12 Finish Exposure and Cloud Names

Friday, September 30, 2022   5:08 PM

Today:
Exposure Conclusion
Clouds 1

Admin:
Reading assignment.
   Up through Clouds 1, 2 and 3.
Clouds First post: Edit your post date and time = your cloud image date and time

Exposure Conclusion

Proper exposure = middle value on an average pixel

Same image brightness
f/5.6, 1/100 sec, ISO 200
f/8, 1/100 sec, ISO 400
f/4, 1/200 sec, ISO 400

OK, many combinations lead to the same overall brightness. How to choose?

In groups, what are the side effects of each choice?

Side Effects	If you want your photo	Side Effects
Large D.O.F. Reduced Sharpness	Aperture — f/8 f/5.6 f/4 f/2.8 f/2.0 f/1.4	Narrow D.O.F.
Freeze motion Rolling Shutter Artifact	Shutter Speed — Fast 1/1000 sec, Medium 1/250 sec, Slow 1/30 sec	Motion Blur Camera shake
Lose info light	ISO Sensitivity — Low gain ISO 100, High gain ISO 6400	Grainy Noisy

Side Effects	If you want your photo	Side Effects
Deep depth of field	Aperture — f/8 f/5.6 f/4 f/2.8 f/2.0 f/1.4	Shallow depth of field
Rolling shutter artifacts	Shutter Speed — Fast 1/1000 sec, Medium 1/250 sec, Slow 1/30 sec	Motion blur
	ISO Sensitivity — Low gain ISO 100, High gain ISO 6400	Noise

Other implication of ISO: Noise

High ISO   Low ISO
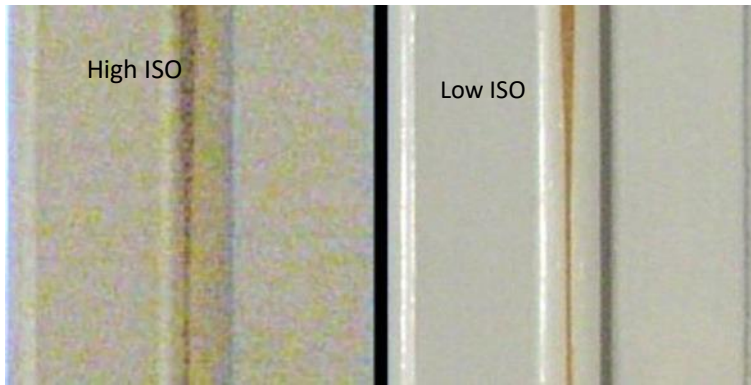
$$$$ in camera buys less noise at high ISO

Autoexposure programs (AE)
Wide variety. Stay away if you can.
Semi -automatic programs are better.
Av = aperture priority. You choose the aperture, camera will choose shutter speed. ISO might be automatic too.
Tv = Time priority; you set the shutter speed and ISO, camera AE will choose the aperture.
M = Manual (maybe). You choose both aperture and shutter speed. Meter will tell you if exposure is OK.

to set over/under exposure

Lighten image, overexpose compared to AE suggestion +++
Darken, underexpose compared to AE, -----

★ Does your camera have a +/- button?

Shutter speed: motion blur at slow speeds
Aperture: low depth of field at large aperture. Diffraction will reduce sharpness at small apertures
ISO: Noise at high ISO
Deliberate under/over: Camera will change one or more of the other three settings, with attendant side effects. With underexposures, get loss of detail in shadows. Worse, at high overexposure, lose detail in highlights.

CLOUDS

Learning Objectives:
1. Be able to identify cloud types
2. Describe air motion and atmospheric stability that govern the appearance of basic cloud types.
3. Interpret weather data with respect to likely clouds, including Skew-T plots and wind soundings.

· Cloud first image due Weds. Great if you can ID your cloud.
· *Required: be able to state stable vs unstable atmosphere during critique.*

• Required: be able to state stable vs unstable atmosphere during critique.

Name Race: in one minute, in your group of 3-4 students, how many separate cloud names can you recall? No internet allowed!

Cumulus
 stratus
Cirrus
Cumulonimbus
Lenticular
Mushroom (Aieeee)
Cumulus congestus

A more complete list, from the Cloudspotter's Guide:

CLOUD CLASSIFICATION TABLE

Clouds are classified according to a Latin 'Linnean' system (similar to the one used for plants and animals), which is based on their heights and appearance. Most clouds fall into one of ten basic groups, known as 'genera'. They can further be defined as one of the possible 'species' for that genus, and any combination of the possible 'varieties'. There are also various accessory clouds and supplementary features that sometimes appear in conjunction with the main cloud types.
(If all this Latin freaks you out, don't worry – it freaks me out too.)

GENUS	SPECIES (CAN ONLY BE ONE)	VARIETIES (CAN BE MORE THAN ONE)	ACCESSORY CLOUDS AND SUPPLEMENTARY FEATURES	
Cumulus	humilis	radiatus	pileus	arcus
	mediocris		velum	pannus
	congestus		virga	tuba
	fractus		praecipitatio	
Cumulonimbus (extends through all three levels)	calvus	(none)	praecipitatio	pileus
	capillatus		virga	velum
			pannus	arcus
			incus	tuba
			mamma	
Stratus	nebulosus	opacus	praecipitatio	
	fractus	translucidus		
		undulatus		
Stratocumulus	stratiformis	translucidus	mamma	
	lenticularis	perlucidus	virga	
	castellanus	opacus	praecipitatio	
		duplicatus		
		undulatus		
		radiatus		
		lacunosus		
Altocumulus	stratiformis	translucidus	virga	
	lenticularis	perlucidus	mamma	
	castellanus	opacus		
	floccus	duplicatus		
		undulatus		
		radiatus		
		lacunosus		
		translucidus	virga	
		opacus	praecipitatio	
			pannus	

		lacunosus	
Altostratus	(none)	translucidus opacus duplicatus undulatus radiatus	virga praecipitatio pannus mamma
Nimbostratus *(extends through more than one level)*	(none)	(none)	praecipitatio virga pannus
Cirrus	fibratus uncinus spissatus castellanus floccus	intortus radiatus vertebratus duplicatus	mamma
Cirrocumulus	stratiformis lenticularis castellanus floccus	undulatus lacunosus	virga mamma
Cirrostratus	fibratus nebulosus	duplicatus undulatus	(none)

Fun book on how the clouds got these names, given by Luke Howard in mid 1800s :

Hamblyn, Richard. *The Invention of Clouds: How an Amateur Meteorologist Forged the Language of the Skies*. First Edition. New York: Picador, 2002.
Available for checkout

Best clouds physics book, easy read:
• Gavin Pretor-Pinney, *The Cloudspotter's Guide* (Perigee/Penguin, 2006). Next, (for free)
• Thomas Carney et al., *AC 00-57 Hazardous Mountain Winds and Their Visual Indicators* (Federal Aviation Administration, 1997), http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/0/780437D88CBDAFD086256A94006FD5B8?OpenDocument.
• https://www.metoffice.gov.uk/binaries/content/assets/mohippo/pdf/r/cloud_types_for_observers.pdf

> Join the Cloud Appreciation Society

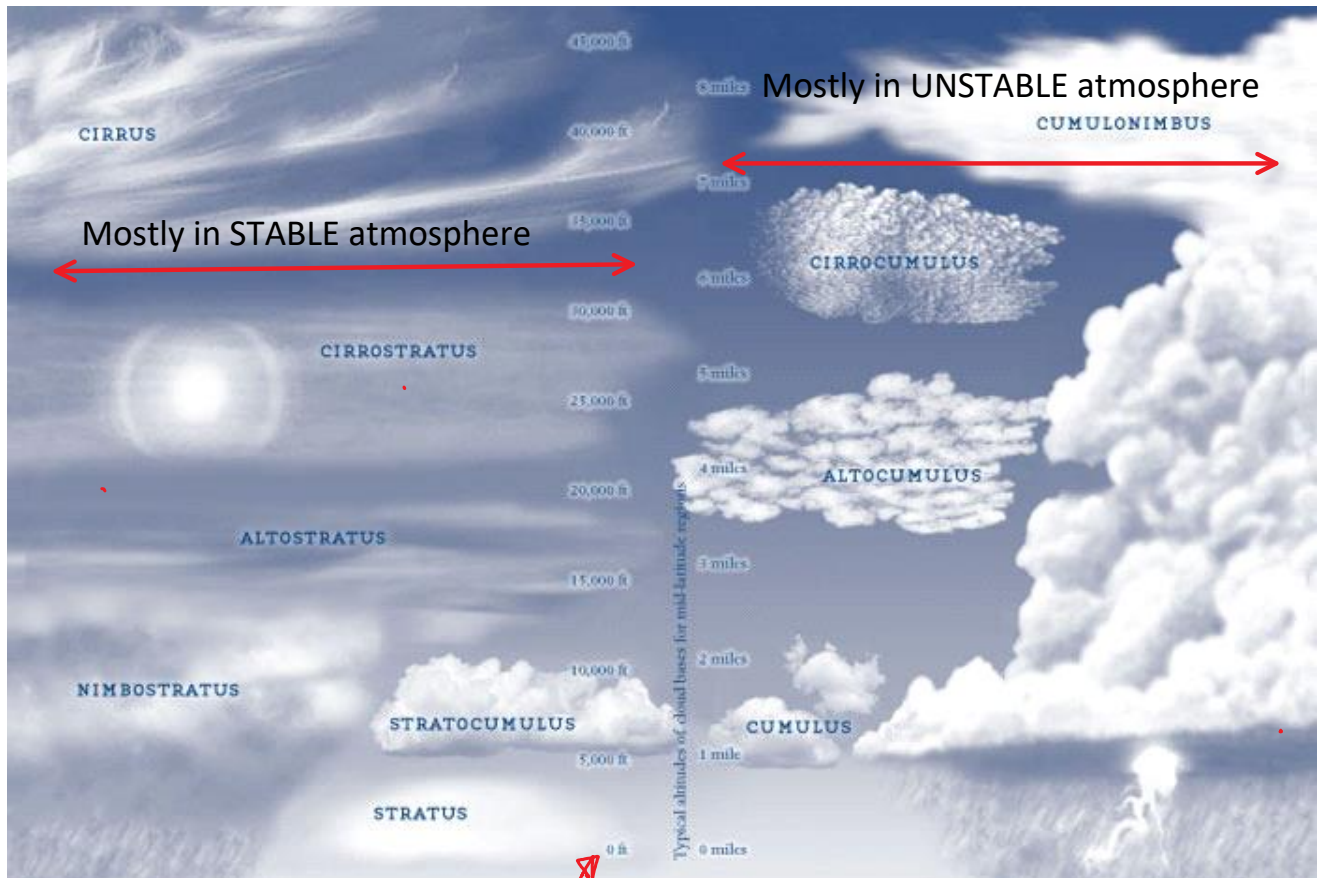Other cloud and atmospheric science books available for checkout; my office.
TONS of online info, most is OK.
Also, Cloud-a-Day or Cloud Guide (UCAR) phone apps

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Following info partially adapted from Mike Baker, local NOAA Weather Service forecaster.

Mostly in UNSTABLE atmosphere

Mostly in STABLE atmosphere

CIRRUS · CUMULONIMBUS · CIRROCUMULUS · CIRROSTRATUS · ALTOCUMULUS · ALTOSTRATUS · NIMBOSTRATUS · STRATOCUMULUS · CUMULUS · STRATUS

Typical altitudes of cloud bases for mid-latitude regions

(ABOVE) Ground level

Pretor-Pinney, Gavin. *The Cloudspotter's Guide*. Perigee/Penguin, 2006.

Hold out three fingers at arm's length. Can you cover a cloud element (clump) with three fingers? No- then it's a low cloud, cumulus variety
If it's between one and three fingers in width, then it's a mid level, alto- type
Smaller than one finger = cirro- level, high cloud.

No cloud elements, just smooth layers = stratus types. If there is visible darkening on the bottom, then it's a low level or alto level layer. If it's all bright, then it's cirrostratus.

Clouds = droplets or ice MOVING UPWARDS

Lift mechanisms determine appearance:
1. Instability. Yes, basically Rayleigh-Taylor. Denser air sinks etc.

2. Orographics: terrain, mountains
3. Synoptic scale weather systems. Both at warm and cold fronts; cold air pushes under in a cold front, warm air overruns in a warm front.
4. Convergence: shoreline temperature differences

1. Instability

Is most complicated but most relevant for our summer clouds. Start with background physics.

What is instability? In groups, give example of
1) a stable and
2) an unstable situation