

“Clouds”

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The second flow visualization project illustrates the uncontrollable flow of the clouds. The intent of the image was to capture the altocumulus castellanus on a typical unstable day.

The picture setup is shown in figure 1 below. The lighting was provided courtesy of the sun. It was 11:00 so the sun was slightly west and the cloud was slightly east as shown in figure 1. The altocumulus clouds are the lowest clouds (besides fog or stratus) at 15,000-30,000 feet and are often classified by their wavy, layered, rounded masses or rolls. These clouds are distinctly different from altocumulus floccus in that they form towers and are often taller than they are wide. The altocumulus castellanus is a sign of great instability in the air and can easily develop into a cumulonimbus, which is the type of cloud associated with thunderstorms and bad weather. The instability in the atmosphere causes updrafts of air at different speeds, which means vertical shear. This is how the “towers” are formed. Altocumulus castellanus clouds can be grey, white or both made up of ice crystals, water droplets or both. The altocumulus cloud genre can easily be confused with the cirrocumulus cloud genre. The clouds presented in the picture are altocumulus because they are not shaded. The spatial resolution is the minimum distance for two distinct objects to be recognized. When photographing clouds the spatial resolution is not only going to be poor because the clouds are so far away and the smallest features are not visible but also because the spatial resolution is degraded by bad focus and it is very hard to focus on clouds. The photograph of the cloud has excellent temporal resolution because from the camera’s point of view the cloud is moving so slowly that it is standing still.

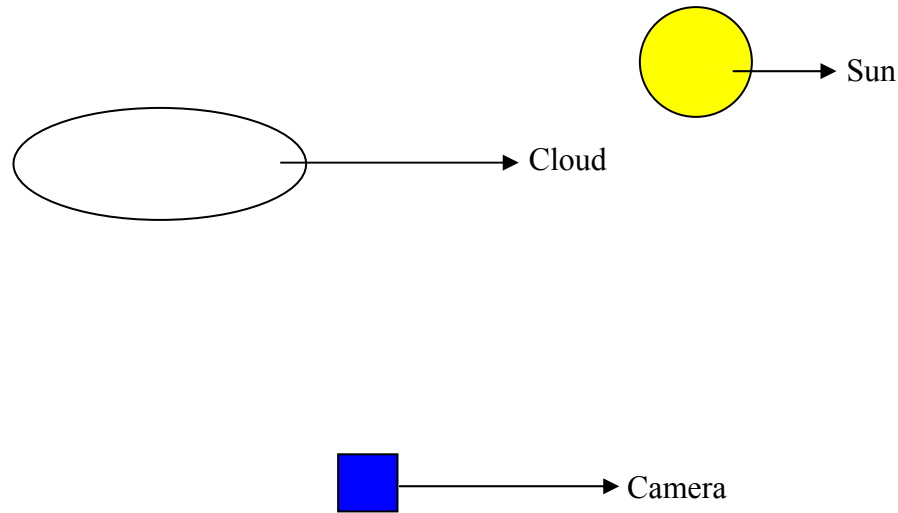


Figure 1: Picture setup

The instability of the atmosphere allowing the formation of clouds provided the visualization technique for this photograph. As mentioned previously, the clouds in this picture are made up of water droplets and ice crystals (but probably mostly water droplets). The bright sunshine provided the necessary light and made the use of a flash unnecessary.

The width of the picture is about 800 meters at a distance of about 23,000 feet away. The camera used is a Fujifilm FinePix digital camera 2600 zoom with 7.5 zoom (3x optical and 2.5 x digital), which is equivalent to 38-114 mm on a 35 mm camera. It has a resolution of 2.0 megapixels, a focal distance of approximately .8 m to infinity and an aperture of 3.5/F8.7. The sensitivity is equivalent to ISO 100 and the shutter speed is in automatic is $\frac{1}{2}$ to 1/1000 seconds. The camera is made for an amateur so the manual settings are limited and use the WYSIWYG (what you see is what you get) philosophy. The cloud picture was taken in the manual mode and the settings were as follows: flash-off, exposure compensation-0, white balance-shooting outdoors in fine weather or sunshine and quality-normal. This camera was used because of the WYSAPCUI (when you see a pretty cloud, use it) rule even though it would have been better to use a better camera.

The cloud image illustrates a beautiful moment caught on camera. The picture illustrates altocumulus castellanus clouds and shows the physics of their “towers”

forming. The only thing that I would change is the quality of the photo. With more resolution and better focus, the photo may have revealed more detail. The altocumulus castellanus clouds are very interesting and look different during sunrise and sunset. A further study could show many times of day side by side and compare and contrast these types of clouds.

References:

1. <http://www.informationosphere.com/html/2330.htm>
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3. <http://www.ems.psu.edu/Courses/Meteo200/lesson1/clouds.htm>
4. <http://www.dcresource.com/reviews/fuji/finepix2600-review/>
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