GLOBE
Cloud
Protocols

"We seek to remind people that clouds are expressions of the atmosphere's moods, and can be read like those of a person's countenance."

– From the Manifesto of the Cloud Appreciation Society

Why Observe Clouds?

- **It's fun!**
- **It's science!**

Clouds are highly variable in space and time, so observations and photos from people in many places, especially when timed to a satellite overpass, provide useful "ground truth" information.

What do you need to start?

Instrument	Your eyes
Helpful References	[GLOBE cloud chart](#) and contrail ID chart ([English/French/Spanish](#)) ([Russian/Chinese/Arabic](#))
When	Good: Any time Better: Within one hour of [local solar noon](#) **Best**: Within +/- 15 minutes of a satellite overpass (times available in app)
Where	A good observation site (See next slides)

Cloud Identification Chart

THE **GLOBE** PROGRAM

Altitude of Cloud Base

High — Contrails

Short-lived

Persistent Non-Spreading

Persistent Spreading

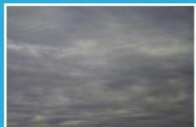6 km
5 km

Cirrus

Cirrostratus

Cirrocumulus

Mid

4 km
3 km

Altostratus

Altocumulus

CONVECTIVE CLOUDS

2 km

Low

Stratus

Stratocumulus

Cumulonimbus

1 km

Nimbostratus

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GLOBE CONTRAIL CHART

NASA

http://science-edu.larc.nasa.gov/GLOBE/
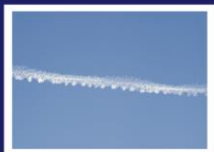
Short-Lived
A contrail that forms and disappears as the plane moves along. Although its length remains about constant it may be very short, or it may span a large fraction of the sky. Generally it is very thin.

Breve Duración
Una estela de vapor que se forma y desaparece a medida que el avión se mueve. Aunque su largo se mantiene constante, puede ser corta o abarcar una gran fracción del cielo. Generalmente es muy fina.

Courte Durée
Une traînée qui se forme et disparaît quand l'avion passe. Sa longueur reste à peu près constante, mais elle peut être très courte, ou couvrir une grande fraction du ciel. Elle est généralement très mince.

Persistent
A thin contrail that remains in the sky after the plane has disappeared. These contrails are not much wider than the short-lived contrails and are thinner than 1 finger held at arm's length.

Persistente
Una estela de vapor fina que permanece en el cielo después de que el avión ha desaparecido. Estas estelas de vapor no son mucho más anchas que las estelas de vapor de breve duración y son más finas que un dedo sostenido a la distancia de un brazo extendido.

Persistante
Une traînée mince qui persiste dans le ciel après le passage de l'avion. Ces traînées ne sont pas beaucoup plus épaisses que les traînées de courte durée et sont plus minces que la largeur d'un doigt bras tendu.

Persistent Spreading
A thick contrail that remains in the sky after the plane has disappeared. They are wider than 1 finger held at arm's length. These contrails can grow to resemble natural cirrus clouds.

Propagación Persistente
Una estela de vapor gruesa que permanece en el cielo después de que el avión ha desaparecido. Son más anchas que un dedo sostenido a la distancia de un brazo extendido. Estas estelas de vapor pueden crecer a parecerse a las nubes cirro.

Persistante et Répandue
Une traînée épaisse qui persiste dans le ciel après le passage de l'avion. Elle est plus épaisse que la largeur d'un doigt bras tendu. Ces traînées peuvent évoluer et ressembler à des cirrus naturels.
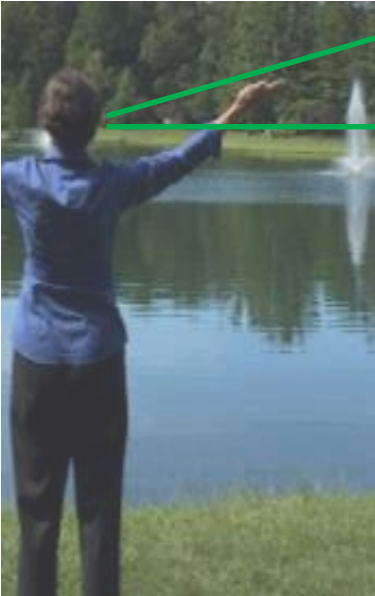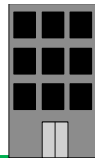
What makes a good observation site?
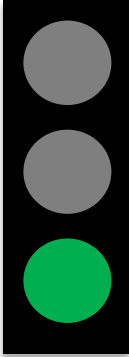
Obstacle test:

- Below hands extended at about head-top level
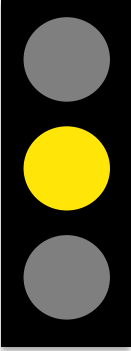- Good observation site

Good:

14°
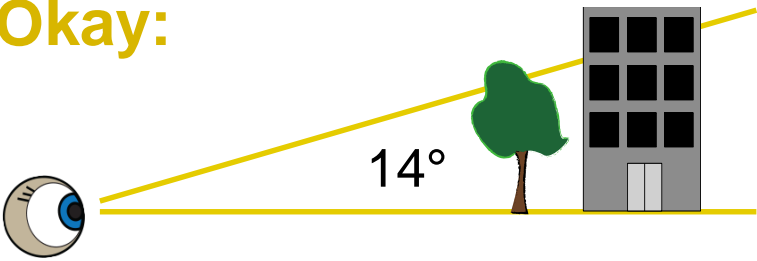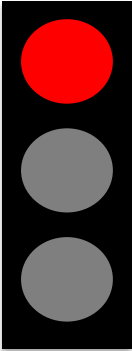
What makes a good observation site?

Obstacles present:

- Minimize as much as possible
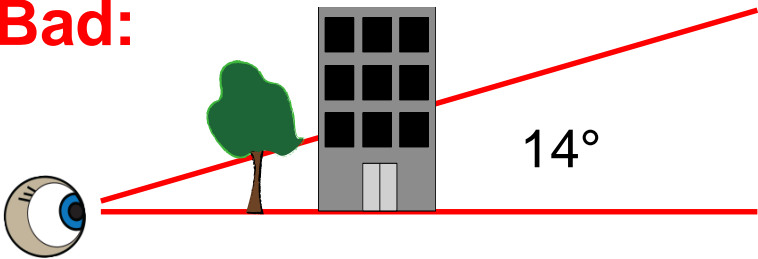- Document (with photos) and proceed

Okay:

14°

What makes a good observation site?

Obstacles present:

- Sky really not visible
- Not a good site

Bad:

14°

How to Observe Introduction

- Look at the sky above 14º in every direction.

- Cloud identification is an art; you will get better with practice.

- You may get feedback from satellite matching, but keep in mind that the view from the ground should NOT always match that from space

How to Observe

Is the Sky Clear?

If yes:

1) Assess sky color (optional)

Pick the shade that most closely matches the bluest part of the sky

What is the sky color?

Deep Blue	○
Blue	○
Light Blue	○
Pale Blue	○
Milky	○
Cannot Observe	●

Tip – this may be a good place to look if not cloudy
- Turn your back to the Sun
- Look at the sky halfway between the horizon and straight up

45°

How to Observe

Is the Sky Clear?

If yes:

2) Assess visibility (optional)

Your best assessment based on local landmarks

What is the sky visibility?

- Unusually Clear
- Clear
- Somewhat Hazy
- Very Hazy
- Extremely Hazy

How to Observe

Is the Sky Clear?

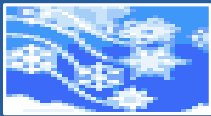If yes:

3) Take Photos (optional)

and you are **DONE**!
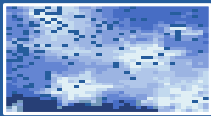
How to Observe:

Is the Sky Obscured?

If over 1/4 is obscured:

1) Record and report the reason
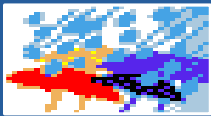2) Take photos (optional)
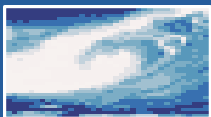
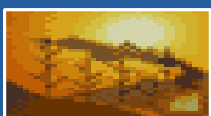   and you are **DONE**!

Blowing Snow

Heavy Snow

Heavy Rain

Fog

Spray

Volcanic Ash

Smoke

Dust

Sand
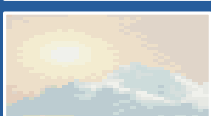
Haze

If Clouds are Present

The app walks you through the steps:

- Cloud fraction*
- Sky Color – explained above
- Visibility – explained above
- High Cloud (if present):
  - Type*/fraction/opacity
  - Including contrails
- Mid cloud (if present):
  - Type*/fraction/opacity
- Low cloud (if present):
  - Type*/fraction/opacity
- Surface Conditions*
- Surface Measurements
- Take Photos

The following pages explain these steps.

- Required item*
- All others optional

How to Observe:
Cloud Fraction*
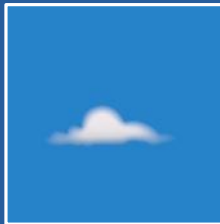
Divide the sky in four quadrants (North, South, East, West) and estimate cloud cover in each first. Then take the average to get the whole sky value.

What Percent of the Sky is Covered by Clouds?

No Clouds
0%

Few
0 - 10%

Isolated
10 - 25%

Scattered
25 - 50%

Broken
50 - 90%

Overcast
>90%

How to Observe:
Cloud Fraction*

- **Observing hint:** If directly overhead there is a pattern of cloud cover with puffs or rolls of cloud separated by clear areas, it is reasonable to infer that pattern continues and the cloud cover is not 100% toward the horizon.

How to Observe: Cloud Fraction

If possible, repeat the estimate of cloud fraction for low, mid, high clouds.

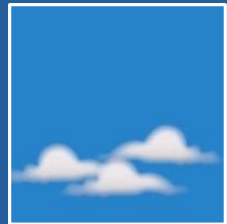If you cannot see a level due to overcast lower levels, skip it.

What Percent of the Sky is Covered by Clouds?
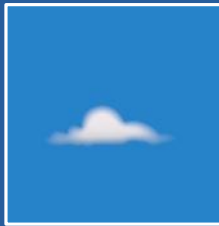
No Clouds
0%

Few
0 - 10%
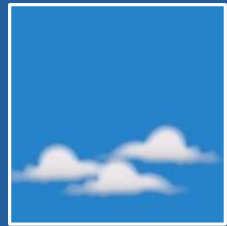
Isolated
10 - 25%

Scattered
25 - 50%

Broken
50 - 90%
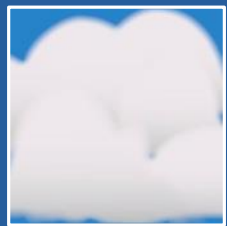
Overcast
>90%

How to Observe:
Cloud Type*
Factor 1: Cloud Shape

The three main cloud shapes are:

Cumulus

(Puffy)

Stratus

(Layered)

Cirrus

(Wispy)

Images: NASA

How to Observe:
Cloud Type*

Factor 2: Cloud Height

High Clouds: Base > 6 Km

Composed of ice crystals, which gives them a delicate appearance. Generally, the Sun can be seen through high clouds and ice particles in cirrostratus scatter sunlight to form a bright ring, called a halo, around it.

Cirrostratus

Cirrus

Cirrocumulus

Images: NASA

How to Observe:
Contrail Type*

If contrails are present,
Count the number of each type:

Images:
GLOBE

Short-lived

Contrails that form short line segments that fade out as the distance from the airplane that created them increases.

Persistent Non-spreading

Remain long after the airplane has left the area. They form long, generally straight, lines of ~constant width across the sky. These contrails are no wider than an index finger held at arm's length.

Persistent Spreading

Remain long after the airplane has left the area. They form long streaks that have widened with time since the plane passed. These contrails are wider than an index finger held at arm's length.

How to Observe:
Cloud Type*

Factor 2: Cloud Height

Middle Clouds: Base 2–6 Km

Always begin with the prefix alto- and are predominantly comprised of water droplets; may contain some ice. Sometimes the Sun can be seen through these clouds, but without a ring.

Altostratus

Altocumulus

Images: NASA

How to Observe:
Cloud Type*

Factor 2: Cloud Height

Low Clouds: Base < 2 Km

Closest to the observer, and often appear to be quite large compared to higher clouds. They may be much darker and grayer than high or middle clouds.

Stratus

Stratocumulus

Cumulus

Images: NASA

Observing Hints: Puffy Clouds
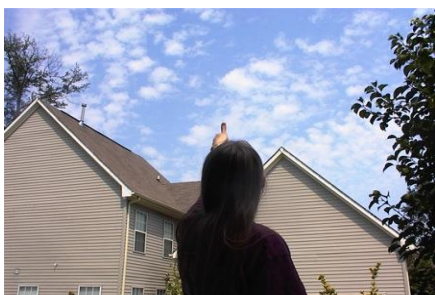
Hint: For cumulus (puffy) clouds, use fist/thumb/pinky finger rule to estimate cloud height.

High Clouds (cirrocumulus)

Appear comparable in size to pinky (smallest) finger held at arm's length

Mid-level Clouds (altocumulus)

Appear comparable in size to thumb held at arm's length

Low Clouds (cumulus)

Appear comparable in size to fist held at arm's length

Images: NASA

Observing Hints: Layered Clouds

Hint: For stratus (layered) clouds, look for clues near the Sun.

> ⚠️ *NEVER look directly at the Sun!*

Cirrostratus

The only cloud type which can produce a halo around the Sun or moon. The halo will have all the rainbow colors in it.

Altostratus

Produces a thinly veiled Sun or moon, and will often be darker in appearance, a medium gray color.

Stratus

Usually very gray and often very low to the ground. The Sun is not visible.

Images: NASA

How to Observe:
Cloud Type*

Factor 3: Precipitation

Clouds with Precipitation

Nimbostratus

Cumulonimbus

Seen from below

Seen from a distance

Images: NASA

Nimbus means cloud in Latin
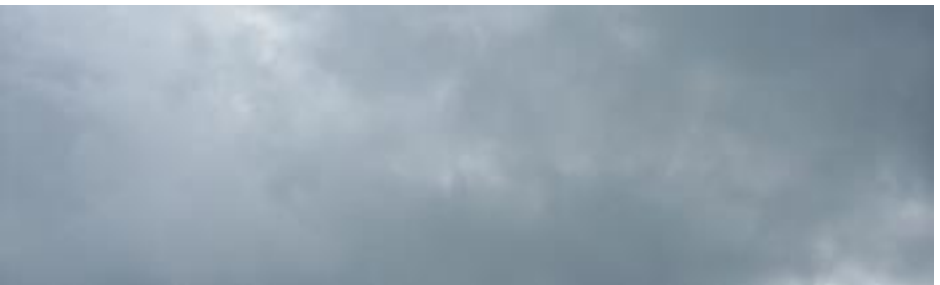
Cloud Opacity

Transparent

Thin clouds through which light passes easily, and through which you can even see blue sky. Note the milky bluish-whitish appearance

Translucent

Medium-thickness clouds that let some sunlight through. There may be some milky bluish-white near the edges, and a very little bit of gray; but these clouds are mostly a bright white.

Opaque

Thick clouds which do not allow light to pass directly, although light can diffuse through them. Clouds look gray. When these clouds are in front of the Sun, it is impossible to tell where the Sun is.
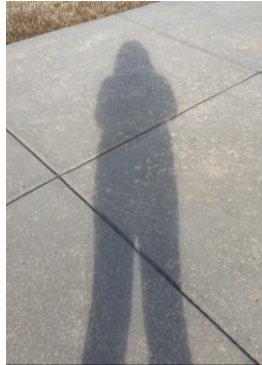
Observing Hints: Cloud Opacity

Transparent

Well defined shadows

Translucent

Fuzzy shadows

Opaque

Little to no shadow

Surface Conditions*

Required, Define the surface conditions of your observation site.

Select Yes/No for each of the following surface conditions

Snow / Ice — Yes — No

Standing Water — Yes — No

Muddy — Yes — No

Dry Ground — Yes — No

Leaves on Trees — Yes — No

Raining / Snowing — Yes — No

TIPS:
- Standing water means *many* puddles.
- Leaves on tress refers to the majority of the deciduous trees around your observation site.

Surface Measurements

- Temperature
- Barometric Pressure
- Relative Humidity

These are all optional. Unless you have been trained in the associated GLOBE protocol, just:

Skip surface measurements

Final Steps

- Take photos (optional)
- You are DONE!

Send report now
Or
Send report later once connected to internet

- Repeat as desired
- Compare your results to satellite images, if times align