class. Make sure your drawing includes arrows showing air direction and any processes occurring inside the cloud.

Cumulus mediocris

Cumulus congestus

Cumulonimbus calvus

Cumulonimbus incus

Questions:

1. In the morning, you see some cumulus humilus. A few hours later (around noon), you still see cumulus humilus, with a few cumulus mediocris here and there. Later that afternoon, you look again and the sky is still littered with cumulus humilus and mediocris. Although the clouds are clearly moving around and changing shape, they really don't look any different than they did this morning. What can you conclude from this observation?
 - A. The air is mostly **Stable** / Unstable (pick one)
 - B. Thunderstorms are **Likely** / **Unlikely** (pick one)
2. In the morning, you see some cumulus humilus. A few hours later (around noon) you see a lot of cumulus congestus and some cumulus castellanus. What can you conclude from this observations?
 - A. The air is mostly **Stable** / **Unstable** (pick one)
 - B. Thunderstorms are **Likely** / Unlikely (pick one)
3. You are watching the local news and the weather reporter says that "Unstable air is moving into New Mexico for the next few days." What kind of weather do you expect in the next few days?
 - A. Clear skies.
 - B. Maybe some scattered cumulus but nothing else.
 - C. Cumulonimbus clouds.**
 - D. Very polluted air near the ground.
4. You are watching the weather channel and they report that a large temperature inversion is growing over New Mexico this week. What kind of weather do you expect in the next few days?
 - A. Cumulus congestus and possibly some cumulonimbus.
 - B. Cloudless skies but air pollution near the ground.**
 - C. Extremely clean and clear air.
 - D. Days of nearly non-stop rain.
5. You see large cloud anvils in the distance in the direction of Santa Fe / Los Alamos. What do you know from this observation?
 - A. The air is very stable.
 - B. It is very unlikely today that we will see any cumulus congestus forming around Albuquerque.
 - C. Air pollution is going to be a problem.
 - D. We have unstable air.**
 - E. The tropopause is unusually low today.
6. You are at home during a spring afternoon. Suddenly there is a tremendous blast of air that seems to have come out of nowhere. The air suddenly gets colder. You look up but see no cloud above you.
 - A. What is the most likely explanation for this event? (what is it called?) **microburst / outflow / gust front**
 - B. Describe briefly in a few sentences what is causing this. Add a sketch to illustrate your answer.

The cold downdraft in a cumulonimbus is dense and sinks. As it sinks, it gains speed and crashes into the ground at high speeds (sometimes over 70mph). It then spreads out laterally, sometimes for hundreds of miles.

For a diagram see your notes from lecture. Please note that some people wanted to call this feature a haboob. The haboob term is only used when dust is being blown.