Starscan

Johnson Space Center Astronomical Society

JSCAS is an association of amateur astronomers dedicated to the study and enjoyment of astronomy. Membership is open to anyone wishing to learn about astronomy.

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Welcome to the New and Revised

Deep Sky/Challenge Object Program and STARSCAN Column.

Chris Randall

I am diligently working to put together a new monthly objects observing program. The intent of the redesigned and refreshed program is to get people, especially myself, interested or revitalized in and start observing on a regular reoccurring basis.

I would like to first like to thank Ken Lester and his predecessors for bringing their objects to the table. I hope I can do as good a job as they have.

I have been observing since I was a kid when I got my first Sears 4" refractor. I really enjoyed watching the Saturn, Jupiter and the Moon from the backyard here in Houston. Then I dropped out of observing for a while. I now believe it was because of the equipment limitations. While attending college I regained my interest while on a geology field trip. I found an old orange C-8 in the storeroom, and asked if we could drag it along on out trip to Arkansas. Of course, all I had for charts was a cheap planisphere I found in the telescope case. I did not even have electricity to plug in the telescope for tracking. Yes, You guessed it was a tiring trip up all day banging on rocks and looking at the stars at night. Then I accidentally found group of astronomers observing at Brazos Bend State Park. Wow a 16" telescope great views out by the interpretive center, from local amateur astronomers. This was before there was a George Observatory. Then construction on the George Observatory began. Soon after it was completed you could find me out there every weekend. I then joined FBAC and purchased my first "real" telescope, which is still my main instrument. It is Meade LX6 10" f/6.3 Schmidt Cassegrain in 1991. No it does not have go-to capabilities. They did not make that back then. Then I started trekking to TSP that year, I was totally hooked on Dim Fuzzy Objects. I joined JSCAS in 1993 at the encouragement of a friend and have been a member ever since.

I am a hard-core observer. If you challenge me I try, to the limits of my equipment and beyond, and usually succeed. If not I have been known to commandeer large aperture. Yes I learned from Barbara Wilson, I could see things that others claim don't exist in telescopes. I also try to sketch my fields and log the objects. I have many of my drawings on my website http://www.ghg.net/cbr/logs. I find that you end up seeing more detail and enjoy the object more if you sketch. It works even if the drawing is horrible. I have acquired many observing program certificates from the Astronomical League, which I am a member at large.

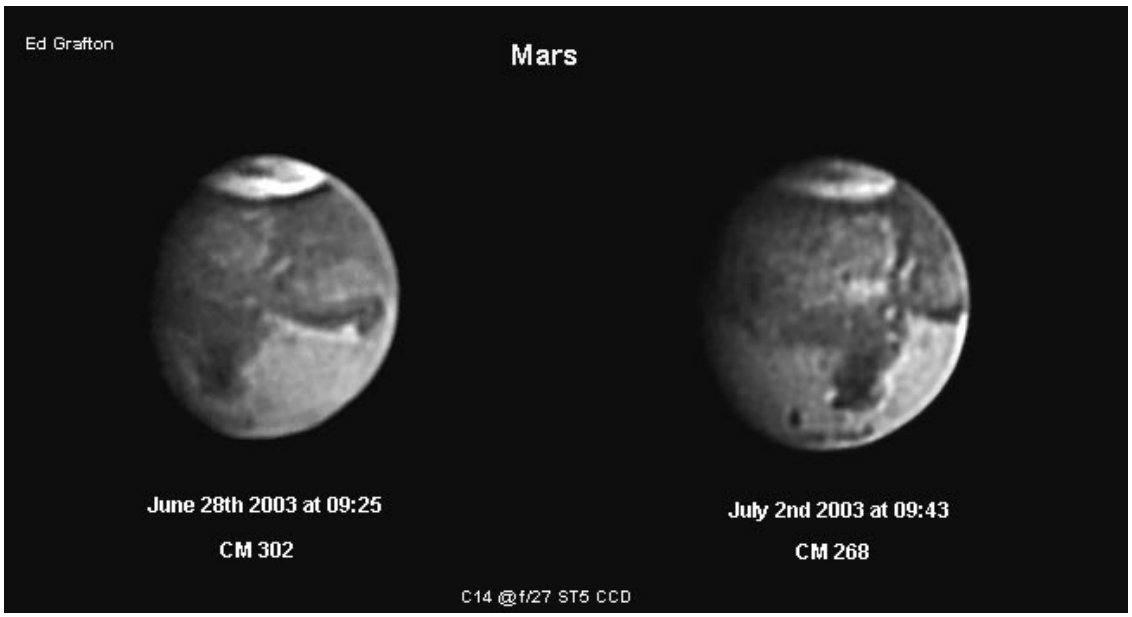
The Program:
I plan on starting with three main areas plus a pick object. Since not everyone loves acronyms, I'll spell them out here.

- ★ DSO's are Dark Sky Objects. These objects are **not** normally visible in Houston.
- ★ BSO's are Bright Sky Objects. These objects are normally visible in Houston.
- ★ SSO's are Solar System Objects. These objects can be the Sun, the Moon, planets, comets, asteroids, and whatever we can find in our local area.
- ★ CDMP's are Chris' Don't Miss Pick. This is the objects that if you can only view one this month it would be the one.

Each month I intend to bring several objects in each category to the club, and current sky events. I plan for the non solar system objects to be visible near the meridian at 10 P.M. on the 15th of the month. This will allow for plenty of viewing time all month. I would like to stay away from the "standard" Messier Objects unless there is a special twist to the object. But I am getting a slow start finding great objects this month so I'll throw some in to get going.

I really want to hear from the club on the type of objects you would like to have in this program. You can email me at cbr@ghg.net for suggestions and questions. I'm always open for new different objects to view.

Some Mars picture by "Illusive Ed Grafton"



Dust on Mars was seen July 1st in the region North of Hellas. Here are a couple of images that were taken on June 28th and July 2nd. The Dust eruption North of Hellas is quite pronounced in the July 2nd image and not present June 28th. There seems to several cores present in the area affected. Images were taken from Houston Texas.

Get Your Name on a Comet

Members of the JSCAS can submit their names to be included on a probe that will impact on the comet Tempel 1 in July 2005. The names will be carried on NASA's Deep Impact spacecraft, which will be launched in December 2004 that will fly past the comet. It will then release a 370 kg copper tipped impactor into the comet, which will create a crater. The impactor will carry a mini CD with the names. You can submit your name until February 2004 by visiting NASA's Deep Impact Web site at http://deepimpact.jpl.nasa.gov/.

Space Stamps

For a mere US$ 20,000 you can send a letter to the International Space Station, which will then be franked there and sent back to you. This is another friendly, yet non-economical undertaking of the Russian Space Agency in association with a special firm that will sell you a stamp for the mail delivery. The price is so high because it costs up to $ 20,000 to deliver 1 kg of cargo to the space station and $ 60,000 to return it. According to the Space Agency, the proceeds of this venture will be devoted to 'space-related activities'. [Anyone with this kind of money to burn should contact the JSCAS and plan to leave an endowment for the construction of a permanent observatory for the club.]

Mars Tumbleweed Rover

Students at the North Carolina State University (NCSU), with the sponsorship of NASA, have developed a wind-powered rover that can be blown across the surface of Mars like tumbleweed. [There is no truth to the rumor that a pilot study was undertaken of managers generating their own brand of hot air before the students came up with this idea]

By studying how the tumbleweed, with its intricate lightweight branch structure, uses the wind for movement, the students built a prototype called the Tumbleweed Earth Demonstrator (TED), scaled for use on Earth. [This device possibly costs $14,000 to build, though cheaper tumbleweeds are available in west Texas for much less]. If successful, a future Mars mission could disperse multiple Tumbleweed rovers to roam the surface of Mars carrying instruments with unique sensors to search for water or investigate climate as well as collecting geological samples.

Simone

At a recent astronomy meeting in Dublin a team of UK scientists proposed the Smallsat Intercept Missions to Objects Near Earth (Simone) to investigate the asteroids called Near Earth Objects (NEOs), which threaten to impact Earth. These are also targets of amateur astronomers' telescopes when they pass by. The 120 kg satellites would be launched in clusters of five on a single launch vehicle and be sent to different targets using on-board solar electric propulsion.

After a rendezvous with the target, the satellite's experiments would map the surface in great detail, in addition to determining its mass, density and composition. The instruments would be:

1. A Multispectral Imaging System to measure the asteroid's size, shape, topography, morphology and albedo;
2. A Radio Science Investigation to determine the asteroid's mass from its gravitational influence on the spacecraft trajectory;
3. An X-ray Spectrometer to determine its elemental composition;
4. An Infrared Spectrometer for mapping minerals and surface variations;
5. A Laser Altimeter to measure the surface topography and range from the spacecraft.

A launch date in 2008 is envisaged - if the project goes ahead.

Star Party News

As you probably are aware, Mars will make its closest approach to Earth in recorded history on Wednesday, August 27th. On Saturday, August 23rd , JSCAS will hold a special public star party at Challenger 7 park. This is the weekend before opposition. The Moon should be favorable for viewing, having set at 5:20 p.m.

Johnson Space Center Astronomical Society

Agenda for August 8 2003

Center for Advanced Space Studies
Lunar and Planetary Institute

7:30 Meeting Start and Welcome

7:40 Presentation: Eleta Malewitz (Princess of Mars) A Brief History of Mars Observation
8:30 Break
8:45 Calendar Review, Announcements, Awards and SIG Reports

- **Deep Sky, Challenge Object – Chris Randall**
- **Star Party News - Lisa Lester**

9:30 Charlie's Challenge - Charles Hudson
10:00 Door Prizes and Adjourn

Web Page: http://www.ghg.net/cbr/jscas/

Short Eye Relief Eyepieces Usable with Glasses

Ed Zarenski

I was out viewing a fairly close double star, Rasalgethi - a Her (3.0-5.4/4.6") recording the view in various eyepieces, looking for the upper and lower limits of magnification necessary for an acceptable view. However, several times I looked up from my note-taking with my glasses still on and noticed I could easily view through the eyepieces from a distance away from the lens. I've noticed this before when viewing planets. Even in very short focal length eyepieces with very short eye relief, small objects are often visible at quite a distance; say 20mm to 30mm, away from the eyepiece. This leads to the conclusion that when viewing small objects, fov and eye relief for any given eyepiece become far less important.

What I noted was the relative eye relief of the various eyepieces, whether or not it was possible to view through each eyepiece with my glasses on and how much of the fov could I see while wearing my glasses. I found that for viewing doubles every eyepiece could be used with glasses. There is no reason to believe this would not be true also for other small field objects such as planetary nebula and planets. To protect from scratching, I needed to be careful not to bump my glasses against those eyepieces that are metal without a rubber eye-guard. I've done this in the past when I first started out and in a very short time I ruined a $300 pair of glasses with antireflection coatings. I now own one pair of glasses without coatings that I use when observing. It's not the lenses that get scratched. It's the soft coatings. No coatings, no scratched eyeglasses.

scope used	F	d	f					
Celestron G5	1375	125	11					**effective**
					afov	**Tfov**	**ep fov**	**tfov**
			estm	**Eye Relief**	**spec**	**mag calc**	**w/glasses**	**w/glasses**
eyepiece	**fl**	**mag**	**er mm**	**to allow 100% fov**	**degree**	**arcmin**	**% visible**	**arcmin**
UO ortho	4	344	4	lash in contact	42	7	60%	4
UO ortho	5	275	5	lash brushing	42	9	60%	5
CelestUltima	5	275	4	eyesocket in contact	50	11	45%	5
UO ortho	6	229	6	lash barely brush	43	11	60%	7
Sirius Pl	6.3	218	6	eyesocket just to eyecup	50	14	40%	5
CelestUltima	7.5	183	6	touching & brushing	52	17	40%	7
Meade UWA	8.8	156	7	eyesocket tight to cup	84	32	50%	16
Meade SP	9.7	142	7	eyesocket tight to cup	49	21	40%	8
Sirius PL	10	138	7	lash brushed occasional	50	22	60%	13
UO Konig II	12	115	7	lash brushing faintly	60	31	45%	14
Celest PL	12.5	110	8	no touch or brush	50	27	60%	16
TV Radian	14	98	15	no touch or brush	60	37	100%	37

UO Konig II	16	86	6	lash brushing constant	65	45	33%	15
Sirius PL	17	81	9	no touching cup	50	37	75%	28
Meade SWA	18	76	6	socket tight to cup	63	49	60%	30
Sirius PL	20	69	10	no touching cup	50	44	90%	39

These are my findings relative to eye relief. Only eyepiece focal length and apparent field of view data listed above are manufacturer's data.

Eye Relief is considered the point at which I must place my eye so that I can see the field edge stop or 100% of the fov in the eyepiece. Estimated ER mm is my guesstimate of how close my eye is to the top of the eyepiece. Based on my written description of eye placement, you may understand how I increased my estimation of ER mm based on whether or not I am touching or brushing the eyepiece. In the orthos, lashes touch the EP, whereas, in the Ultimas the eye socket is in contact with the EP This is a result of the shape of the eyepiece, the UO orthos being conical and the Ultimas squared off at top with a slight lens recess. These eye relief values in mm are not significant for calculations in this analysis, just useful information.

True fov is calculated based on the magnification formula afov/mag * 60 = Tfov arcmin. This formula is only an approximation of Tfov, but for the purposes of this analysis, to compare tfov with or without glasses, it works just fine.

I then put my glasses on and viewed from as close as I could get to the eyepiece. I moved my eye around the view until I could see the edge stop at one edge of my view and noted how far I could see past the star in the center of the fov. This was recorded as the % of the fov visible with glasses on. Almost none of these eyepieces are normally considered as usable with glasses, however that turns out to be not entirely true. With my glasses on, I was viewing through these eyepieces probably from a distance of 15mm to 20mm. I could see the separation and color of the components in Rasalgethi just fine through every one of the high power eyepieces.

What is significant is the % of fov visible when viewed wearing glasses. This is a good indication of the real relative eye relief. Eyepieces with shorter eye relief result in less of the field of view being seen with glasses because with glasses on and being in contact with the eyepiece, the eyes are almost always placed at the same distance away from every eyepiece. The lower the percent of fov visible when wearing glasses, the further out beyond the true eye relief focus point the eyes are. Since the glasses place the eyes at a fixed distance, eye relief must be further in front of the eyes for those with a lower percentage fov visible.What came as a real positive surprise was that with my glasses on I could see 60% of the fov in the three shortest focal length UO ortho eyepieces, the 4mm, 5mm and 6mm.

The real under-performer I think is the 16mm University Optic's Konig II. No matter how I moved around with my glasses up tight to the eyepiece, I couldn't see more than 33% of the fov. I believe the 16mm Konig eye relief is somewhat short of the claim ample. For an eyeglass wearer, the 12mm Konig provides nearly the same tfov as the 16mm Konig and at a substantially higher power that will allow seeing more. The Orion Sirius 10mm Plossl provides even more power and only a hair less fov than the 12mmK.

The Radian, true to its claim, allowed easy eye relief and 100% fov with glasses on.

The Orion Sirius 17mm Plossl is a very comfortable eyepiece to use while wearing glasses, providing at least 75% of the full fov. In fact, the 17mm Plossl with glasses on provided 28arcmin fov, almost the same tfov as the Meade 18mmSWA at 30arcmin. For an eyeglass wearer, the 17mm Plossl, a very sharp, clear eyepiece, is providing effectively the same view as the 18mmSWA at 1/3 the cost.

The Meade 8.8 UWA required contortions to see the edge of field and was the most uncomfortable of all to view with glasses on, however I still love that EP and I'll take mine without glasses thank you. Either way it dishes up a spectacularly clear wide view.

By the time we get to a 20mm EP we are reaching the point where eye relief is nearly sufficient to use with or without glasses. My 25mm lens allows me to see 100% of the fov while wearing glasses and I expect that every lens from 26mm on up to 40mm, all having fairly long eye relief, would allow 100% view of fov with glasses on.

The conclusion I reach here is different eyepieces serve different purposes and one need not be so concerned about eye relief if the eyepieces are not being used for wide field viewing. There are at least a dozen eyepieces in this data that are not normally intended as usable by eyeglass wearers and yet, under certain circumstances, each of these eyepieces can be used by viewers with glasses. Keep that in mind next time you are considering a $240 eyepiece over a $59 model, just so you can get additional eye relief. Maybe you'll want another reason for that purchase, not just eye relief.

The Atmosphere and Observing - A guide to Astronomical Seeing.

Damian Peach

An observer, be they at a mountain top observatory, or in their own back yard must, at all times contend with the Earth’s atmosphere. It is a notoriously unpredictable and limiting factor in obtaining fine views of the Planets, and close binary stars. Many often comment, especially here in the UK that seeing is all too often mediocre on most nights, but what are the factors that contribute to this? Are there ways and signs, which indicate whether the atmosphere, will be stable or turbulent on a given night?

What is “seeing”?

So what exactly is atmospheric seeing? It is high frequency temperature fluctuations of the atmosphere, and the mixing of air “parcels” of different temperatures/densities. This behavior of the atmosphere is seen at the eyepiece as a blurred, moving, or scintillating image. There are roughly 3 main areas where atmospheric turbulence occurs. Near ground seeing (0 – 100metres or so.) central troposphere (100m – 2km), and high troposphere (6-12km). Each area exhibits different characteristics, which are explained in more detail below.

1. Lower Altitude effects.

The air near the ground is where the great majority of turbulent airflow of the atmosphere occurs, which of course happens to be the area where the great majority of amateur observers are located! This is caused mainly by areas (houses, other building etc) of varying density radiating heat differently, resulting in local convection currents. This is caused when the Sun heats the ground during the day, and the heat is then radiated away at night. An un-varying

topography, such as grassy fields, and large bodies of water are favorable to observe over, at they radiate the stored heat from the day more slowly and equally.

Also the telescope itself can perturb the image, if it hasn't reached ambient temperature, this will result in a "boiling effect" when viewing. One should leave their scope for at least 1 hr prior to observing and probably longer. Also certain types of telescope and observatory are more prone to turbulence. Newtonian reflectors can be troublesome if not properly ventilated, as can Schmidt Cassegrains if not left to cool for long enough. As for observatories, Domes have poorer characteristics for stable seeing than run of roof designs.

2. Mid- Altitude effects.

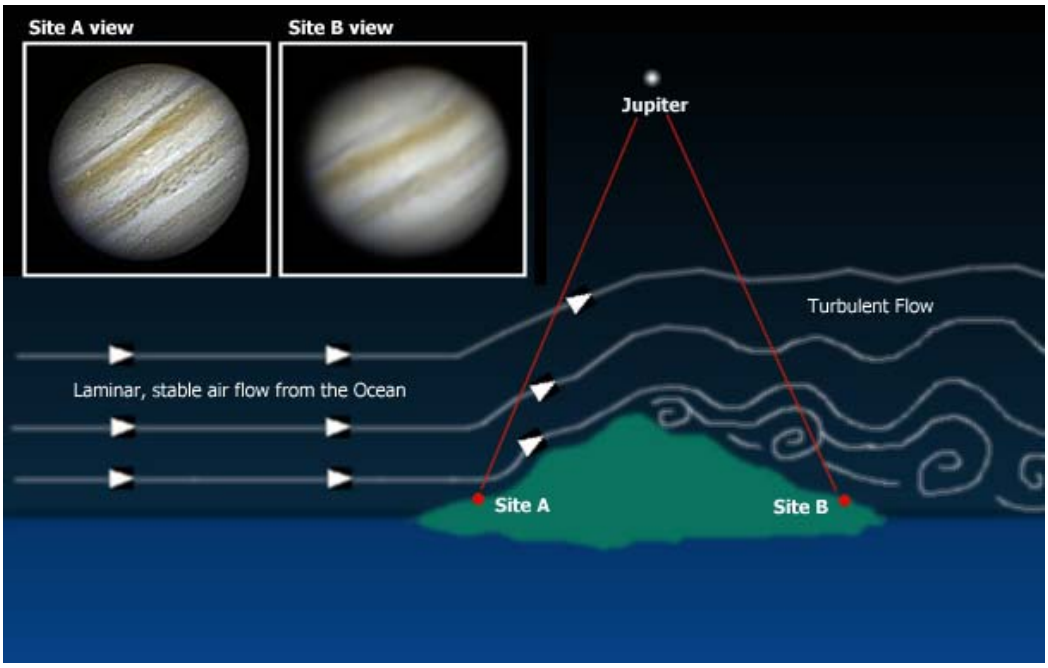
The turbulence at these altitudes is determined largely by the topography upwind of the observing site. Hence again, living downwind of a large city, or densely populated area, mountain range or other very varied topography will perturb the atmosphere. Downwind of a mountain peak will disrupt the airflow into turbulent eddies, resulting in scintillating images. This effect can prevail as far as 100km downwind of the peak. In this aspect, it is best to observe where the prevailing winds across your site have traveled over an unvarying terrain (large body of water or hills/fields for many miles upwind of the site.) This will help produce a laminar flow, and stable images.

3. High Altitude effects.

Effects at this altitude are caused by fast moving "rivers" of air know as Jet streams. Wind shears at around the 200-300mb altitude level can cause images to appear stable, but very fuzzy, and devoid of fine detail. There isn't anything the observer can do to prevent these effects, but forecasts are available, to help predict weather a Jet stream is present over your area. Areas of the Northern hemisphere most affected by the Polar jet stream are the Central US, Canada, North Africa, and Northern Japan. The Jet stream's position varies with the seasons, tending to move further South during the winter and spring months.

Where are the best locations for good seeing?

The world's finest locations for a stable atmosphere are mountain top observatories, located above frequently occurring temperature inversion layers, where the prevailing winds have crossed many miles of ocean. Sites such as these (La Palma, Tenerife, Hawaii, Paranal etc) frequently enjoy superb seeing much of the year, (with measured turbulence as low as 0.11" arc seconds occurring at times) due to a laminar flow off the ocean. Sea level locations, on shorelines, where the prevailing winds have crossed many miles of ocean (Florida, Caribbean Islands, Canary Islands etc) can be almost as good, and generally very consistent and stable conditions prevail there. Also a major factor is generally unvarying weather patterns, dominated by large anti-cyclones (High pressure systems.) Areas outside these large high-pressure systems have more variable weather, and are more prone to a more variable state of atmospheric stability. Other, less well know locations where excellent stability prevails are the Island of Madeira's highest point (Encumeada Alta, 1800m) where seeing is better than 1" arc second 50% of the time. At Mount Maidanak (Uzbekistan, 2600m) the median seeing value observed from 1996-2000 was just 0.69" arc seconds, presenting a site with properties almost as good as Paranal and La Palma.

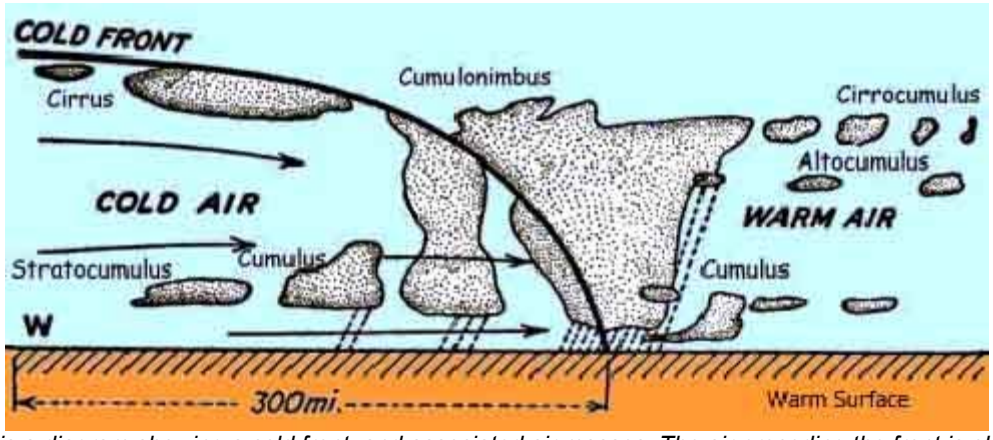


Above is a diagram showing how mountains break up stable airflow into turbulence. Note the difference in the probable views from site A (facing into the prevailing winds off the ocean) and site B (Located on the downwind side of the mountain peaks.)

Predicting your local seeing.

So is it possible to predict Atmospheric seeing with any accuracy?. The answer to this is yes, most of the time. For example poor seeing will almost always occur after a cold front has passed over, replacing the warmer air, with cooler air, which often gives rise to local convection, and turbulent skies. However, preceding a cold front the air is warmer, and more stable. This is especially true when a large High-pressure system has been present, and mist or fog forms. At these times, transparency can be reduced, but seeing can be excellent. It is also my experience that strong winds are often associated with poor seeing. Another thing to look out for is what type of clouds are present. Lots of cumulus forming in the afternoon due to convection will probably mean seeing will be poor for several hours after sunset. However if the winds are light, and high altitude cirrus shows a smooth linear pattern, this often indicates that the seeing will be good. It was also once thought that maritime locations were far from optimal for good seeing conditions, but as we have seen earlier in the article this is often far from the case.

An even easier way to quickly gauge if a given night will present fine telescopic views is to simply see how much the stars are twinkling. If they twinkle little, and slowly, it probably indicates seeing conditions are reasonably good. However, if they are twinkling madly its probably a sign the views will be poor. This basic method does work quite well, but isn't 100% accurate. Nights when fast, high altitude turbulence prevails will not show itself as noticeable twinkling, and one must simply look through their telescope to see what's happening.



Above is a diagram showing a cold front, and associated air masses. The air preceding the front is older, and warmer, and generally quite stable as the ground/air temperature difference is small. However, after the front passes, the warmer air is replaced by cooler air, resulting in significant local convection causing turbulence. Seeing wont improve until the ground/air temperatures again equalize – this usually takes several hours.

A scale of seeing

Many scales have been devised to rate how steady the atmosphere is on a given night. Below is one of the most popular in use, and one I personally use.

This scale of seeing is the Pickering Scale, devised by Harvard Observatory's William H. Pickering (1858-1938). Pickering used a 5-inch refractor to devise the scale. His comments about diffraction patterns will have to be modified for larger or smaller instruments. A good starting point:

p1. Star image is usually about twice the diameter of the third diffraction ring if the ring could be seen; star image 13" in diameter.
p2. Image occasionally twice the diameter of the third ring (13").
p3. Image about the same diameter as the third ring (6.7"), and brighter at the center.
p4. The central Airy diffraction disk often visible; arcs of diffraction rings sometimes seen on brighter stars.
p5. Airy disk always visible; arcs frequently seen on brighter stars.
p6. Airy disk always visible; short arcs constantly seen.
p7. Disk sometimes sharply defined; diffraction rings seen as long arcs or complete circles.
p8. Disk always sharply defined rings seen as long arcs or complete circles, but always in motion.
p9. The inner diffraction ring is stationary. Outer rings momentarily stationary.
p10. The complete diffraction pattern is stationary.

Note: On this scale 1-2 is very poor, 3-4 is poor, 5 is fair, 6-7 is good, 7-8 very good and 8-10 excellent.

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