Photographing the by Reed Hoffmann

Monday, August 21, 2017 Time 09:25:40 a.m. PDT Center Duration Sun Altitude

Animation by NASA



Reed Hoffmann















American Astronomical Society – How to Shoot a Solar Eclipse

https://eclipse.aas.org/imaging-video/images-videos

"Mr Eclipse", Fred Espenak

http://www.mreclipse.com/

<u>His solar exposure guide:</u> <u>http://www.mreclipse.com/SEphoto/image/SE-</u> <u>Exposure1w.GIF</u>

Interactive map:

http://www.eclipsewise.com/solar/SEgmap/2001-2100/ SE2017Aug21Tgmap.html



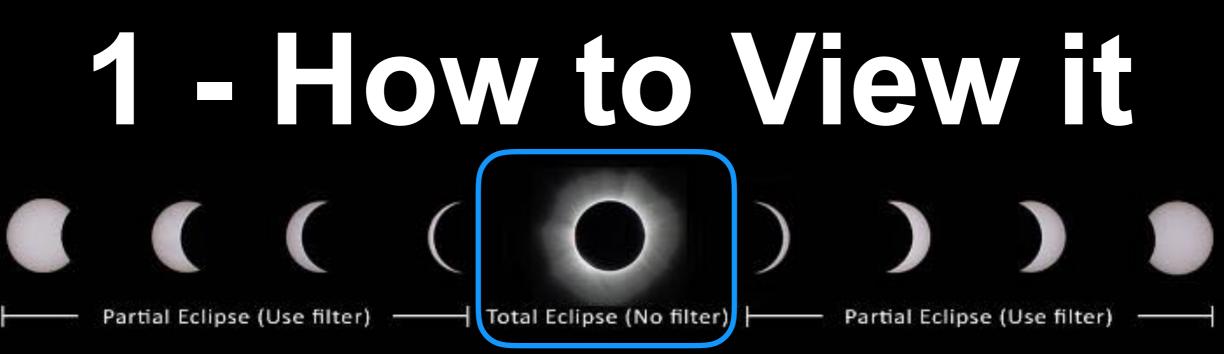
NASA interactive map that show what you'll see based on where you are, and exactly what time all of that will happen <u>https://eyes.jpl.nasa.gov/eyes-on-eclipse-web-app.html#</u>

Eclipse apps https://eclipse.aas.org/resources/apps-software

Photographer who does astrophotography: http://www.astropix.com/html/i_astrop/2017_eclipse/ Eclipse_2017.html

> NASA info on Eclipse Eyeglass safety https://eclipse2017.nasa.gov/safety

1 - How to view it safely 2 - Stages, Location, Timing 3 - Cameras, Settings 4 - Planning



A total solar eclipse is about as bright as the full Moon — and just as safe to look at. But the Sun at any other time is dangerously bright; view it only through special-purpose safe solar filters.





1 - How to View it

Eclipse Eyeglass Safety: Don't be Blindsided!

NASA has been alerted there are <u>unsafe paper solar</u> glasses being distributed. How to tell what is safe?

Conforms to and meets the Transmission Requirements of ISO 12312-2, Filters for Direct Observation of the Sun. Meets the Transmission Requirements of EN 1836:2005 + A1:2007 (E) for an E15 Filter for the Direct Observation of the Sun. Meets the Transmission Requirements of AS/NZS 1338.1:2012, Filters for Eye Protectors. EC Type Examination by: SAI Global Assurance Services Ltd. (Notified Body No. NB2056), MK5 8HJ UK

Mfg. by: American Paper Optics, LLC, 2995 Appling Rd., Ste. 106, Bartlett, TN 38133, USA, Tel: 901-381-1515, www.3dglassesonline.com



User Instructions: Inspect each time before use, Do not use and discard if damaged, torn, punctured or separated from the frame in any way. Do not use with other optical devices. This is not a toy. Children should only use with adult supervision. Limited to 3 minutes continuous use, intermittently for several hours. When using this product do not move around, drive a motor vehicle, or operate machinery. Do not use with diseased eye or after eye surgery. Warning: Never look at the sun without special eye protection. When viewing the eclipse, use eclipse glasses at all times when any part of the Sun is visible. Direct viewing of the Sun can cause permanent damage if the proper precautions are not taken. Adequate eye protection specifically designed for viewing the Sun is essential and should be worn so that no harmful rays from the Sun can reach the eye. Clean with a soft cloth or tissue only. Discard and do not use after 3 years.

Look for <u>BOTH</u>:

- U.S. Manufacturer Name (Recommend any of these: American Paper Optics, Rainbow Symphony, Thousand Oaks Optical, or TSE 17)
- 2. "ISO" Icon (Must have ISO reference 12312-2)

www.ReedHoffmann.com

CE

C1 11:42am

C2 C3 1:08:42pm1:11:15pm

www.MrEclipse.com

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Δ

2:36pm

Remember, the <u>ONLY</u> time it's safe to view the eclipse without eye protection is during Totality!!!

Corona

 Diamond ring effect

TOTAL SOLAR ECLIPSE

Chromosphere

Baily's beads

This is the corona

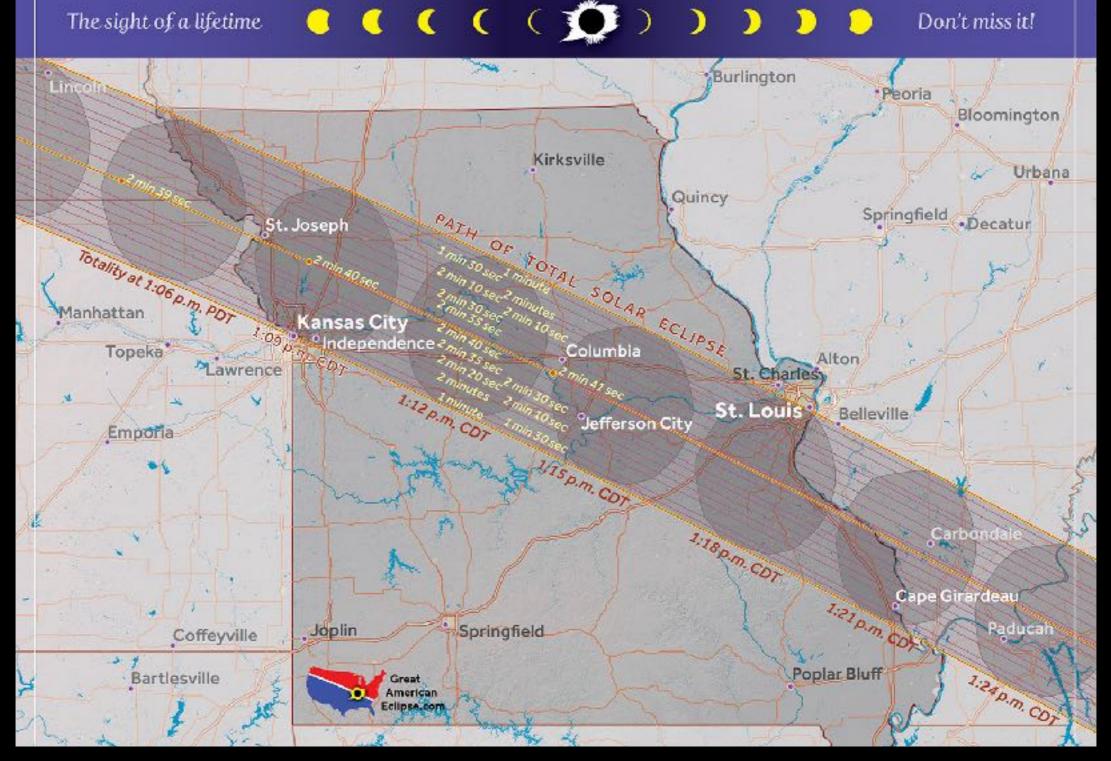
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W

TOTAL SOLAR ECLIPSE OVER MISSOURI ON AUGUST 21, 2017

The sight of a lifetime



Don't miss it!

(KC is minus-5 hrs UT)

39° 05' 34.44" N	<->	39.09290°
94° 34' 51.44" W	<->	-94.58096°
Umbral depth : 0.119	/0	Max

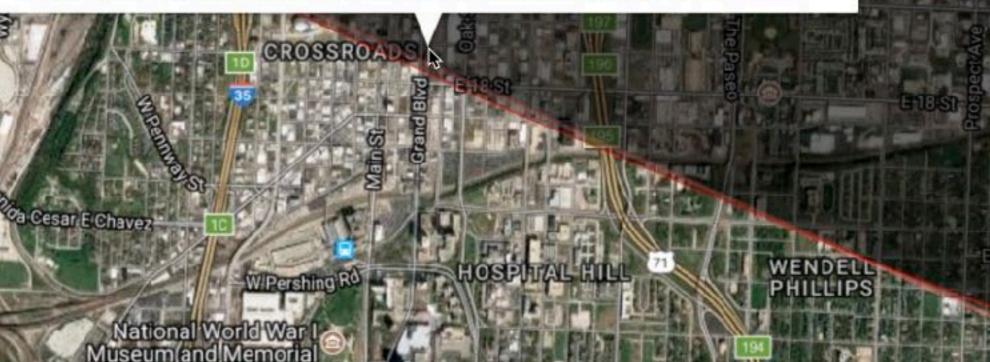
56.4km (35.0mi) Path width : 112.8km (70.1mi) Obscuration : 100.00%

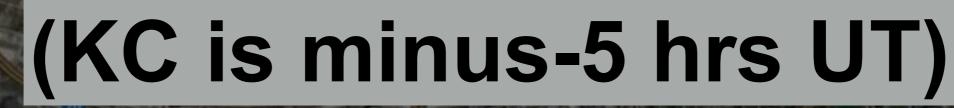


Om 07.5s (beaded total solar eclipse) Om 00.0s (lunar limb corrected)

> Magnitude at maximum : 1.00002 Moon/Sun size ratio : 1.03054 Umbral vel. : 0.668km/s (1494 mph)

Event (ΔT=68.8s)	Date	Time (UT)	Alt	Azi	P	V	LC
Start of partial eclipse (C1) :	2017/08/21	16:41:18.3	+54.9°	134.0°	292°	01.0	
Start of total eclipse (C2) :	2017/08/21	18:08:49.8	+62.6°	173.3°	200°	05.1	+41.65
Maximum eclipse (MAX) :	2017/08/21	18:08:53.6	+62.6°	173.4°	022°	11.1	
End of total eclipse (C3) :	2017/08/21	18:08:57.4	+62.6°	173.4°	205°	05.0	-41.65
End of partial eclipse (C4) :	2017/08/21	19:36:01.0	+58.1°	216.4°	113°	09.2	





39° 05' 34.44" N <-> 39.09290° 94° 34' 51.44" W <-> -94.58096°

8096° Or

0m 07.5s (beaded total solar eclipse) 0m 00.0s (lunar limb corrected)

Umbral depth : 0.11% 56.4km (35.0mi) Path width : 112.8km (70.1mi) Obscuration : 100.00%

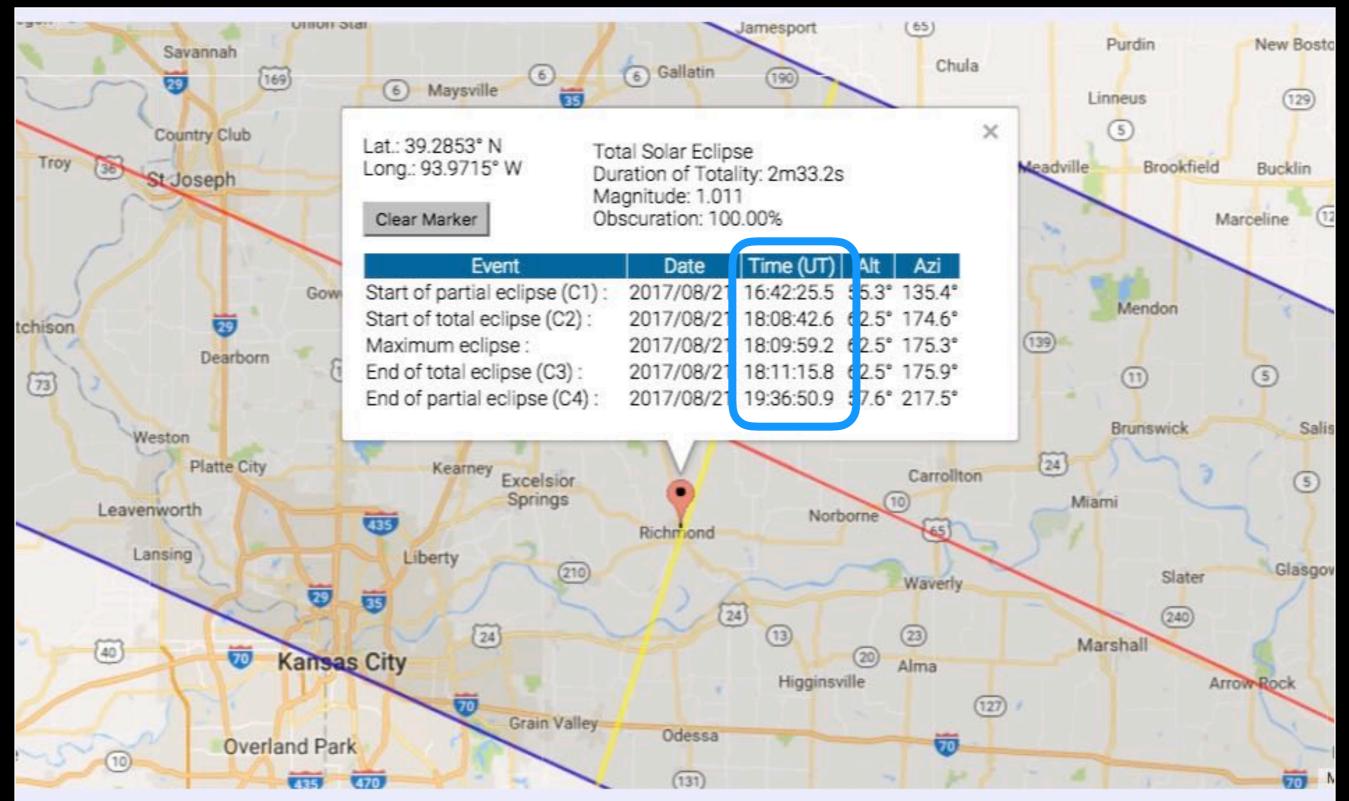


Magnitude at maximum : 1.00002 Moon/Sun size ratio : 1.03054 Umbral vel. : 0.668km/s (1494 mph)

Help

Event (ΔT=68.8s)	Date	Time (UT)	Alt	Azi	Р	V	LC
Start of partial eclipse (C1) :	2017/08/21	16:41:18.3	+54.9°	134.0°	292°	01.0	
Start of total eclipse (C2) :							+41.6s
Maximum eclipse (MAX) :	2017/08/21	18:08:53.6	+62.6°	173.4°	022°	11.1	
End of total eclipse (C3) :	2017/08/21	18:08:57.4	+€ 2.6°	173.4°	205°	05.0	-41.65
End of partial eclipse (C4) :	2017/08/21	19:30:01.0	+58.1°	216.4°	113°	09.2	





3 - Cameras, Settings Smartphones and Basic P&S Still need a filter. Set focus and exposure. Perhaps accessory telephoto lens? HDR mode? Turn off the flash. Use with telescope? Capture video/audio.

<u>Smartphone - no filter</u>



Smartphone - with filter



Smartphone - with filter

1 - Tap to set focus

2 - Slide to darken

Smartphone - with filter



Zoom smartphone?



Tape filter on



3 - Cameras, Settings Have a telescope?



3 - Cameras, Settings **Cameras with Controls** Still need a filter. Manual exposure. Manual focus. Daylight white balance. Telephoto lens. Tripod.

3 - Cameras, Settings ISO 100, 1/8000 second, f/32, 550mm 10-stop ND No filter

3 - Cameras, Settings ISO 400, 1/500 second, f/11, 800mm Solar filter (1/1,000,000 of light!)



3 - Cameras, Settings <u>Filters</u>

"Solar," or "White Light"

10-stop Neutral Density filter





3 - Cameras, Settings ND filters are <u>NOT VISUALLY SAFE!</u>



3 - Cameras, Settings Manual Exposure



3 - Cameras, Settings Manual ISO

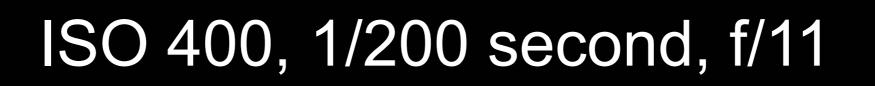


3 - Cameras, Settings <u>Manual Exposure</u> Luckily, you can do some tests ahead of time...

ISO 400, 1/500 second, f/11

(with solar filter)

3 - Cameras, Settings <u>Manual Exposure</u> And the moon is another way to test



(with no filter)

3 - Cameras, Settings Manual Exposure

ISO		<i>f</i> /Number									
25		1.4	2	2.8	4	5.6	8	11	16	22	
50		2	2.8	4	5.6	8	11	16	22	32	
100		2.8	4	5.6	8	11	16	22	32	44	
200		4	5.0	8	11	16	22	32	44	64	
400		5.6	8	11	16	22	32	44	64	88	
800		8	11	16	22	32	44	64	88	128	
1600		11	16	22	32	44	64	88	128	176	
Eclipse Feature	Q	Shutter Speed									
Partial ¹ - 4.0 ND	11	-	-	_	1/4000	1/2000	1/1000	1/500	1/250	1/125	
Partial ¹ - 5.0 ND	8	1/4000	1/2000	1/1000	1/500	1/250	1/125	1/60	1/30	1/15	
Baily's Beads ²	11	-	-	-	1/4000	1/2000	1/1000	1/500	1/250	1/125	
Chromosphere	10	-		1/4000	1/2000	1/1000	1/500	1/250	1/125	1/60	
Prominences	9		1/4000	1/2000	1/1000	1/500	1/250	1/125	1/60	1/30	
Corona - 0.1 Rs	7	1/2000	1/1000	1/500	1/250	1/125	1/60	1/30	1/15	1/8	
Corona - 0.2 Rs3	5	1/500	1/250	1/125	1/60	1/30	1/15	1/8	1/4	1/2	
Corona - 0.5 Rs	3	1/125	1/60	1/30	1/15	1/8	1/4	1/2	1 sec	2 sec	
Corona - 1.0 Rs	1	1/30	1/15	1/8	1/4	1/2	1 sec	2 sec	4 sec	8 sec	
Corona - 2.0 Rs	0	1/15	1/8	1/4	1/2	1 sec	2 sec	4 sec	8 sec	15 sec	
Corona - 4.0 Rs	-1	1/8	1/4	1/2	1 sec	2 sec	4 sec	8 sec	15 sec	30 sec	
Corona - 8.0 Rs	-3	1/2	1 sec	2 sec	4 sec	8 sec	15 sec	30 sec	1 min	2 min	

Solar Eclipse Exposure Guide from Fred Espenak

3 - Cameras, Settings Filters off for these photos!

ISO			f/Number									
25		1.4	2	2.8	4	5.6	8	11	16	22		
50		2	2.8	4	5.6	8	11	16	22	32		
100		2.8	4	5.6	8	11	16	22	32	44		
200		4	5.6	8	11	16	22	32	44	64		
400		5.6	8	11	16	22	32	44	64	88		
800		8	11	16	22	32	44	64	88	128		
1600		11	16	22	32	44	64	88	128	176		
Eclipse Feature	Q		Shutter Speed									
Partial ¹ - 4.0 ND	11	-	-	-	1/4000	1/2000	1/1000	1/500	1/250	1/125		
Partial ¹ - 5.0 ND	8	1/4000	1/2000	1/1000	1/500	1/250	1/125	1/60	1/30	1/15		
Baily's Beade ²	11				1/4000	1/2000	1/1000	1/500	1/250	1/125		

Tarnar 410 MD			100 million -		111000	114000	111000	11200	*******	
Partial ¹ - 5.0 ND	8	1/4000	1/2000	1/1000	1/500	1/250	1/125	1/60	1/30	1/15
Baily's Beads ²	11	-	-	-	1/4000	1/2000	1/1000	1/500	1/250	1/125
Chromosphere	10	-		1/4000	1/2000	1/1000	1/500	1/250	1/125	1/60
Prominences	9		1/4000	1/2000	1/1000	1/500	1/250	1/125	1/60	1/30
Corona - 0.1 Rs	7	1/2000	1/1000	1/500	1/250	1/125	1/60	1/30	1/15	1/8
Corona - 0.2 Rs3	5	1/500	1/250	1/125	1/60	1/30	1/15	1/8	1/4	1/2
Corona - 0.5 Rs	3	1/125	1/60	1/30	1/15	1/8	1/4	1/2	1 sec	2 sec
Corona - 1.0 Rs	1	1/30	1/15	1/8	1/4	1/2	1 sec	2 sec	4 sec	8 sec
Corona - 2.0 Rs	0	1/15	1/8	1/4	1/2	1 sec	2 sec	4 sec	8 sec	15 sec
Corona - 4.0 Rs	-1	1/8	1/4	1/2	1 sec	2 sec	4 sec	8 sec	15 sec	30 sec
Corona - 8.0 Rs	-3	1/2	1 sec	2 sec	4 sec	8 sec	15 sec	30 sec	1 min	2 min

Solar Eclipse Exposure Guide from Fred Espernak

3 - Cameras, Settings Can try AF first, then turn it off



3 - Cameras, Settings Manual Focus - tape it down



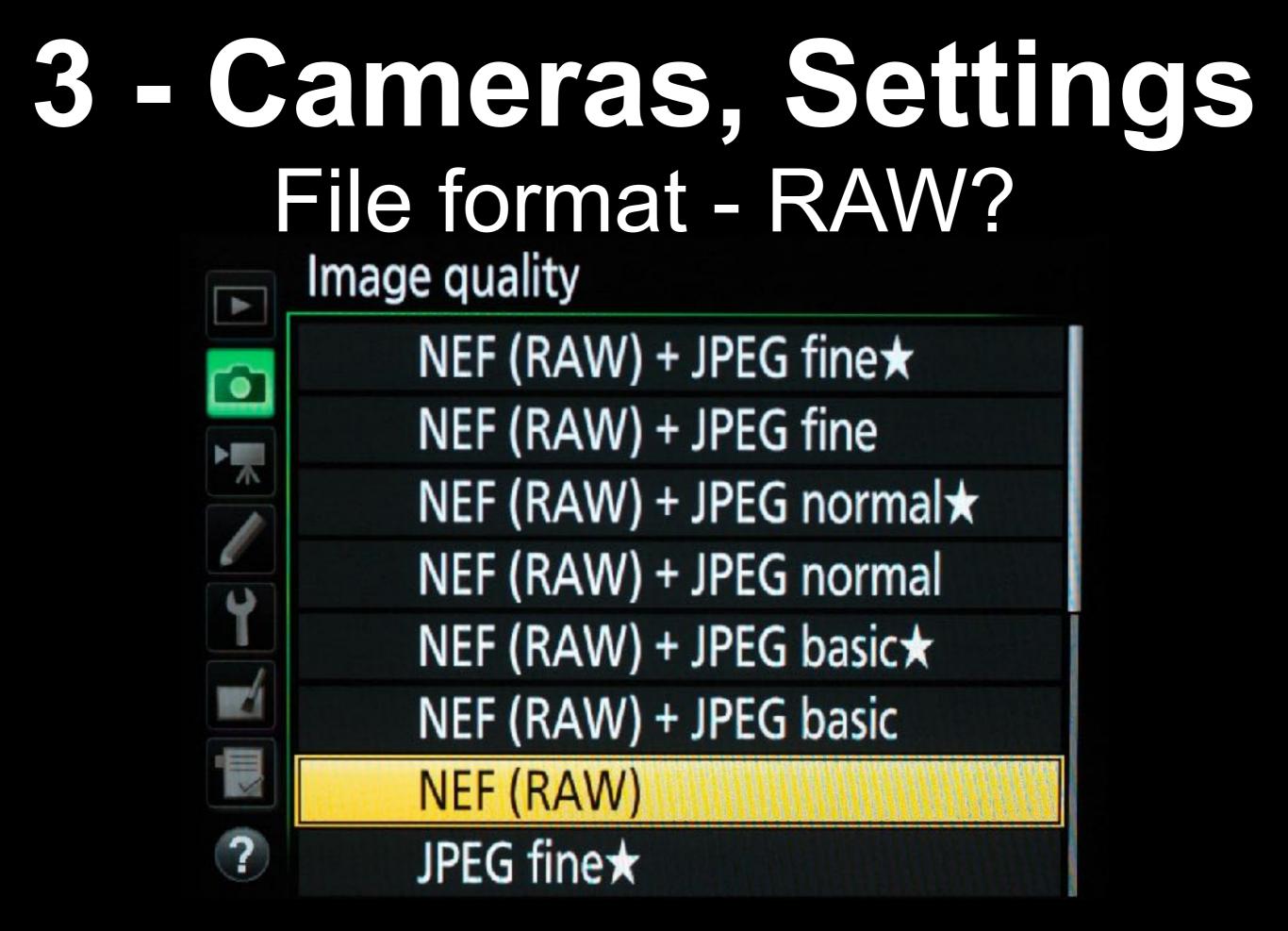
3 - Cameras, Settings Manual Focus - infinity isn't!



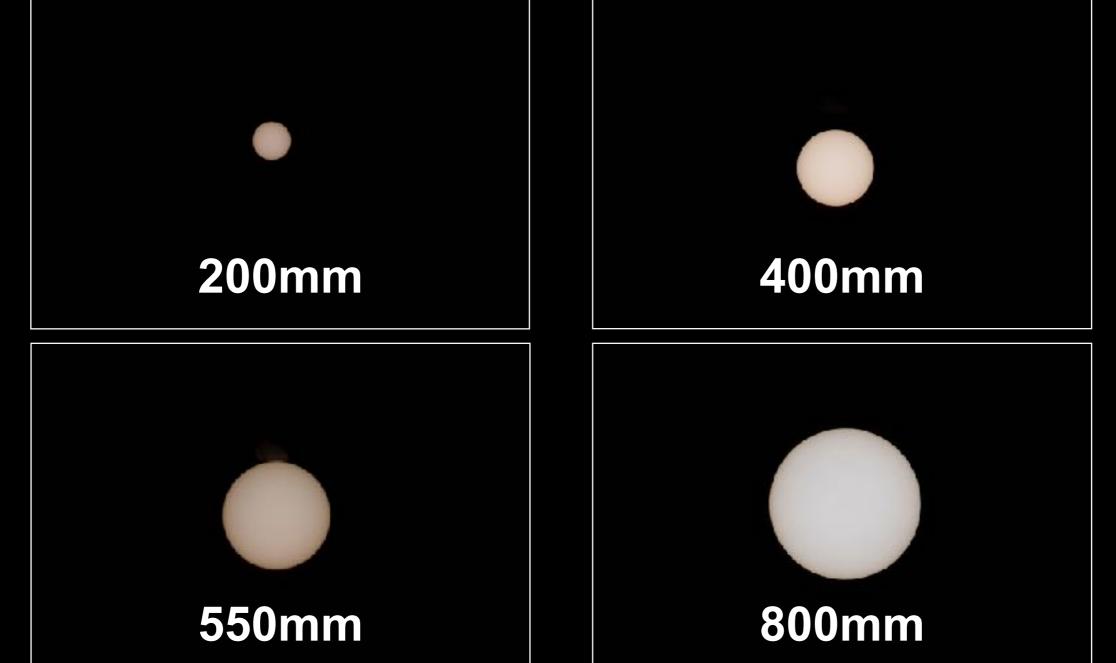
3 - Cameras, Settings Daylight White Balance



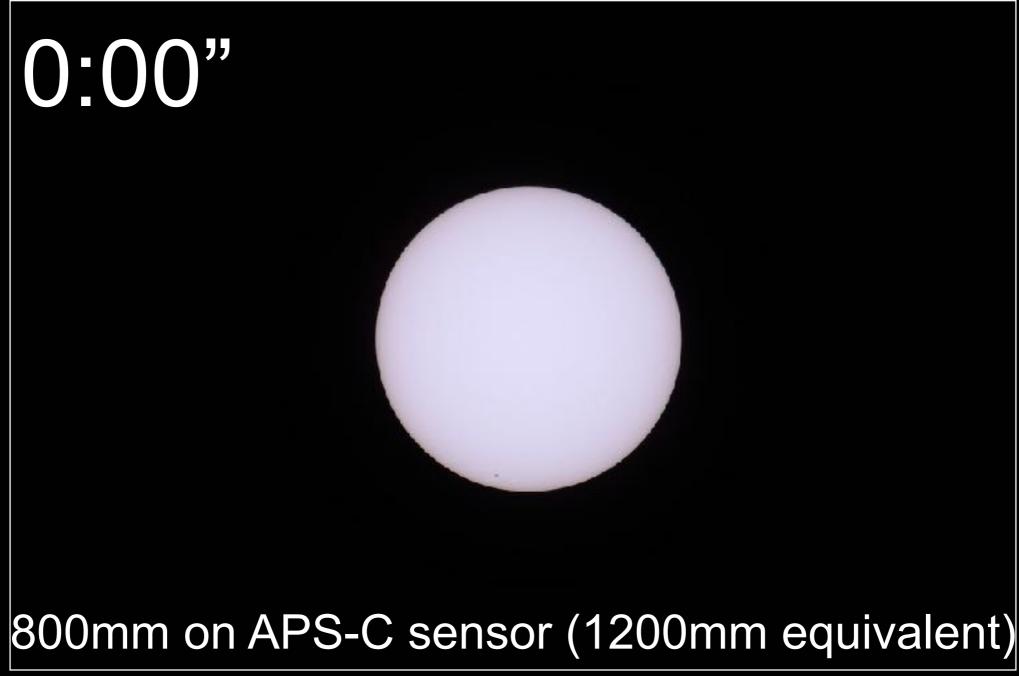




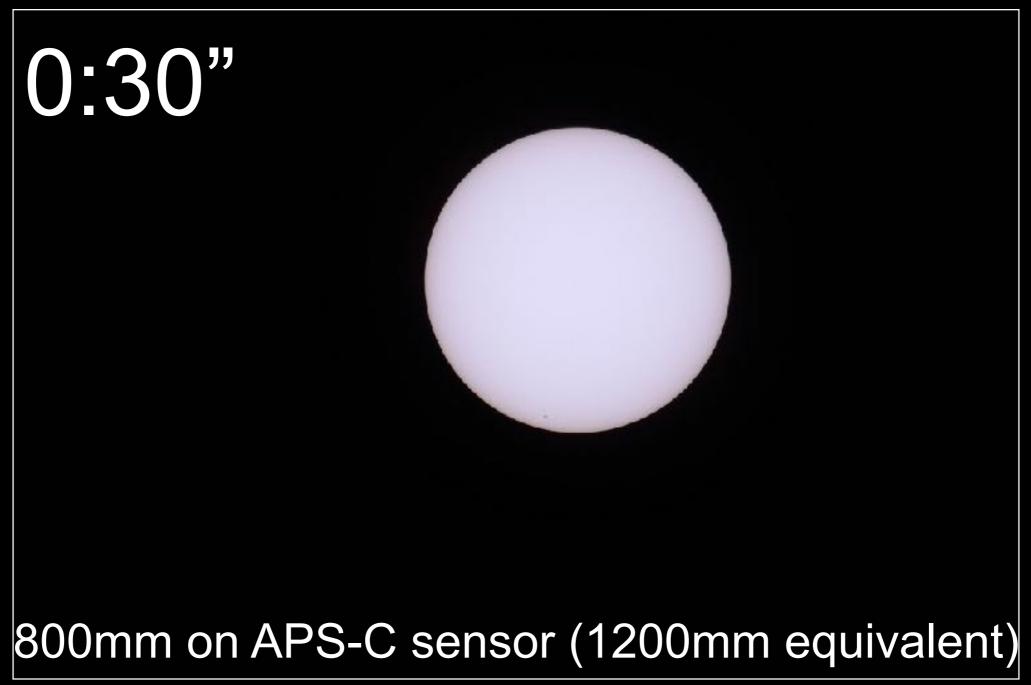
3 - Cameras, Settings Lens choice (APS-C sensor)



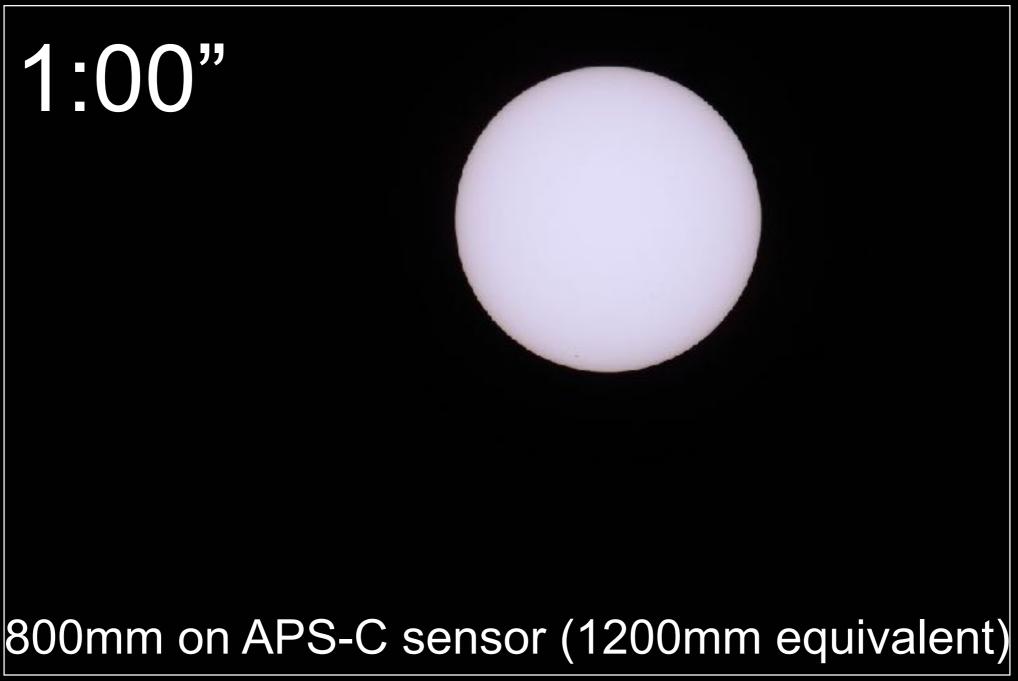
The earth rotates, so the sun will move across your frame, about one diameter's width in two minutes



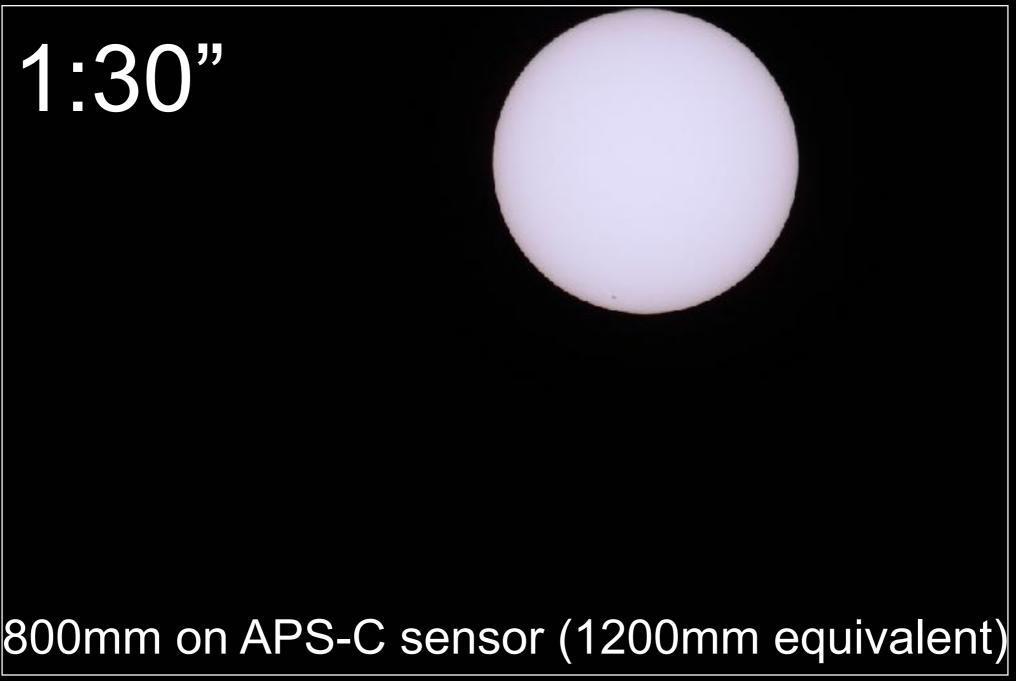
The earth rotates, so the sun will move across your frame, about one diameter's width in two minutes



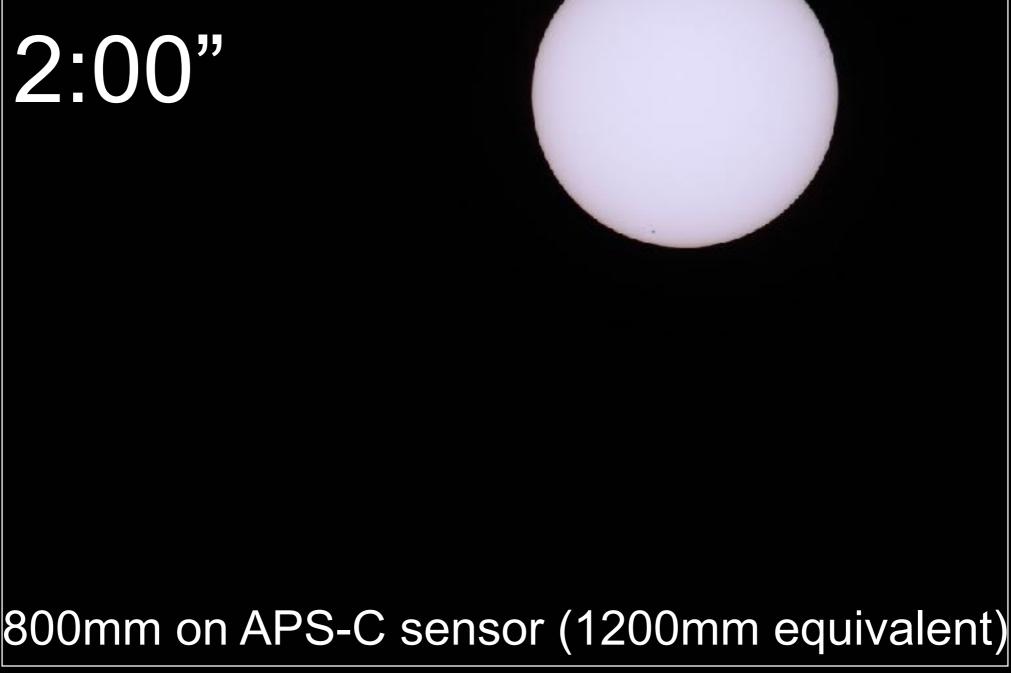
The earth rotates, so the sun will move across your frame, about one diameter's width in two minutes



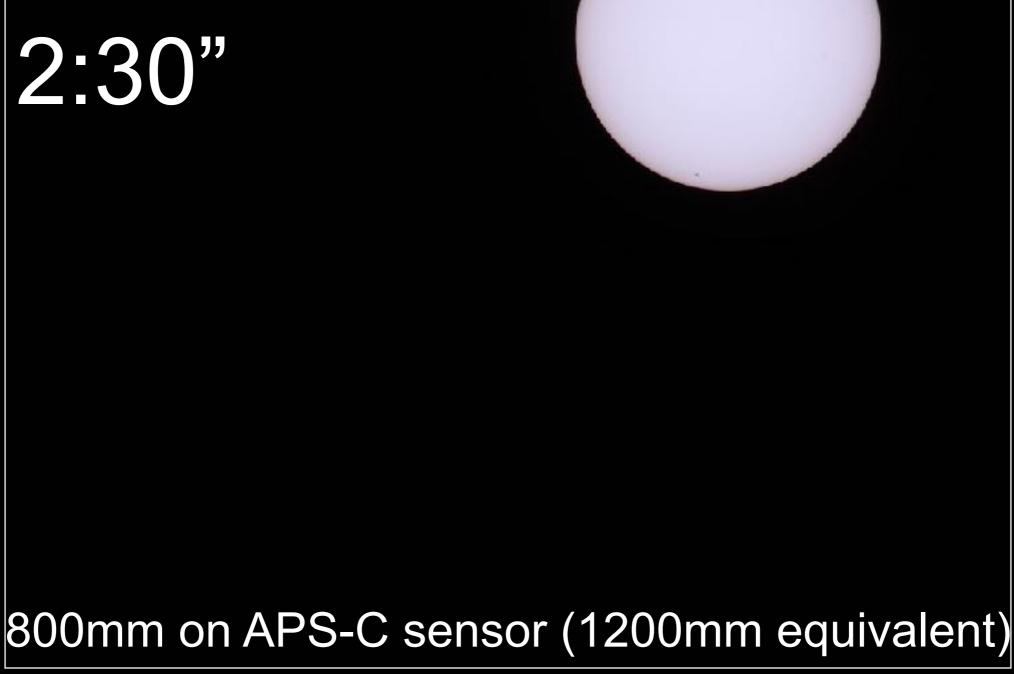
The earth rotates, so the sun will move across your frame, about one diameter's width in two minutes



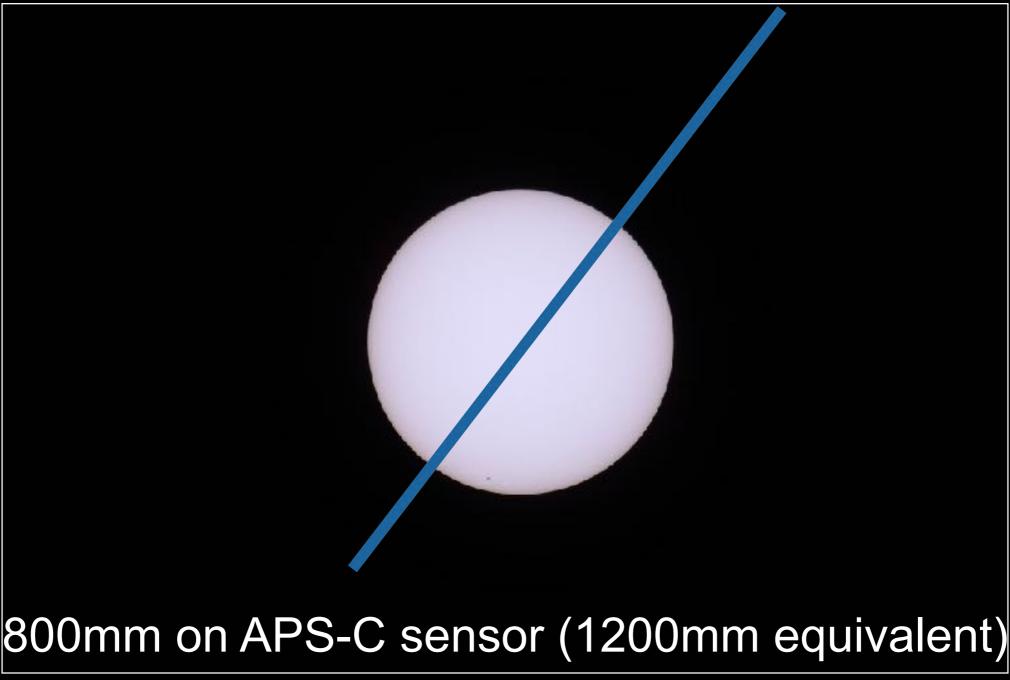
The earth rotates, so the sun will move across your frame, about one diameter's width in two minutes



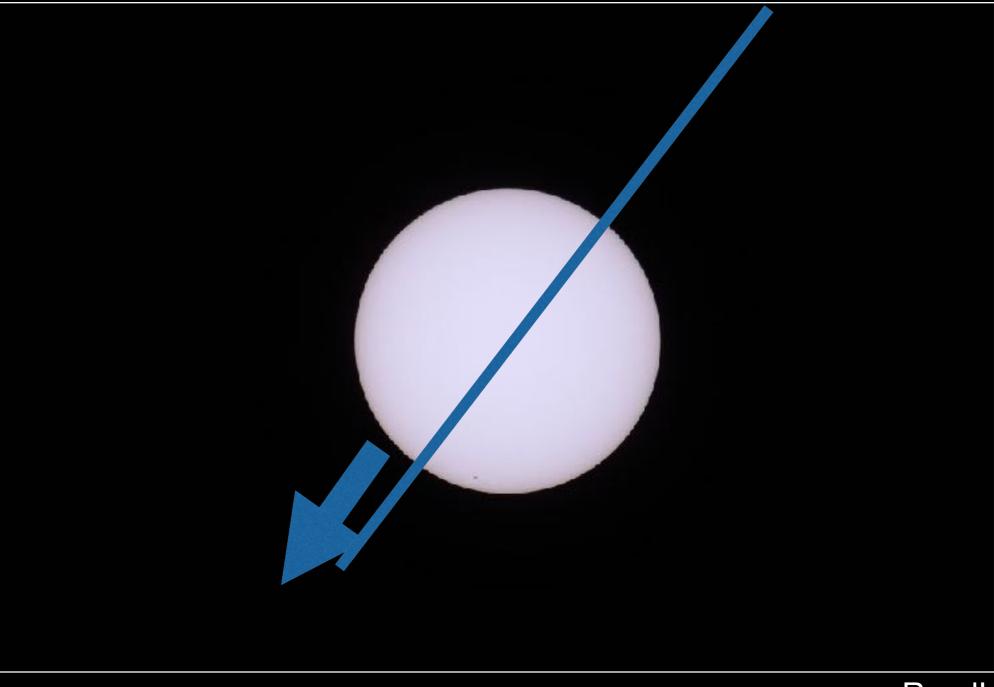
The earth rotates, so the sun will move across your frame, about one diameter's width in two minutes



Also, the sun won't move across the sky in a straight, horizontal line. Know that and plan for it.



Also, the sun won't move across the sky in a straight, horizontal line. Know that and plan for it.



And that movement can also mean blur at slow shutter speeds

ISO				f	Numbe	er			
25	1.4	2	2.8	4	5.6	8	11	16	22
50	2	2.8	4	5.6	8	11	16	22	32
100	2.8	4	5.6	8	11	16	22	32	44
200	4	5.6	8	11	16	22	32	44	64
400	5.6	8	11	16	22	32	44	64	88
800	8	11	16	22	32	44	64	88	128
1600	11	16	22	32	44	64	88	128	176

Eclipse Feature Q

Shutter Speed

Partial ¹ - 4.0 ND	11	-	-	-	1/4000	1/2000	1/1000	1/500	1/250	1/125
Partial ¹ - 5.0 ND	8	1/4000	1/2000	1/1000	1/500	1/250	1/125	1/60	1/30	1/15
Baily's Beads ²	11	-	-	-	1/4000	1/2000	1/1000	1/500	1/250	1/125
Chromosphere	10	-		1/4000	1/2000	1/1000	1/500	1/250	1/125	1/60
Prominences	9		1/4000	1/2000	1/1000	1/500	1/250	1/125	1/60	1/30
Corona - 0.1 Rs	7	1/2000	1/1000	1/500	1/250	1/125	1/60	1/30	1/15	1/8
Corona - 0.2 Rs3	5	1/500	1/250	1/125	1/60	1/30	1/15	1/8	1/4	1/2
Corona - 0.5 Rs	3	1/125	1/60	1/30	1/15	1/8	1/4	1/2	1 sec	2 sec
Corona - 1.0 Rs	1	1/30	1/15	1/8	1/4	1/2	1 sec	2 sec	4 sec	8 sec
Corona - 2.0 Rs	0	1/15	1/8	1/4	1/2	1 sec	2 sec	4 sec	8 sec	15 sec
Corona - 4.0 Rs	-1	1/8	1/4	1/2	1 sec	2 sec	4 sec	8 sec	15 sec	30 sec
Corona - 8.0 Rs	-3	1/2	1 sec	2 sec	4 sec	8 sec	15 sec	30 sec	1 min	2 min

Solar Eclipse Exposure Guide from Fred Espernak

Plus, the longer the telephoto lens, the higher the <u>minimum</u> shutter speed needed

ISO	f/Number									
E				ns ns						5
Corona - 0.1 Rs	7	1/2000	1/1000	1/500	1/250	1/125	1/60	1/30	1/15	1/8
Corona - 0.2 Rs ³	5	1/500	1/250	1/125	1/60	1/30	1/15	1/8	1/4	1/2
Corona - 0.5 Rs	3	1/125	1/60	1/30	1/15	1/8	1/4	1/2	1 sec	2 sec
Corona - 1.0 Rs	1	1/30	1/15	1/8	1/4	1/2	1 sec	2 sec	4 sec	8 sec
Corona - 2.0 Rs	0	1/15	1/8	1/4	1/2	1 sec	2 sec	4 sec	8 sec	15 sec
Corona - 4.0 Rs	-1	1/8	1/4	1/2	1 sec	2 sec	4 sec	8 sec	15 sec	30 sec
Corona - 8.0 Rs	-3	1/2	1 sec	2 sec	4 sec	8 sec	15 sec	30 sec	1 min	2 min

Solar Eclipse Exposure Guide from Fred Espernak

3 - Cameras, Settings Tripod



Help avoid camera movement blur? Use a release, intervalometer (in some cameras), smartphone app or even the self-timer.



3 - Cameras, Settings HDR (composite of corona)

(22 images were used to make this)

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3 - Cameras, Settings HDR (composite)

Changing only the shutter speed, while keeping the ISO, aperture and framing the same (must be on a tripod, no movement).

ISO 200, f/8								
1/4000	1/250	1/15						
1/2000	1/125	1/8						
1/1000	1/60	1/4						
1/500	1/30	1/2						

3 - Cameras, Settings Wideangle Lens



2001 Eclipse Over Zambia This wide angle eclipse photo used a 28mm lens and tripod. during the total solar eclipse of 2001 Jun 21.

You can do this in Auto exposure

3 - Cameras, Settings Wideangle Lens



Ben Cooper, www.LaunchPhotogr,aphy.com

3 - Cameras, Settings Don't forget about video!



W

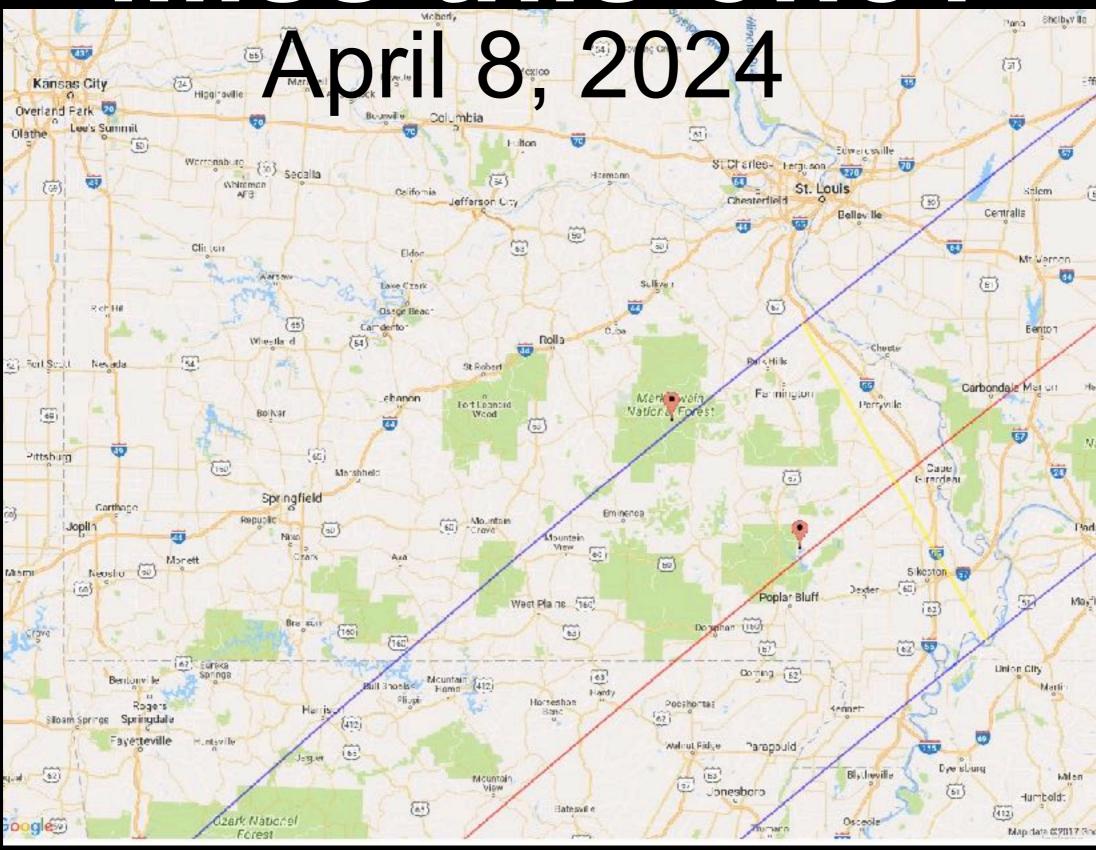
4 - Planning

 1 - Make a list of what you'll need. (extra batteries, memory cards, food, water, etc.)
2 - Make a schedule for what you'll do. (especially for the brief period of totality)
3 - Practice, practice, practice!
(remember, that filter will have to come off and go back on, and you'll need to change your exposure settings)

Most important?

Pray for sunny weather!

Miss this one?



(much of this material can be found in a blog post on my website)

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