2011 DECEMBER

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TOTALITY!

THE JOURNAL FOR ECLIPSE CHASERS

eclipse travel adventures

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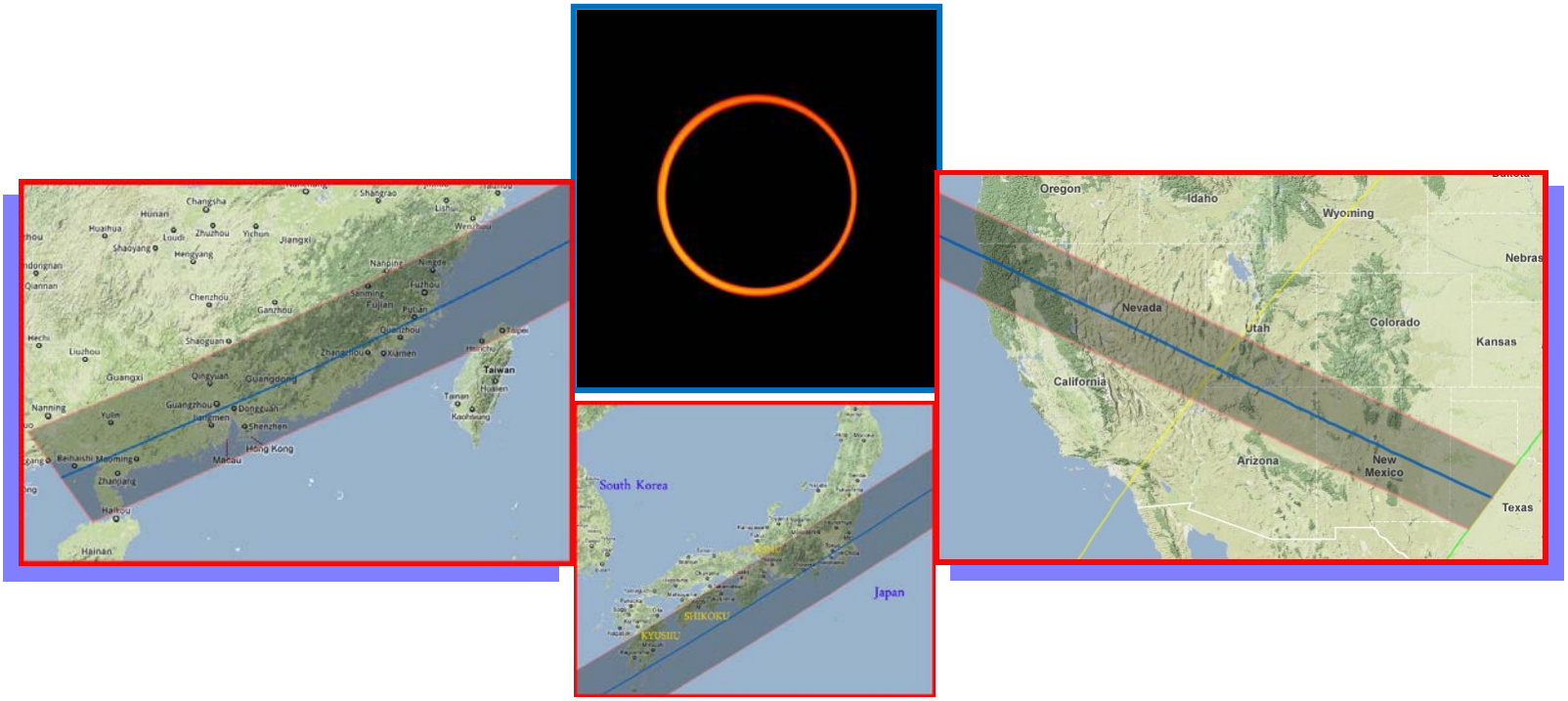
http://xjubier.free.fr/en/site_pages/Solar_Eclipses.html

and

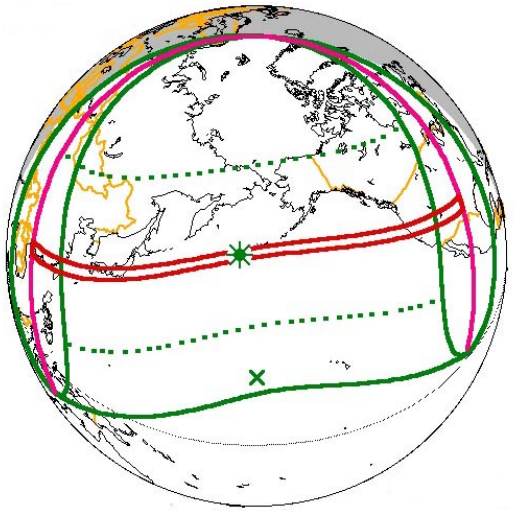
http://www.eclipse-chasers.com/totality.html

Preparing For the 2012 Annular Solar Eclipse



Also In this Issue;

One saros later, an annular solar eclipse returns to the uSA



OK, I know I have been remiss about including annular solar eclipses in TOTALITY!, but I have not found enough time to devote to them. More people have started to travel to view annular eclipses of late, taking advantage of the fact that because it is not the huge draw that total eclipses are, crowds are pretty much non-existent for annular eclipses. It is also due to eclipse chasers who are retiring from their jobs or any eclipse chaser who has the desire to travel to new places and experience another location in the world. A few chasers are picking viewing sites nearer the edge of the path of annularity in order to view and record Baily's Beads, and in some cases, also to see solar prominences and even on rarer occasions, the chromosphere. In recent years, serious eclipse chasers have done great work making chromospheric observations during annular eclipses, even long-duration eclipses like that on 2010 January 15. On the shortest duration of annular eclipses, there was the remarkable eclipse of 1984 May 20, where a few of us witnessed and imaged the entire chromosphere in the "11-second" annular eclipse in the USA, where a remarkable 160,000-kilometer-high prominence and over 100 Baily's beads, were observed. You can see my personal images at http://www.pbase.com/photographerlarry/annular_solar_eclipse_1984.

I have put out the call in the past for anyone who can, to submit articles on any upcoming annular eclipses, but I have received no takers, so I put it out there again: if anyone is interested, please contact me. The annular eclipse of 2012, however, visits the USA, and I plan to take a trip to observe and photograph this event myself because of its location and my familiarity with many of the parks it will pass over (even though I live 1200 miles from the region for this event). Because of the multitude of unique locations that lie in the path of the eclipse in the west and southwest, there are many great photogenic opportunities in addition to the eclipse. Even if it is cloudy or you just want to observe the event, these locations can only enhance your eclipse experience. This is a great way to get out and see some of the parks of the U.S.

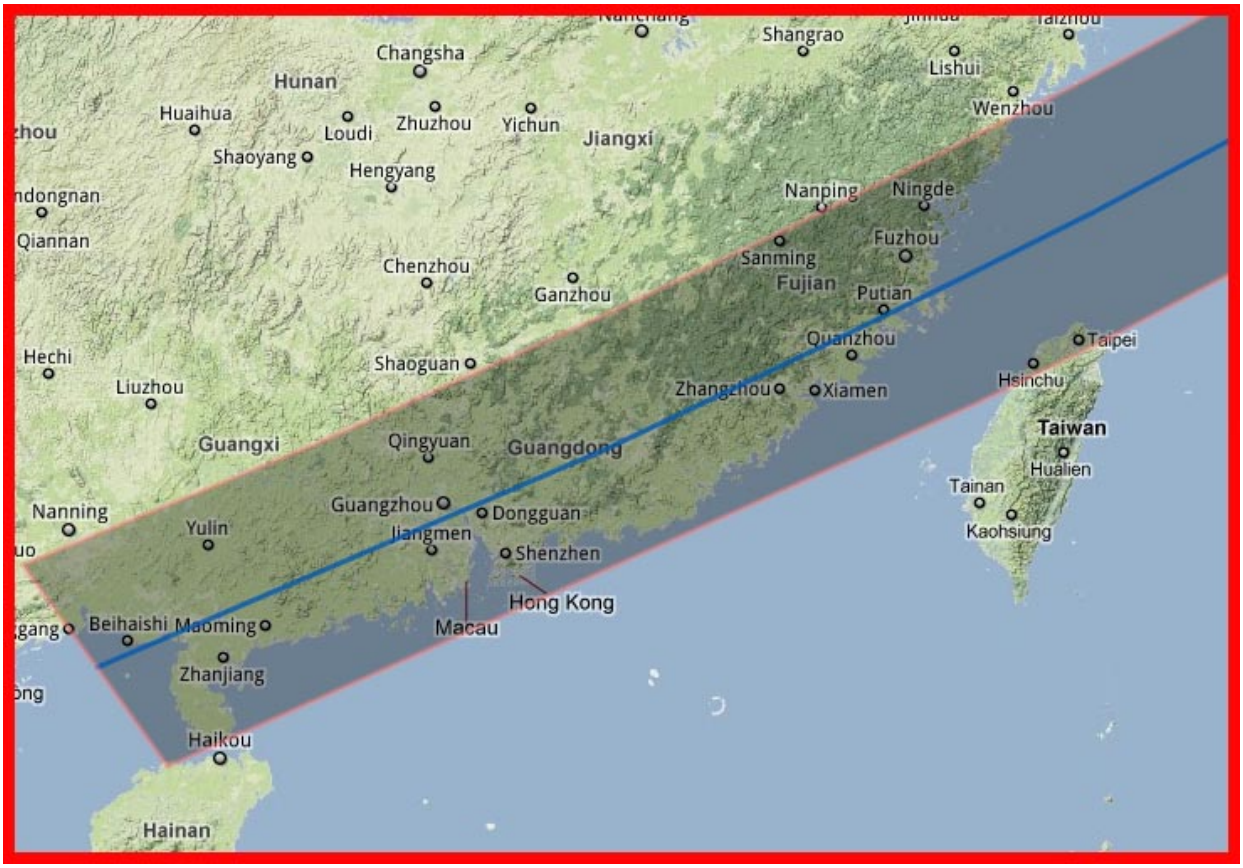
It has been 6585.32 days (nearly 18 years, 10 1/3 days) since the last annular eclipse in the USA, a period that is known as a saros, and since that day (1994 May 10) the world will be rotated almost 120° further west than that eclipse, so instead of squarely falling on the USA, it will be centered on the Pacific Ocean, where few, if any, will be able to view it. Mostly falling over water, it does however touch land near the start and end of the path, where the annular eclipse will be visible to tens of millions of individuals. Of course, a huge area of the North Pacific basin will get to view a partial eclipse, including Hawaii, nearly all of China and southeast Asia, much of eastern Russia, Alaska, and all of Canada and the USA except the easternmost coasts of these two countries.

China, Japan and the United States are the only countries to be able from which people can view the annular portion of the eclipse, and many millions will have the opportunity in China and Japan to see the annular phase. Far fewer in the U.S will be well placed for the event as the eclipse passes over mostly desolate or low population areas, but many will come to the U.S. to view the eclipse because of the large number of very scenic national parks that fall within its path.

The next time saros 128 returns, the eclipse will be centered on Russia and will begin in eastern Algeria, passing over southern Tunisia, clipping the corner of northwest Libya, and fording the Mediterranean Sea to Greece with the centerline only 70 kilometers from Athens. It then passes only 11 kilometers from Istanbul in northwest Turkey, across the Black Sea and encounters the Crimea before entering Russia and skirting the northwest borders of Kazakhstan. The apparent noon of the eclipse will be about 250 kilometers northwest of Novosibirsk, Russia. The path crosses northeastern China, back across Russia and then onto the Sea of Japan. Remarkably not far from the termination of the path of annularity, the island of Hokkaido will be dead centered in the path, and all the rest of Japan will have to suffice with only a partial eclipse, the inverse to that for the present eclipse, which we highlight here.

The southeast coast of China is first to experience the eclipse as the Sun rises near the northeastern shores of Halong Bay. The centerline first encounters Shatianzhen (4m 17s) in southern China with the Sun barely above the horizon.

A huge population density lies along the Xhujiang River Estuary on the southern coast of China. To the west is Macau (3m 34s) where mid-eclipse occurs only 4.5° above the eastern horizon. To the east can be found Guangzhou (4m 16s), Dongguan (4m 21s), Shenzhen (3m 57s), and Hong Kong (3m 20s); all combined, they comprise a total population of nearly 40 million, and many more in the additional surrounding cities.

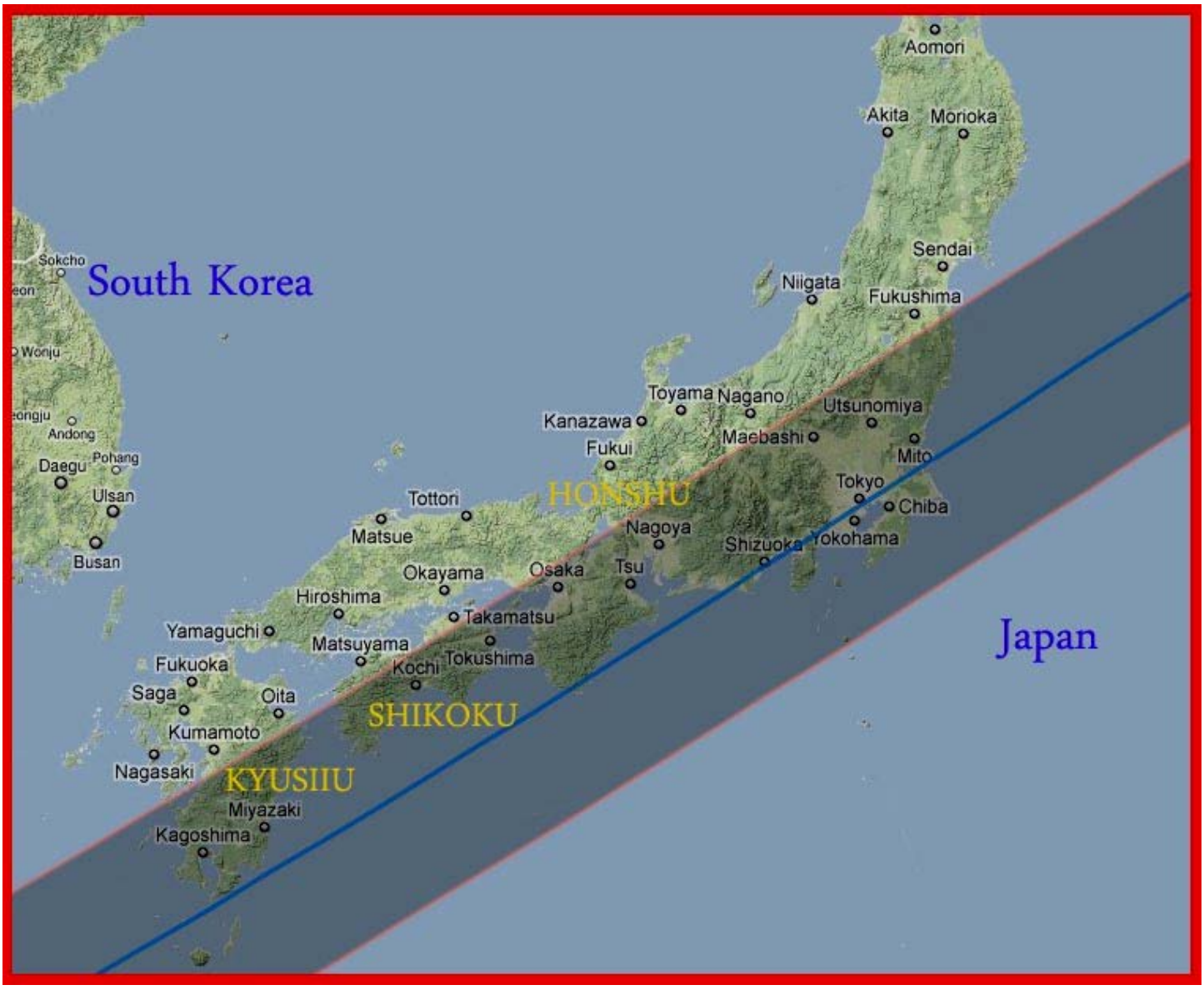


Southeast China and the path of the Annular Solar Eclipse of 2012 May 21
Map courtesy Google Maps and Xavier Jubier

Along the southeast coast Zhangehou (4m 24s), Xiamen (4m 15s), Quanzhou (4m 25s), Putian (4m 25s), Fuzhou (4m 10s) and Ningde (3m 08s) comprise more the 20 million more. Taipei City, Taiwan (1m 47s), is found very near the southern limit of annularity, and New Taipei, which is southeast of Taipei City, actually falls outside the limit. The path takes it across the East China Sea until it encounters, Japan.

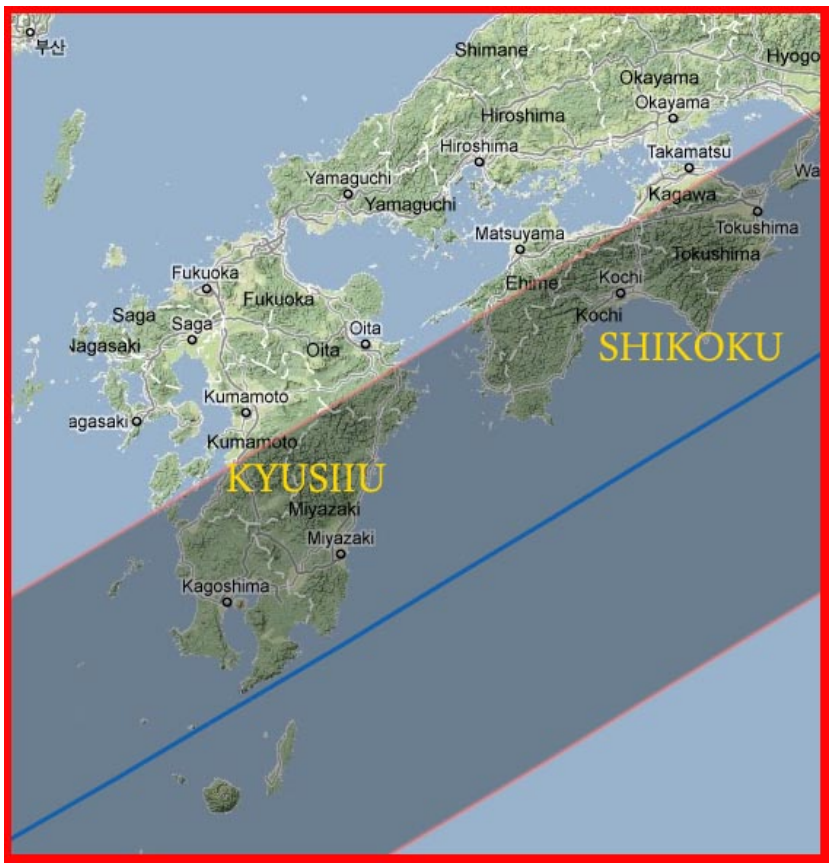
JAPAN

The Japanese island of Okinawa and its neighboring islets are found south of the path of annularity however the Tokara-Retto islands <u>are</u> located in the path of annularity. The longest eclipse of the 20th century passed over these same islands on July 11, 2009. However, rain did not allow anyone to view the event from these locations; perhaps weather will be a bit better in May for this event.



Japan and the path of the Annular Solar Eclipse of 2012 May 21
Map courtesy Google Maps and Xavier Jubier

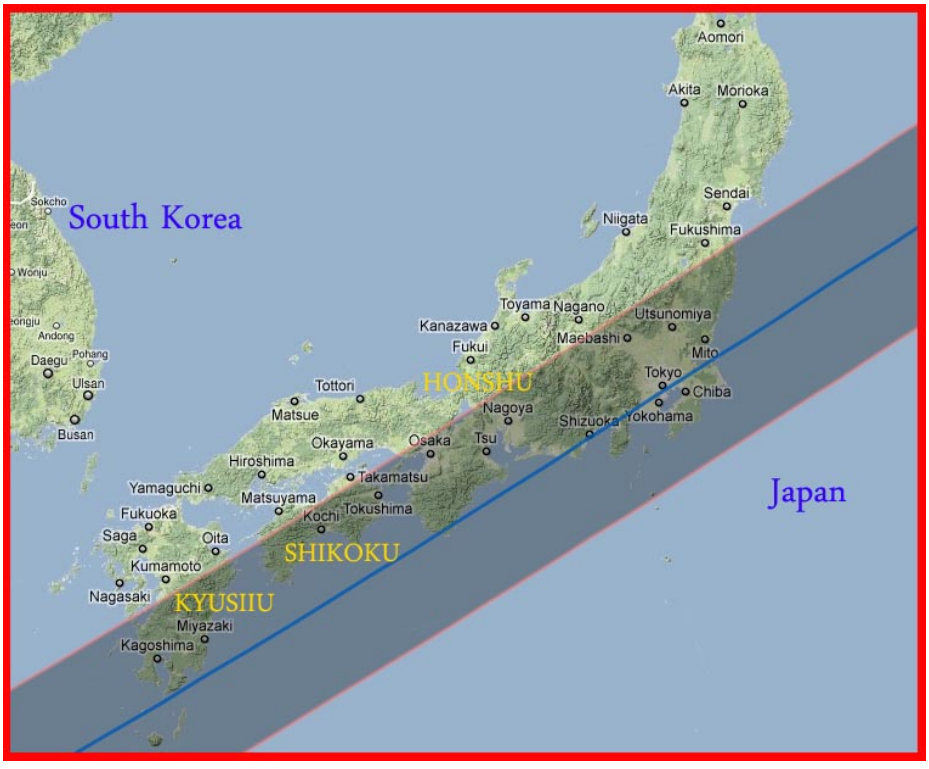
Unless otherwise noted, all maps in this issue were generated and are used courtesy of Xavier Jubier's Five Millennium Cannon of Solar Eclipses and Google Maps;
http://xjubier.free.fr/en/site_pages/solar_eclipses/5MCSE/xSE_Five_Millennium_Canon.html



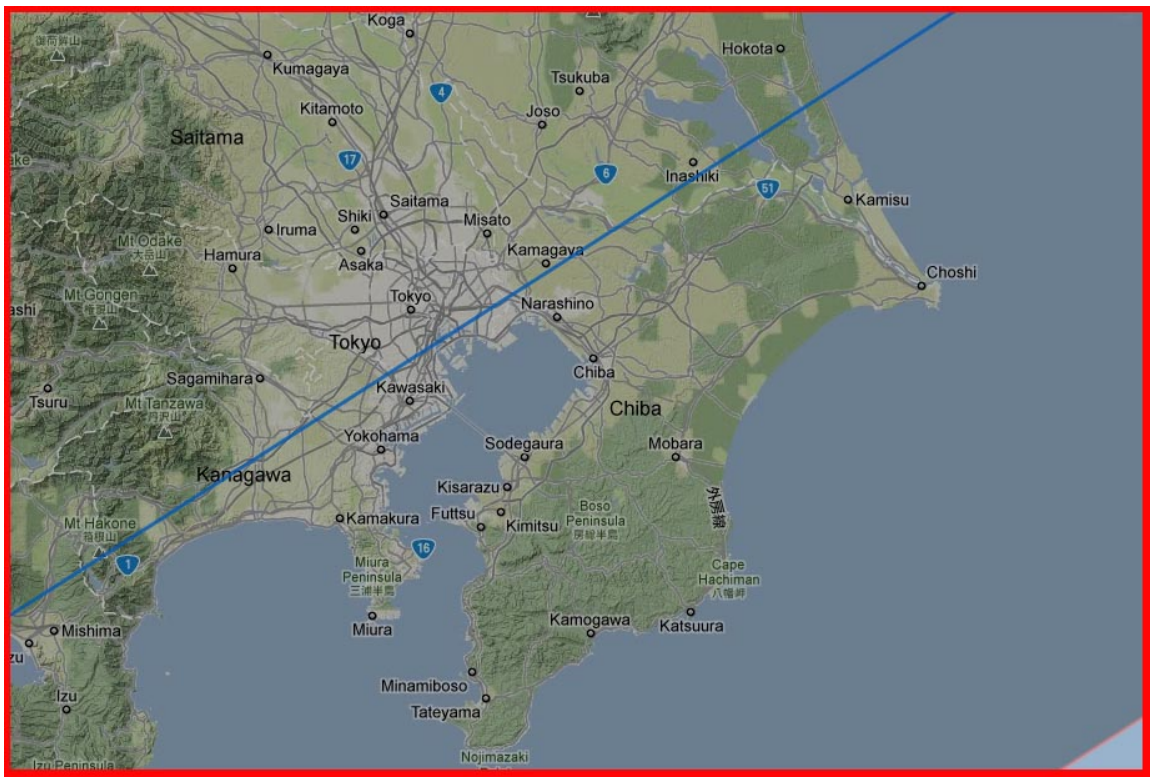
The northern half of the eclipse path passes over three of the four main islands of Japan, missing only Hokkaido far to the north. All of Japan, will however, get to have a partial solar eclipse. Even the northernmost tip of Hokkaido will get to see nearly 73% of the solar disk covered by the Moon, and at maximum eclipse on the centerline on Honshu slightly more than 88% obscuration will occur at mid-eclipse. This value is slightly greater than anywhere else on land, and at most is only fractionally more than 89% at maximum eclipse in the North Pacific Ocean.

The centerline marginally misses Kyusiiu Island by only 5 kilometers, and the entire southern part of the island will see annularity. Kagoshima (4m 08s) and Miyazaki (4m 22s) are two of the more notable cities that will get to observe annularity. Those taking a ferry out to Mishima on Kagoshima Island (4m 41s), however, will be afforded a view from the centerline.

Nearly all of Shikoku Island will get to view the annular eclipse with the exception of the extreme northwest regions. The centerline passes about 50 kilometers offshore, but the duration is not greatly reduced. The longest annularity on Shikoku will be at Muroto (4m 28s). Kochi (2m 53s) and Tokushima (3m 08s) are a few of the notable cities here.



The centerline grazes the southern shores of Honshu Island, (also called the mainland) and skips across from land, to water, to land, to water and back to land again, firstly on the Ki Peninsula, then it passes near Shingu (4m 48s), across the Kumano-nada and Enshu-nada Seas, onshore again near Cape Omaezaki (4m 54s), Kikugawa (4m 52s), and Yaizu (4m 53s), back out into the waters across Suruga Bay, then arrives for the last time on the mainland not far from Numazu (5m 54s), followed by Yokohama (4m 56s), Tokyo (4m 53s), Chiba (4m 57s) and Mito (4m 47s).



Notable durations for cities within the path but not nearest the centerline on Honshu include; Osaka (2m 40s), Tsu (4m 08s) and Nagoya (3m 21s).

The centerline skirts the northwest boundaries of Tokyo Bay as it progresses through downtown Tokyo, the largest metropolitan area in the world, and adds another 20 million people under the path of annularity, and tens of millions more on Honshu Island where the majority of the population of Japan resides.

There has been talk about the possibility of scaling Mt. Fuji (4m 48s), to view the eclipse. This picturesque stratovolcano, which last erupted in 1707-08, is also Japan's highest mountain at 3776 meters (12,388 feet). Buses run to the 5th station during July and August, when most people climb the mountain, and many do so in the dark so they can be at the summit for sunrise.

Mid-annularity occurs in this area 2 hours 40 minutes after sunrise with the Sun 34° above the horizon and nearly due east. It is <u>not</u> recommended however to attempt the ascent from October through May due to the possibility of severe winter storms that can rapidly develop over the mountain.

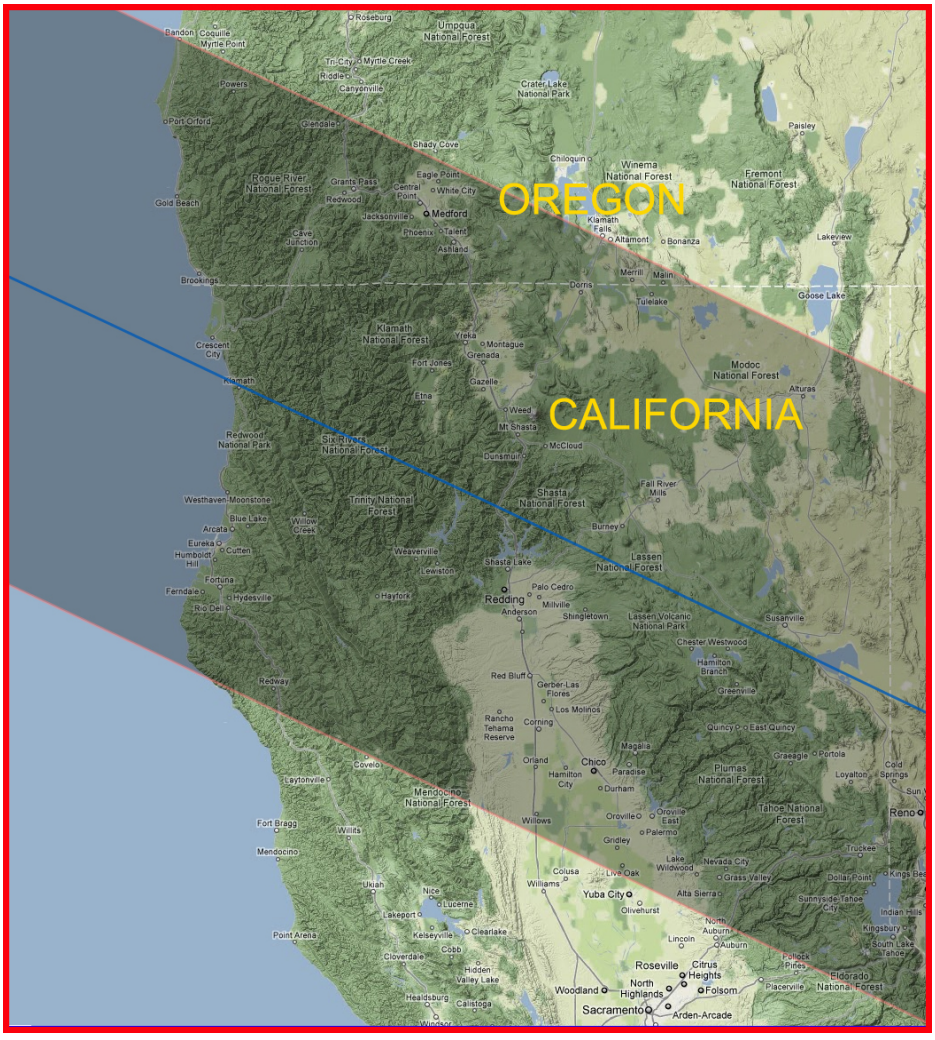
Observers in Tokyo might want to consider a drive to the Kishima-nada Sea northeast of Tokyo to observe with a pristine horizon across the ocean. The centerline departs the mainland near Kashima (5m 05s) and will not hit land again until it reaches the west coast of the United States of America. The longest duration of annularity (5m 46s) will occur south of the Aleutian Islands.

Mt. Fiji, shown here with the surrounding lakes to the north which would make a great landscape during the eclipse
Map courtesy Google Maps and Xavier Jubier

This is the first annular eclipse in the U.S. since 1994, 18 years ago. For those paying attention to the eclipse, and fortunate enough to have eclipse glasses available, in China and Japan at least 200 million people will have an opportunity to view the eclipse from the path of annularity, but when it comes ashore in the U.S., all the towns and cities combined across the path will not equal 1/100th of that total. But what the U.S. lacks in a large population in the path, it makes up for in its abundant amount of the most scenic locations anywhere.

The path for this eclipse takes it across numerous unique locations, many in the desert southwest, but before we get to there, we will step across the locations as the eclipse progresses across them.

NORTHERN CALIFORNIA and SOUTHWEST OREGON



Since leaving Japan the path of annularity does not touch land again until it arrives on the west coast of the United States of America. The centerline comes ashore near Requa, California (4m 42s), at the scenic Klamath River Overlook, where the central phase of annularity occurs with the Sun just shy of 22° above the west-northwest horizon. There are a few of the "sea stack" type rocks here along the shoreline and also offshore of Del Norte Coast Redwoods State Park, but you might want to avoid being deep in the redwood forest during the eclipse. Only 5¼ years after this eclipse, a total solar eclipse will sweep ashore just 225 miles north of here, at Lincoln Beach, Oregon, the first total eclipse in the USA in over 38 years.

The path of annularity actually extends nearly 80 miles up the Oregon coastline north of California, and there are dozens of great locations near the Oregon Coast Highway where scenic sea stack rocks and pinnacles, and even a natural arch, and vantage points can be found at Mack Arch Cove (4m 13s), Hunters Cove (4m 06s), Otter Point State Recreation Site (3m 52s), Sisters Rocks State Park (3m 27s), Cape Blanco State Park (2m 49s), and ending on the northern edge of the path of annularity at Bandon (0m 45s), just to name some of the many scenic locations along the beaches of Oregon. If you have an ATV it would certainly help you get to a good viewing location. Definitely check it out weeks beforehand if you live in the area, or at least a day or two before if you are traveling to view from here. There is no better location than a

beach to watch a solar eclipse. A couple of inland towns in Oregon in the path of annularity include Medford (2m 44s) and Grants Pass (2m 55s),

Like Oregon, the northern California coast also has locations with sea stacks that are quite scenic, two of which lie very close to the centerline, and the longest duration of annularity (4m 42s) in the U.S.. North of the centerline is False Klamath Cove, and south is the beach below Flint Ridge.

Away from the coast in California the path takes it over Mt. Shasta (4m 15s) about 20° above a level horizon at mid-eclipse where a decent view might be had from Highway 89 about 35 miles east of I-5, or for the more daring on Forest Route 19. The centerline slices through Lassen Volcanic National Park where there are some very scenic vantage points, such as Fantastic Lava Beds in the eastern regions of the park, and over 3000 feet below Lassen Peak. Although very scenic, both of these areas have roads that are closed in winter due to heavy snowfall, so keep an eye on how much snow is on the ground and check beforehand to see if the roads are open before heading to these locations. Noticeable locations in the path are Klamath (4m 42s), Crescent City (4m 40s), Eureka (3m 53s), Redding (4m 27s), Chico (3m 15s), Lava Beds National Monument (2m 59s), just to name a few.

FALSE KLAMATH COVE & FLINT RIDGE / CALIFORNIA – Local Circumstances

EVENT	Local Time	Alt	Az	Pos∠
Sunrise	**05:51 am PDT on May 20**			
1st Contact	05:08:26 pm PDT	+36.3°	265.5°	271°
2nd Contact	06:24:18 pm PDT	+22.2°	277.9°	271°
Maximum	06:26:42 pm PDT	+21.7°	278.3°	001°
3rd Contact	06:29:05 pm PDT	+21.3°	278.7°	091°
4th Contact	07:35:30 pm PDT	+09.2°	288.9°	091°
Sunset	**08:34 pm PDT on May 20**			

LASSEN VOLCANIC NATIONAL PARK

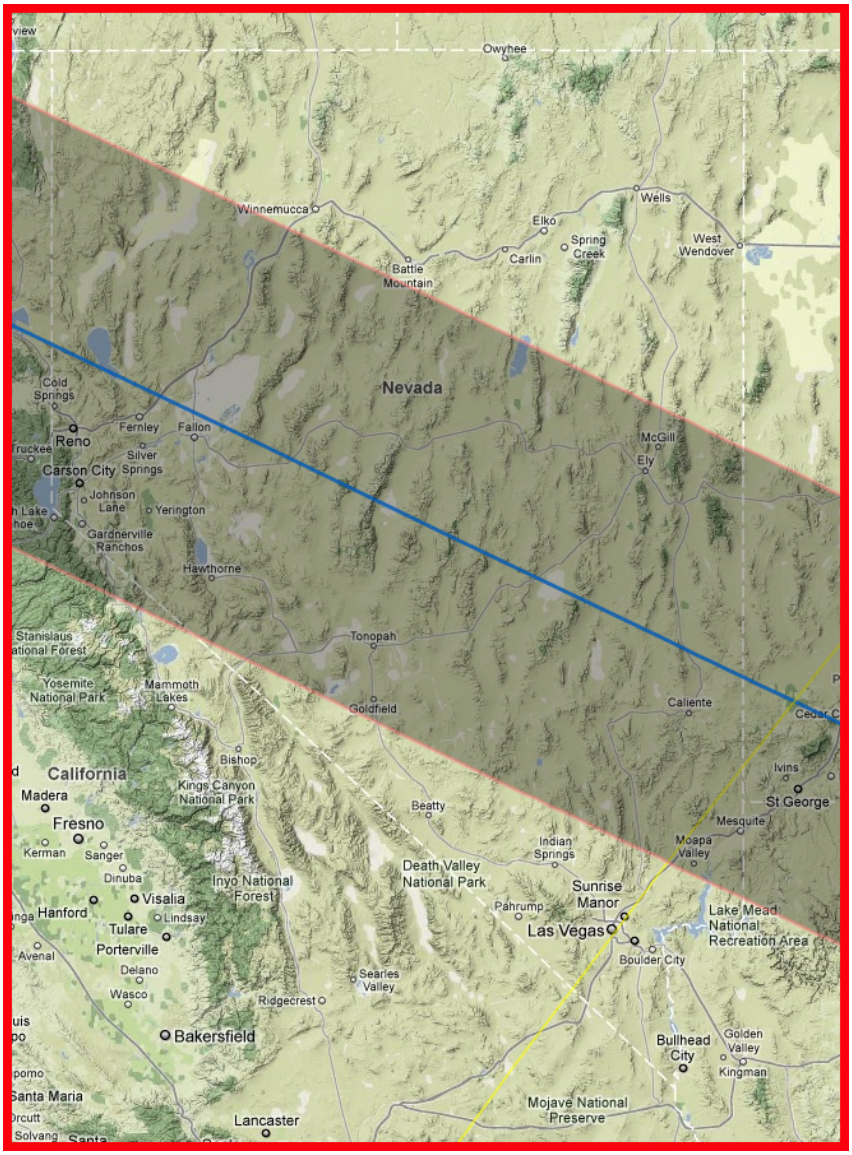
If snow levels are not too bad, a very colorful location is the Painted Desert in the Fantastic Lava Beds area in the northeastern part of Lassen Volcanic National Park. The centerline passes directly through this area of the park and here the Sun will be 19^{o} above a perfect horizon just to the north of Lassen Peak.

LASSEN NTL PARK @ Fantastic Lava Beds – Local Circumstances

EVENT	Local Time	Alt	Az	Pos∠
Sunrise	**05:43 am PDT on May 20**			
1st Contact	05:12:34 pm PDT	+33.5°	268.8°	271°
2nd Contact	06:26:37 pm PDT	+19.5°	280.4°	272°
Maximum	06:28:58 pm PDT	+19.1°	280.7°	002°
3rd Contact	06:31:20 pm PDT	+18.6°	281.1°	091°
4th Contact	07:36:19 pm PDT	+06.8°	290.9°	091°
Sunset	**08:20 pm PDT on May 20**			

NEVADA

A large part of Nevada is directly under the path of annularity, especially so in the central part, but the bad news is there are not a lot of people living in this desolate region. On the California/Nevada border lays Lake Tahoe, and the entire lake is in the path from 3m 43s on the north shore to 2m 47s on the south shore. Even though Reno (4m 18s) is 30 miles south of the centerline, it loses less than 20 seconds of annularity, and south of Reno is Carson City (3m 45s) which will still get to see a respectable duration of annularity, that is, if people can take a few minutes away from the slot machines.



The centerline skirts the southern end of Pyramid Lake (4m 37s), which features a pyramid shaped natural rock near the southeast end of the lake. By this time the Sun will be 17° above a true horizon. On the eastern side of Nevada is the Great Basin National Park (3m 15s) where the Sun will only be 13° above the horizon. Las Vegas falls outside the path of annularity, but is obscured by 86.5% of the lunar disk, and remarkably on the centerline the obscuration increases only three quarters of a percent to 87.27%. The Valley of Fire state park lies only 3 miles south of the path, yet gets 87.23% obscuration, only fractionally different than inside the path. This could make for a good scenic view.

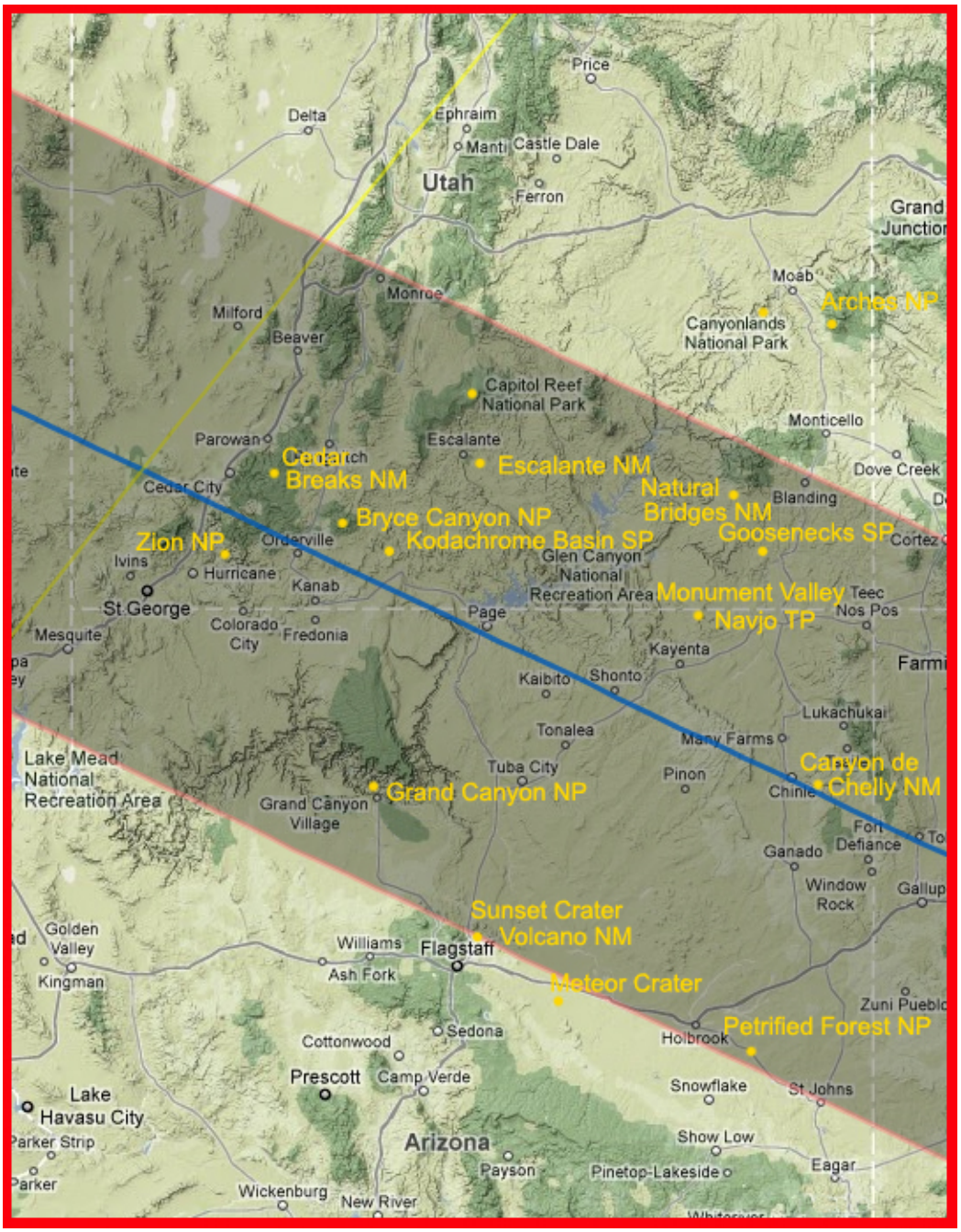
PYRAMID LAKE / NEVADA – Local Circumstances

EVENT	Local Time	Alt	Az	Pos∠
Sunrise	**05:37 am PDT on May 20**			
1st Contact	05:14:57 pm PDT	+31.6°	270.8°	271°
2nd Contact	06:27:50 pm PDT	+17.8°	281.8°	269°
Maximum	06:30:11 pm PDT	+17.4°	282.2°	182°
3rd Contact	06:32:31 pm PDT	+16.9°	282.5°	094°
4th Contact	07 36:36 pm PDT	+05.2°	292.1°	092°
Sunset	**08:11 pm PDT on May 20**			

UTAH and ARIZONA

Without a doubt, Utah and Arizona are some of the most scenic areas in the world, and a myriad of unique locations abound. Nearly half of all the U.S. national parks are found here, not to mention numerous state parks. Several of these locals encounter the path of annularity not far off of the Utah and Arizona border.

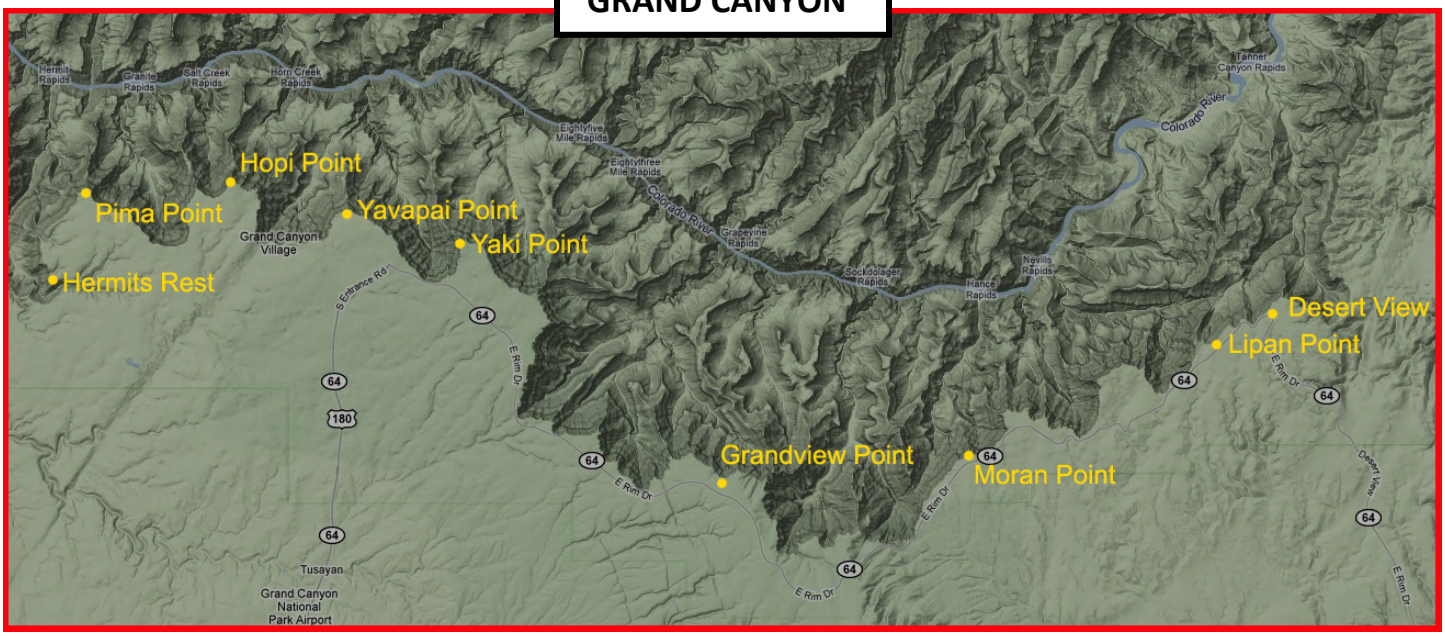
Zion National Park (4m 23s), Cedar Breaks National Monument (4m 25s), Bryce Canyon NP (4m 16s), Kodachrome Basin State Park (4m 13s), Capitol Reef National Park (1m 34s), Escalante National Monument (3m 41s), Glen Canyon National Recreation Area (Lake Powell) (4m 27s), Natural Bridges National Monument (2m 12s) and Goosenecks State Park (3m 28s) are some of the unique locations in southern Utah that are within the path of annularity.



Grand Canyon National Park; Grand Canyon Village (3m 08s), Monument Valley Navajo Tribal Park (3m 57s), Sunset Crater Volcano National Monument (0m 41s), Horseshoe Bend (4m 27s), Petrified Forest National Park (2m 11s), Canyon de Chelly National Monument (4m 26s), and Window Rock (4m 18s), in Arizona are some of the larger attractions. Unfortunately Meteor Crater lies just 5 miles south of the path of annularity.

I encourage you to Google these places and look for a unique location to view the eclipse from, and try taking a photo after sunset of the scenery. Low clouds on the horizon may be a problem however. From Zion NP in the west to Canyon de Chelly National Monument in the east, the Sun drops from 11.1° to 7.7°.

GRAND CANYON



The Grand Canyon falls within the path of annularity, and since you view the canyon from the rim, the land is rather flat all around, so a low horizon exists here, in addition to one of the world's greatest views. The canyon stretches for miles and miles, but the area above is where the road in the park makes it easy to find a good location to view the eclipse. The major viewpoints on the map above are listed below. All of the locations are excellently positioned for viewing the eclipsed Sun above the canyon to the west-northwest.

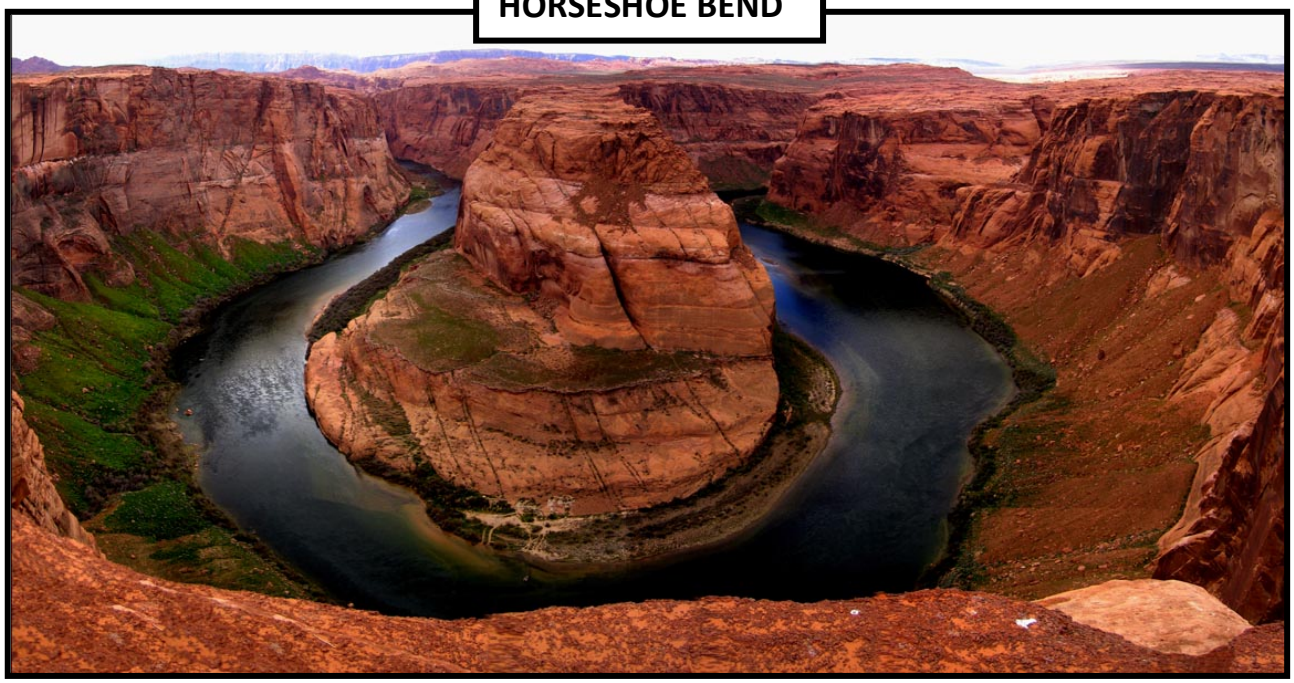
LOCATION	DURATION OF ANNULARITY	DEGREES ABOVE THE HORIZON @ MAX
Hermits Rest	3m 01.4s	9.8°
Pima Point	3m 06.7s	9.8°
Hopi Point	3m 10.8s	9.7°
Yavapai Point	3m 12.0s	9.7°
Yaki Point	3m 13.3s	9.7°
Grandview Point	3m 07.4s	9.6°
Moran Point	3m 14.5s	9.5°
Lipan Point	3m 23.3s	9.5°
Desert View	3m 25.2s	9.5°

GRAND CANYON @ Grandview Point – Local Circumstances

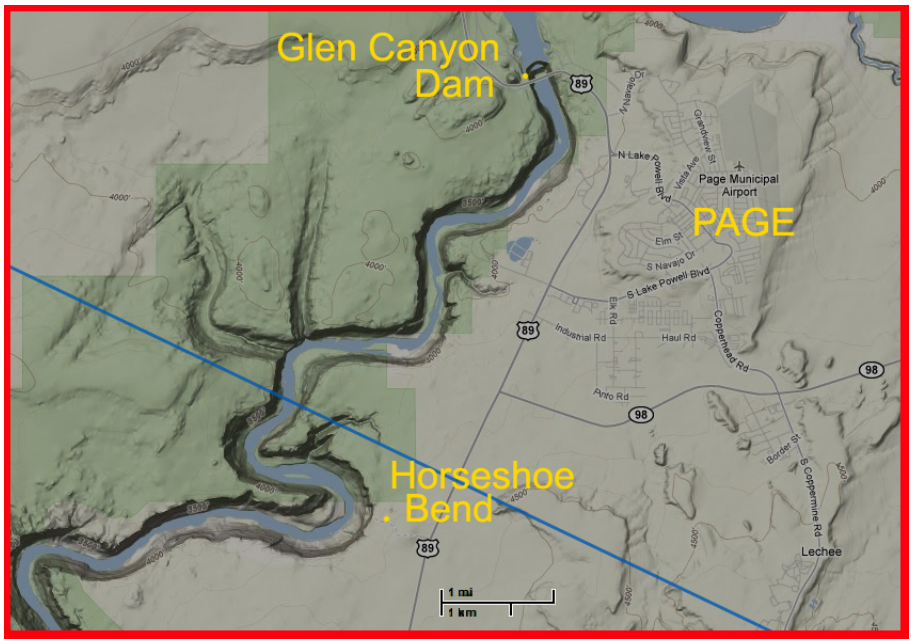
EVENT	Local Time*	Alt	Az	Pos∠
Sunrise	**05:17 am MST on May 20**			
1st Contact	05:25:19 pm MST	+23.4°	278.7°	273°
2nd Contact	06:34:04 pm MST	+09.9°	287.9°	317°
Maximum	06:35:41 pm MST	+09.6°	288.1°	002°
3rd Contact	06:37:18 pm MST	+09.3°	288.3°	048°
Sunset	**07:31 pm MST on May 20**			
4th Contact**	07:38:20 pm MST	-02.0°	297.0°	090°

* Arizona does not observe Daylight Savings Time,
however the Navajo Nation within Arizona does
** Occurs after Sunset

HORSESHOE BEND



Panorama of Horseshoe Bend © Larry A. Stevens



Horseshoe Bend is a great location where the horizon is marvelous and so is the view. The parking area is rather small and a single bus can clog up the lot rather easily. A ¼ mile hike is needed to reach the overlook.

At mid-eclipse the Sun will only be 9.7° to the west-northwest, directly over the outcrop seen in the center of the Colorado River below.

Map © Google Maps and Xavier Jubier

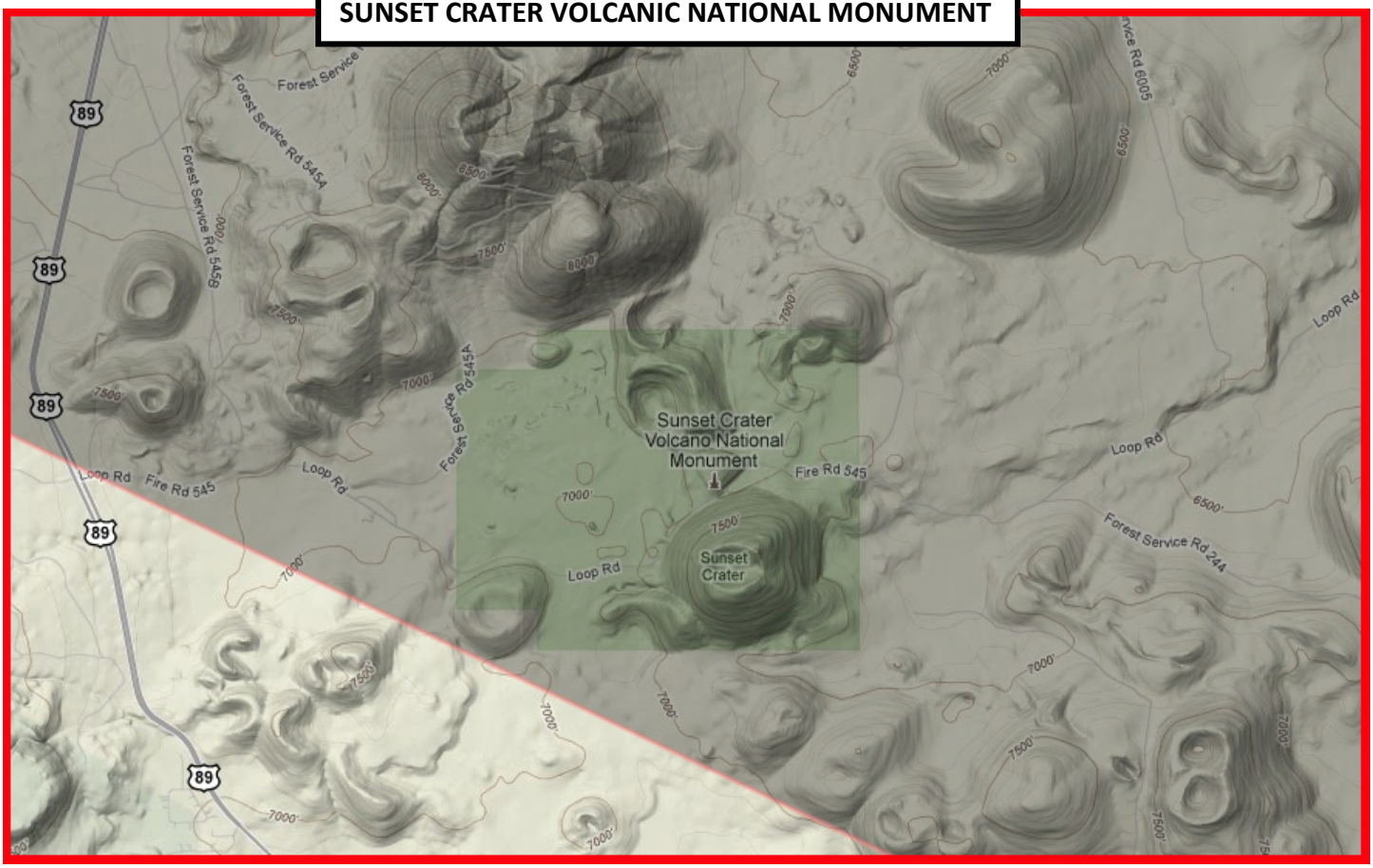
HORSESHOE BEND near PAGE / ARIZONA – Local Circumstances

EVENT	Local Time*	Alt	Az	Pos∠
Sunrise	**05:13 am MST on May 20**			
1st Contact	05:24:17 pm MST	+23.4°	278.4°	272°
2nd Contact	06:32:16 pm MST	+10.1°	287.8°	272°
Maximum	06:34:31 pm MST	+09.7°	288.1°	002°
3rd Contact	06:36:47 pm MST	+09.3°	288.4°	091°
Sunset	**07:31 pm MST on May 20**			
4th Contact**	07:37:10 pm MST	-01.7°	297.2°	092°

* Arizona does not observe Daylight Savings Time, however the Navajo Nation within Arizona does

** Occurs after Sunset

SUNSET CRATER VOLCANIC NATIONAL MONUMENT



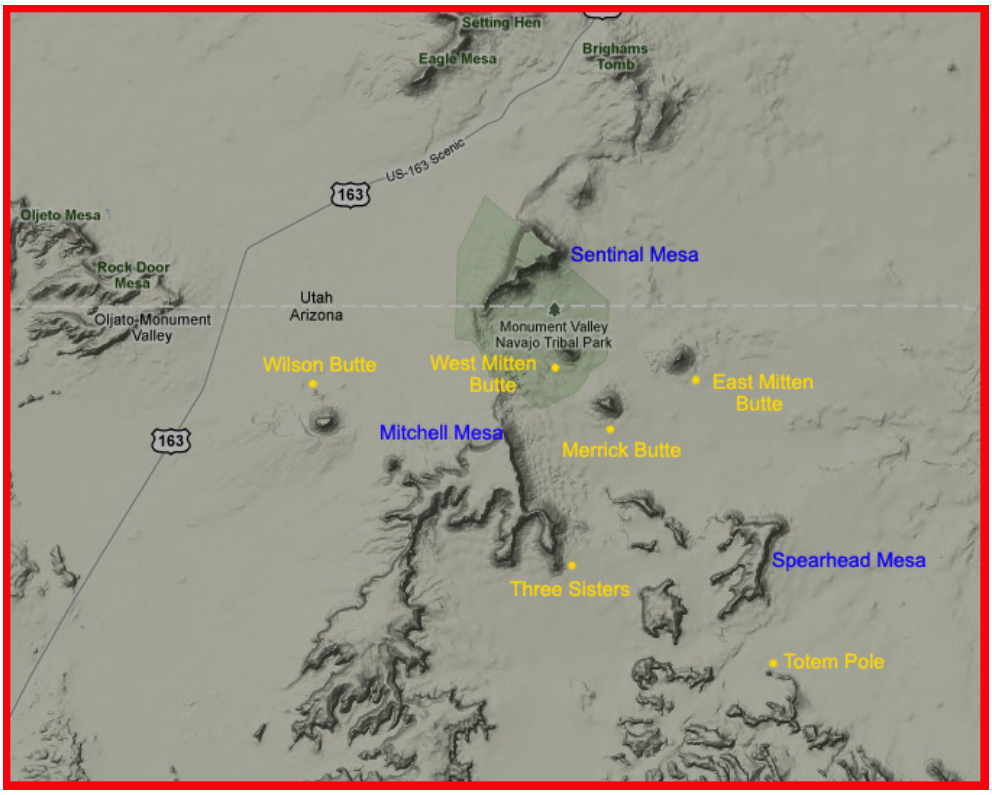
Near Flagstaff, Arizona, a dormant volcano field is found just off of Highway 89. It is known as the Sunset Crater Volcano National Monument. It is quite near the southern edge of the path of annularity, so it could be a good location for viewing Baily's beads. Normally observers of the bead effect like to place themselves further toward the centerline than this so the durations of each bead lasts longer, but this is a scenic site as well. Just a few dozen meters can make a huge difference in the duration of annularity. Views of the south side of the crater will have a duration of about 30 seconds, and the north side can shift the duration to 50 seconds.

SUNSET CRATER near FLAGSTAFF / ARIZONA – Local Circumstances

EVENT	Local Time*	Alt	Az	Pos∠
Sunrise	**05:17 am MST on May 20**			
1st Contact	05:26:27 pm MST	+22.7°	279.4°	274°
2nd Contact	06:36:02 pm MST	+08.9°	288.5°	352°
Maximum	06:36:25 pm MST	+08.8°	288.6°	002°
3rd Contact	06:36:48 pm MST	+08.8°	288.6°	012°
Sunset	**07:27 pm MST on May 20**			
4th Contact**	07:38:44 pm MST	-02.7°	297.4°	090°

* Arizona does not observe Daylight Savings Time,
however the Navajo Nation within Arizona does
** Occurs after Sunset

MONUMENT VALLEY



The Three Sisters spires found in Monument Valley Navajo Tribal Park.
© Larry A. Stevens

The monoliths of Monument Valley are iconic, so here may be a good location for yet another unique view of the annular eclipse. The Sun will be only 8.7° above an unobstructed horizon at mid-eclipse. There are a number of locations that would make great backdrops, but care must be taken to be sure that the landscape will not obscure the placement of the eclipsed Sun. A few subjects that come to mind are the West and East Mitten Buttes, as well as the Three Sisters or Totem Pole monuments. If you can show up a day or two before the eclipse so you can see where the Sun is setting and you can find a good location that is perfect for staging your photographs, however there are many other possibilities. Even though the desert southwest is well known for its clear skies, often distant clouds can be found near the horizon. No matter what location you pick, you're bound on making a unique photograph.

MONUMENT VALLEY near KAYENTA / ARIZONA – Local Circumstances

EVENT	Local Time*	Alt	Az	Pos∠
Sunrise	**06:07 am MDT on May 20**			
1st Contact	06:24:46 pm MDT	+22.1°	279.3°	271°
2nd Contact	07:32:11 pm MDT	+09.1°	288.5°	248°
Maximum	07:34:15 pm MDT	+08.7°	288.8°	182°
3rd Contact	07:36:19 pm MDT	+08.3°	289.1°	115°
Sunset	**08:26 pm MDT on May 20**			
4th Contact**	08:36:22 pm MDT	-02.6°	298.0°	092°

* Arizona does not observe Daylight Savings Time, however the Navajo Nation within Arizona does
** Occurs after Sunset

MEXICAN HAT

A short drive to the northeast of Monument Valley on highway 163, just across the Arizona border into Utah, is the town of Mexican Hat. Here we find its namesake in a small park is a butte that has a balanced rock that looks like a Mexican sombrero that is balancing upside down atop a sandstone outcrop.

Mexican Hat photo © Larry A. Stevens

MEXICAN HAT - GOOSENECKS SP / UTAH – Local Circumstances

EVENT	Local Time	Alt	Az	Pos∠
Sunrise	06:06 am MDT on May 20			
1st Contact	06:24:33 pm MDT	+22.1°	279.2°	271°
2nd Contact	07:32:07 pm MDT	+09.0°	288.6°	237°
Maximum	07:33:58 pm MDT	+08.7°	288.9°	182°
3rd Contact	07:35:49 pm MDT	+08.3°	289.1°	127°
Sunset	08:21 pm MDT on May 20			
4th Contact*	08:36:03 pm MDT	-02.6°	298.0°	093°

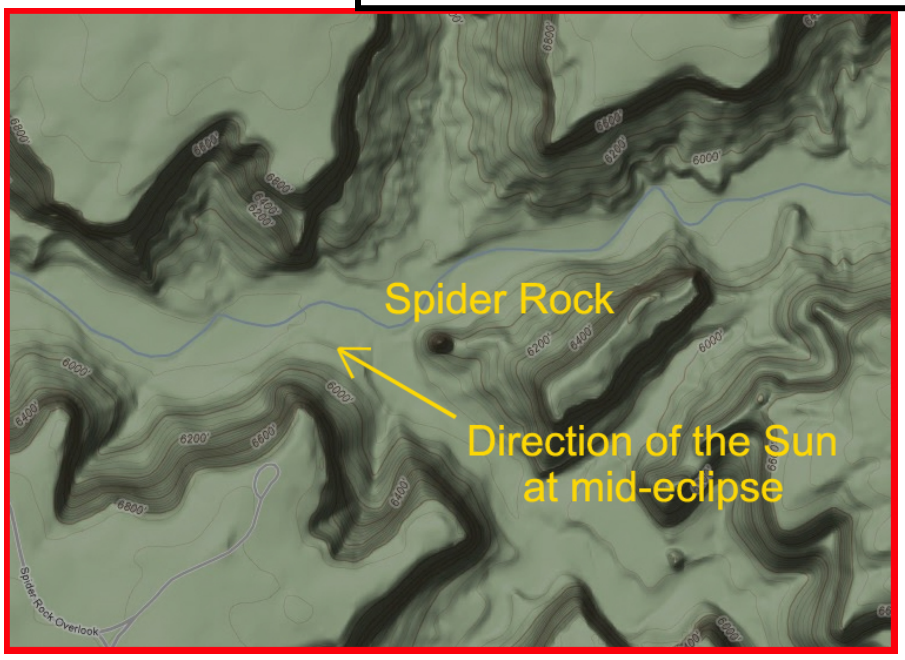
* Occurs after Sunset

GOOSENECKS STATE PARK

About 3 miles away as the crow flies, and 5 miles by road, we drive further north on Highway 163 we turn onto Highway 261, and about a mile further on we turn onto Highway 316 and drive about 3 miles and we end at Goosenecks State Park. If you thought Horseshoe Bend was something, here you will be overlooking not one, but 3 horseshoe shaped bends in the river. From here like at Horseshoe Bend, the horizon is completely flat to the horizon. The park is situated directly on the central bend, which would face you to the southwest, but a walk along the canyon rim trail to the southern bend will place you facing to the direction of the eclipsed Sun. From this location the Sun will be in mid-eclipse with it to the west-northwest and 8.7° above the horizon, and here you will have a spectacular and unobstructed horizon view. Annularity will last about 3m 31s from this vantage point.

Goosenecks State Park, this panorama is comprised of 7 images, © Larry A. Stevens

CANYON de CHELLY NATIONAL MONUMENT



Spider Rock as seen from the Spider Rock Overlook. Notice the embankment to the right, which rises to the southeast, and could increase an observer's elevation to help make the Sun slightly higher than on the canyon valley itself. The image below was taken in April about 3 hours before sunset. The shadow in the lower right corner of the image is that of the bluffs to the left of the overlook. A wide angle lens would likely be needed.

Photo of Canyon de Chelly
© Larry A. Stevens

In Canyon de Chelly (pronounced *shay*), stands the iconic rock spire, "Spider Rock." The sandstone spire stands alone about 1000 feet from a nearby bluff, and rises some 800 feet (240 m) high. This may be a tricky view if you are on the canyon floor since the Sun at mid-eclipse will only be 7.7^{o} above a perfect horizon and nearby bluffs could easily drop the Sun below the horizon. Although I have been to Canyon de Chelly, I have not observed Spider Rock from the valley floor. You will need a local Indian guide to enter the valley, and if you select this marvelous venue to observe from, you will want to find out what time the Sun sets here a day or two before the eclipse to be sure the Sun is still visible during mid-eclipse. If this does not work out, there are several nearby sights to pick as alternatives. Spring is the rainy season in the canyon, so keep this in mind.

CANYON de CHELLY near CHINLE / ARIZONA – Local Circumstances

EVENT	Local Time*	Alt	Az	Pos∠
Sunrise	06:06 am MDT on May 20			
1st Contact	06:26:13 pm MDT	+21.1°	280.2°	272°
2nd Contact	07:32:57 pm MDT	+08.1°	289.2°	270°
Maximum	07:35:11 pm MDT	+07.7°	289.5°	182°
3rd Contact	07:37:26 pm MDT	+07.3°	289.8°	094°
Sunset	08:21 pm MDT on May 20			
4th Contact**	08:36:54 pm MDT	-03.6°	298.4°	092°

* Arizona does not observe Daylight Savings Time,
however the Navajo Nation within Arizona does
** Occurs after Sunset

COLORADO and NEW MEXICO

A small corner of southwestern Colorado lies in the path of the annular eclipse, and this falls close to the northern edge of the path. There is only a sprinkling of small towns in the area, and just inside it is Mesa Verde National Park (1m 14s) where ancestral Pueblo Indians lived on unique cliff dwellings.

A monument marks the location where the states of Utah, Arizona, New Mexico and Colorado come together, and it is known as the Four Corners (3m 07s). It is the only location in the USA where you can stand in 4 states at the same time, some people like to place an appendage in each of the quadrants and have their picture taken straddling the four states either push-up style, or bending over backwards, families or groups of four often join hands, one person in each state. Like Monument Valley, it is a Navajo Nation Park, and numerous handcrafts from local tribes are also available. Mid-eclipse occurs about 8° above the horizon.

Not far away and in the northwest corner of New Mexico we find Shiprock Monument (3m 40s). The town of Shiprock is about 33 miles from four corners, but the monument itself is still a 17 mile drive to the southwest. It is the leftover core of a below ground volcano that now rises nearly 1600 feet above the high desert, and is similar to that of the monoliths in Monument Valley and part of the same region known as the Navajo Volcanic Field. From this location the Sun will be 7.7° to the west-northwest at mid-eclipse.

Just 15 miles from the southern edge of annularity we find the Very Large Array (VLA) (2m 16s). This could make yet another scenic location for a photograph of the annular phase with the Sun 5.3° above the horizon. Image © Larry A. Stevens

The path of annularity takes the centerline almost directly over Albuquerque (4m 23s), New Mexico, and is the most populous area that the eclipse passes across with over 900,000 people. The Sun will be only 5° above the horizon at mid-eclipse. To the east is the Sandia Peak Tramway where you can ride to the top of Sandia Peak (4m 17s) to view the eclipse at 10,378 feet and look down into the Rio Grande Valley overlooking Albuquerque. If however you don't want to lug your equipment on the tramway, a road from the west side of the mountain will get you to the peak only a mile to the north of the tramway on Sandia Crest Scenic Highway (Hi536), where you can actually view the eclipse above 10,600 feet.

Northeast of Albuquerque is Santa Fe (3m 23s), New Mexico, here the Sun will be 5° above the horizon at mid-eclipse. To the south and further east along the path, Roswell (3m 39s) also gets to view all of annularity, but the Sun is now only 2.6° above the horizon at mid-eclipse. Prof Jay Pasachoff with colleagues and students will be observing the eclipse with the extended VLA (EVLA). Alamogordo (86.6% obscured) and nearby White Sands National Monument (86.3% obscured) both fall outside the south edge of the path of annularity, as opposed to that of 86.9% obscuration from inside the path of annularity in this area.

VLA / NEW MEXICO – Local Circumstances

EVENT	Local Time	Alt	Az	Pos∠
Sunrise	06:04 am MDT on May 20			
1st Contact	06:29:29 pm MDT	+18.7°	282.2°	274°
2nd Contact	07:36:02 pm MDT	+05.5°	290.8°	329°
Maximum	07:37:14 pm MDT	+05.3°	290.9°	002°
3rd Contact	07:38:27 pm MDT	+05.0°	291.1°	035°
Sunset	08:09 pm MDT on May 20			
4th Contact*	08:37:56 pm MDT	-06.0°	299.5°	090°

* Occurs after Sunset


COLORADO
NEW MEXICO
Mesa Verde NP
Shiprock Monument
VLA
White Sands NM
New Mexico
Albuquerque
Santa Fe
Las Cruces
Roswell
Farmington
Pueblo
Alamosa
Trinidad
Clovis
Ciudad Juarez
Uncompahgre National Forest
San Juan National Forest
Rio Grande National Forest
Gila National Forest
Apache National Forest
Lincoln National Forest
Comanche National Grassland

TEXAS

The Sun is now very near the western horizon as it gets close to setting. And northwest Texas is the last location where annularity will be visible. Just 26 miles northeast of the centerline, Lubbock (4m 06s), Texas is the last sizeable city to see annularity its population is 275,000. 2nd contact comes with the Sun 1.3° above the horizon, mid-eclipse is 0.9° above the horizon and 3rd contact comes with the Sun just 0.5° above the horizon, though atmospheric refraction can raise that a bit.

Often the towns of Midland and Odessa are spoken of together, as in Midland-Odessa, and both are very near the end of the zone of annularity, a single mile can make a big difference for viewing all of annularity, or a part of it, and even how long it will last. The city of Odessa (1m 02s) is very near the south edge of annularity, and also very near the limit of viewing the eclipse, 2nd contact = 0.3° / mid-eclipse = 0.2° / 3rd contact = 0.1°. Midland (2m 30s), 2nd contact = 0.4° / mid-eclipse = 0.1° / 3rd contact occurs below the horizon at -0.1°, however atmospheric refraction should allow it to be visible at this point, and the Sun will likely be rather flattened. The Sun will be setting immediately after this.

For the Annular eclipse of 2012 May 20-21, the most obscuration of the Sun's disk at central phase will be nearly 88%

SELECT CITIES OF THE WEST PACIFIC RIM EXPERIENCING ONLY PARTIAL PHASES

	Sunrise	C1	MAX	C4	Obscuration
BANGKOK, THAILAND	05:50 am	- - -	- - -	06:06:27 am	
BEIJING, CHINA	04:55 am	05:31:32	06:33:15	07:41:56 am	57%
CHONGQING, CHINA	07:43 am	- - -	08:33:15	09:41:56 am	70%
FUKUOKA, JAPAN	05:14 am	06:15:58	07:25:35	08:45:54 am	86%
LHASA, TIBET	07:00 am	- - -	- - -	06:23:34 am	
MANILA, PHILIPPINES	05:27 am	- - -	05:58:43	07:06:11 am	62%
NIIGTA, JAPAN	05:29 am	06:23:01	07:38:15	09:05:29 am	86%
NOVOSIBIRSK, RUSSIA	05:12 am	05:22:43	06:03:57	06:46:54 am	16%
SAPPORO, JAPAN	04:06 am	06:33:09	07:49:52	09:17:39 am	78%
SEOUL, SOUTH KOREA	05:18 am	06:23:12	07:31:04	08:48:19 am	73%
SHANGHAI, CHINA	04:55 am	05:15:09	06:19:47	07:33:15 am	81%
ULAANBAATAR, MONGOLIA	05:08 am	05:51:58	06:46:48	07:46:04 am	36%
URUMQI, CHINA	06:39 am	- - -	06:46:03	07:36:11 am	29%
WUHAN, CHINA	05:25 am	- - -	06:19:05	07:27:46 am	75%

SELECT CITIES IN CANADA EXPERIENCING ONLY PARTIAL PHASES

	C1	MAX	C4	Sunset	Obscuration
CALGARY, AB	06:03:56	07:13:56	08:17:42	09:28 pm MDT	62%
EDMONTON, AB	06:01:16	07:09:56	08:12:53	09:37 pm MDT	56%
LONDON, ON	08:20:18	- - -	- - -	08:47 pm EDT	
MONTREAL, QB	08:16:36	- - -	- - -	08:24 pm EDT	
QUEBEC, QB	08:15:05	- - -	- - -	08:20 pm EDT	
REGINA, SK	00:09:57	01:14:49	02:14:30	08:47 pm CST	56%
SASKATOON, SK	00:07:01	01:12:24	02:12:36	09:03 pm CST	54%
THUNDER BAY, ON	00:15:52	01:13:35	- - -	10:38 pm EDT	48%
WHITEHORSE, YT	23:34:30	00:49:49	01:59:47	11:51 pm PDT	54%
TORONTO, ON	08:19:23	- - -	- - -	08:42 pm EDT	
VANCOUVER, BC	04:58:39	06:14:51	07:23:13	08:56 pm PDT	73%
WINNIPEG, MB	07:13:10	08:14:17	09:10:59	09:15 pm CDT	51%
YELLOWKNIFE, NT	23:50:33	00:54:34	01:54:40	11:46 pm MDT	40%

SELECT CITIES IN THE U.S. EXPERIENCING ONLY PARTIAL PHASES

	C1	MAX	C4	Sunset	Obscuration
ANCHORAGE, AK	03:16:59 pm	04:37:50	05:53:48	10:55 pm AKDT	58%
ATLANTA, GA	06:28:38	07:26:32	- - -	09:36 pm EDT	
BILLINGS, MT	06:13:53	07:22:07	08:24:02	08:45 pm MDT	69%
BIRMINGHAM, AL	07:29:31	- - -	- - -	07:45 pm CDT	
BISMARCK, ND	07:15:40	08:19:30	- - -	09:18 pm CDT	60%
BOISE, ID	06:12:10	07:25:16	08:30:35	09:09 pm MDT	80%
BUFFALO, NY	08:19:51	- - -	- - -	08:37 pm EDT	
CHEYENNE, WY	06:21:10	07:27:57	- - -	08:16 pm MDT	76%
CLEVELAND, OH	08:21:35	- - -	- - -	08:44 pm EDT	
DALLAS, TX	07:31:56	- - -	- - -	08:23 pm CDT	
DENVER, CO	06:22:52	07:29:49	- - -	08:13 pm MDT	79%
DES MOINES, IA	07:22:34	08:23:44	- - -	08:33 pm CDT	65%
DETROIT, MI	07:21:08	- - -	- - -	08:53 pm EDT	
HONOLULU, HI	02:02:39	03:11:43	04:11:19	07:05 pm HST	09%
HOUSTON, TX	07:35:06	- - -	- - -	08:11 pm CDT	
IDAHO FALLS, ID	06:14:59	07:25:37	08:29:07	08:52 pm MDT	77%
INDIANOPOLIS, IN	07:23:52	- - -	- - -	08:57 pm EDT	
KANSAS CITY, MO	07:25:07	08:27:00	- - -	08:29 pm CDT	71%
KNOXVILLE, TN	08:26:41	- - -	- - -	08:39 pm EDT	
LAS VEGAS, NV	05:23:33	06:35:41	07:39:33	07:44 pm PDT	86%
LINCOLN, NE	07:23:12	08:25:54	- - -	08:42 pm CDT	69%
LITTLE ROCK, AR	07:29:28	08:30:26	- - -	08:10 pm CDT	
LOS ANGELES, CA	05:24:59	06:38:16	07:42:41	07:52 pm PDT	78%
MEMPHIS, TN	07:28:42	- - -	- - -	08:01 pm CDT	
MILWAUKEE, WI	07:21:04	- - -	- - -	08:14 pm CDT	
MINNEAPOLIS, MN	07:19:05	08:19:31	- - -	08:42 pm CDT	57%
MOBILE, AL	07:32:25	- - -	- - -	07:44 pm CDT	
NASHVILLE, TN	07:27:11	- - -	- - -	07:51 pm CDT	
NEW ORLEANS, LA	07:33:42	- - -	- - -	07:50 pm CDT	
RAPID CITY, SD	06:18:07	07:23:45	- - -	08:18 pm MDT	68%
OKLAHOMA CITY, OK	07:29:00	08:32:14	- - -	08:32 pm CDT	82%
OMAHA, NE	07:22:47	08:25:08	- - -	08:41 pm CDT	68%
PHOENIX, AZ	05:28:56	06:38:45	- - -	07:26 pm MST	83%
PITTSBURGH, PA	06:22:01	- - -	- - -	08:35 pm PDT	
PORTLAND, OR	05:04:04	06:21:02	07:29:27	08:41 pm PDT	81%
ROCHESTER, NY	08:19:22	- - -	- - -	08:33 pm EDT	
SACRAMENTO, CA	05:15:24	06:31:44	07:38:48	08:16 pm PDT	87%
SALT LAKE CITY, UT	06:18:43	07:29:26	08:32:45	08:42 pm MDT	83%
SAN ANTONIO, TX	07:35:55	- - -	- - -	08:23 pm CDT	
SAN DIEGO, CA	05:27:53	06:40:00	07:43:30	07:44 pm PDT	76%
SAN FRANCISCO, CA	05:15:49	06:32:37	07:39:54	08:17 pm PDT	84%
SEATTLE, WA	05:01:35	06:17:49	07:25:58	08:47 pm PDT	76%
SPOKANE, WA	05:05:45	06:18:54	07:24:42	08:27 pm PDT	72%
ST. LOUIS, MO	07:25:26	08:25:23	- - -	08:11 pm CDT	
TUCSON, AZ	05:31:06	06:40:00	- - -	07:18 pm MST	81%
WICHITA, KS	07:26:34	08:29:45	- - -	08:37 pm CDT	77%

2012 WEATHER

There is no doubt about where the best weather resides for the path of annularity for the eclipse on 2012 May 20-21, it is the USA, and more specifically in the desert regions of the southwest. This can be realized from the graph below prepared by eclipse weather authority Jay Anderson.

Only 2 weeks later and not that far removed is the weather for the Transit of Venus on 2012 June 05-06, for which the best location for the entire transit is northern Australia, and eastern Greenland. The best area for viewing weather prior to sunset is again the desert southwest in the USA, and after sunrise is northern Africa and the Arabian countries, in the Arabian Peninsula, Iraq, Iran and Afghanistan.

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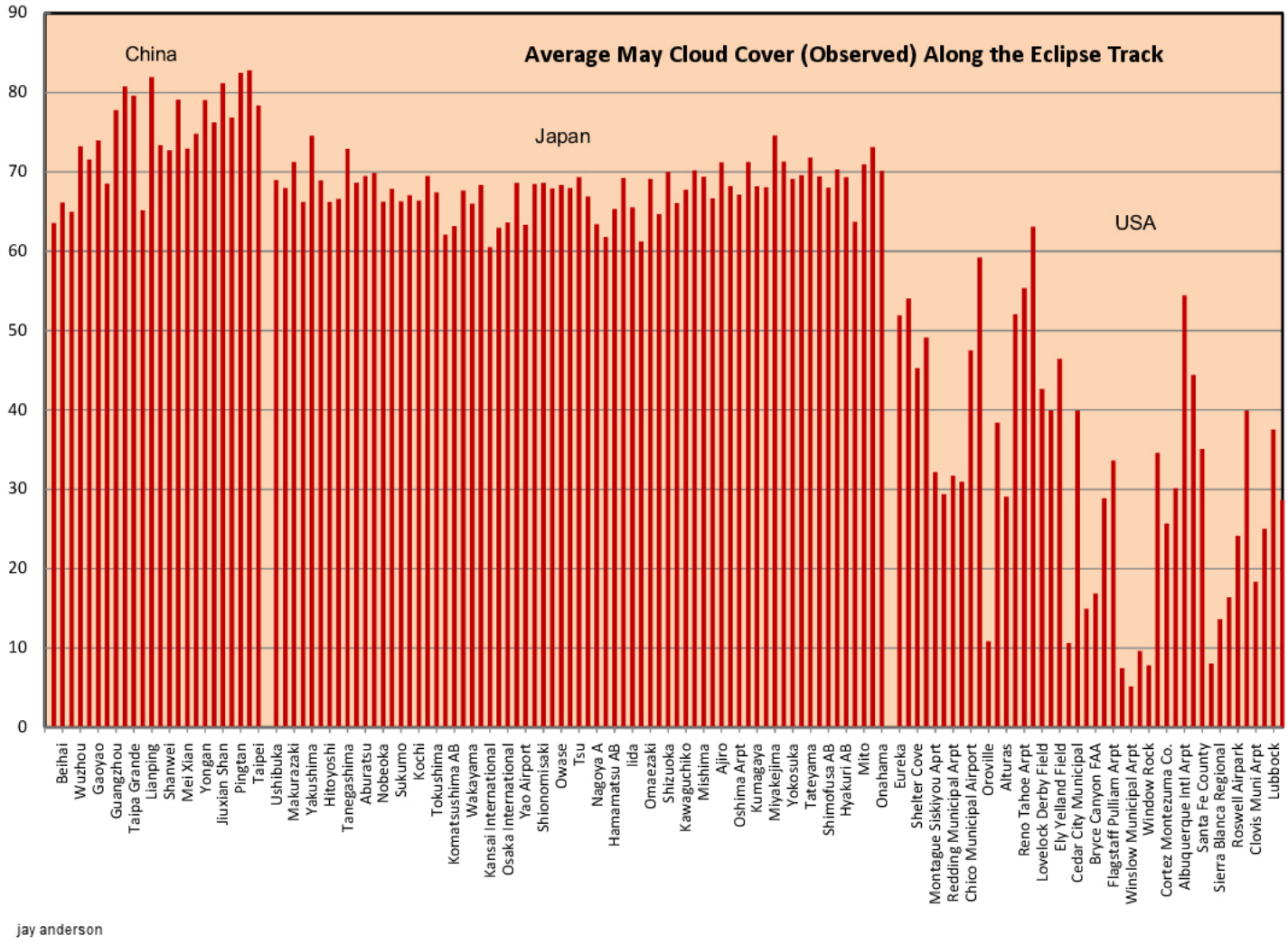


This graph tells the story of the best locations along the path of annularity for the 2012 Annular Solar Eclipse. Graph used with permission of Jay Anderson

For more detailed information, please refer to Jay Anderson's site @ http://home.cc.umanitoba.ca/~jander/

ASE PHOTOGRAPHY

Shooting a *Total* Solar Eclipse, there are the partial phases, and the total phase, but during an *Annular* Solar Eclipse there is, of course, is no total phase. This means that taking the your photos is easier since you don't have to worry about taking the solar filter off and replacing it at the right points in time. There could be instances where thin clouds or haze may allow the bright Sun to be filtered enough where you can snap of a series of exposures to capture it without a filter, but use great precautions in viewing through the camera since much of the harmful light from the Sun is still present. You will, however, need to adjust your exposure times slightly as the Moon progressively covers more and more of the Sun, mostly during the hour closest to maximum eclipse when the Moon covers $^{2}/_{3}$ or more of the Sun; if you are observant, you should be able to pick up on the difference visually. As we get just past 2nd contact or closer to 3rd contact, the larger side of the Sun will definitely be brighter than the slender side, giving a bit of an unbalanced exposure, but that is just the nature of things.

PINHOLE PROJECTIONS

Some of the more fascinating images that are visible from an annular eclipse that is not possible during a total eclipse can be from the effect caused by pinhole projections during annularity. The ring of sunlight around the dark moon will be able to be seen using pinhole projections. Look for this around trees, or, if you are in the desert southwest, take along a straw hat with several pinholes in it, or a cheese grater. I have a wok strainer I use; anything with smallish holes in it will do, and take a picture with your little point-and-shoot camera while facing away from the Sun itself toward the projected pinhole images (likely you will want the flash to be turned off though.)

Jay Pasachoff demonstrating using a cheese grater for projecting pinhole images of the eclipsed Sun (Courtesy Jay Pasachoff)

IMAGING THE CHROMOSPHERE & BAILY'S BEADS

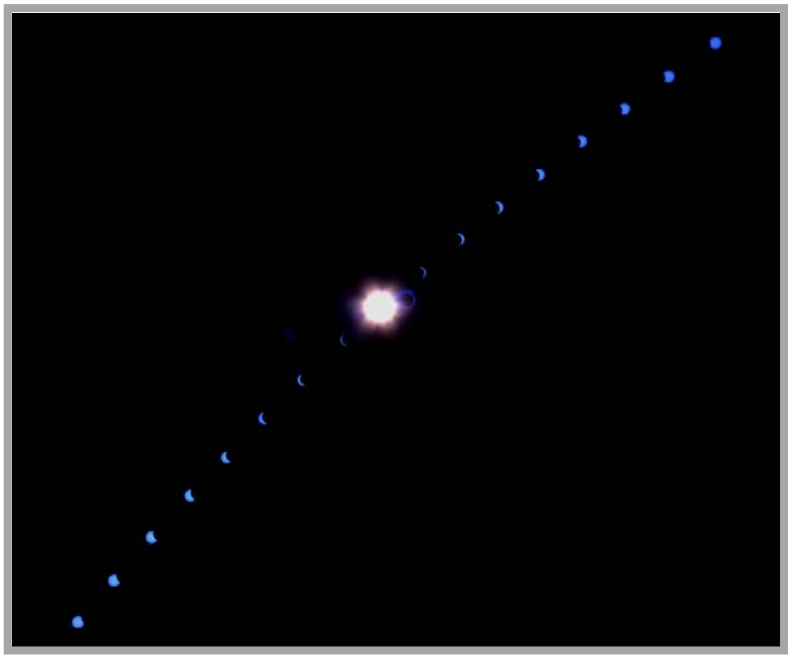
In the last several years a few eclipse photographers have been using telescopes to image the chromosphere and prominence activity during annular eclipses. This is done by using a telescope at moderate magnification to take images as the trailing edge of the Moon moves across the Sun between the transition points. Others set up just inside the northern or southern limits of the path of annularity. This can be very dangerous to your eyes or equipment if not careful, and if you wish to do this type of photography I encourage you to look further into the subject. Usually a piggybacked telescope is used for monitoring the positioning of the main instrument where a filtered instrument can be used. To maximize your observations, attach a video camera to your equipment to allow a continuous record of the complete event. The edge of the Moon can be graphed out rather well when Baily's Beads are recorded in this manner. Likely you will need to use a manual exposure setting as auto mode will overcompensate greatly for the brightness of the Sun and make your image too dark to see any chromosphere while eliminating the smallest of beads.

MULTIPLE EXPOSURE ECLIPSE SEQUENCE PHOTOGRAPHY

This is where we are going to focus much of our attention; making a successful multiple exposure image. It is somewhat challenging, but with today's digital cameras and a little simple Photoshopping, the iconic multiple-exposure eclipse image can be produced, and you don't have to be on the centerline to create a good image either.

Photos of eclipse sequences can often be found on magazine covers and they can sum up much of the entire eclipse in a single picture. To compose this picture, if you can try to find some landscape scenery that would be really set your image apart from others. *Once upon a time* . . . eclipse photographers had to expose a single frame of film several times manually at the correct moment of time using a stop watch, and you could not bump the tripod, or the whole thing was ruined. It became more complicated if you did not have any help and were trying to do close-up images through a telescope at the same time, and missed your interval. For total eclipses, you would have to take the filter off at mid-eclipse, take a frame, and replace the filter and continue to take filtered images until the end of the eclipse, again, all without moving the camera. You would not know if you succeeded until after the film was developed.

Then, in 1990, Adobe introduced Photoshop. Soon after, astrophotography (which in itself has been very instrumental in creating new and different methods of imaging,) would be able to take individual images and then stack them together into one image. Although you can now composite anything together, I encourage you to be true to your location, which makes your image that much more realistic. Nothing sets me off more than an image I know was impossible because it was not a total eclipse from the monument that is in the foreground.



My first successful attempt at a multiple frame eclipse sequence was one actually done for ASE1984 on a single frame of Ektachrome film using a Mamiya 645 camera, whose lens barely would allow the entire sequence if I oriented the camera at an angle to run diagonally across the frame.

I removed the mylar filter to capture maximum eclipse, and even though the Sun was 99.54% obscured, it was still very bright, and caused the internal reflections, which shows the broken ring best at mid-eclipse (May's eclipse will be nearly 88% obscured at most, so it will be much brighter than this image shows). I recently made a fixed image of this sequence that shows how it would have looked if I had left the filter in place during mid-eclipse; you can see it at:

http://www.pbase.com/photographerlarry/image/140177084

Select a lens that the entire eclipse will be visible through from start to finish; and additionally one frame before and one frame after the partial phases (assuming they do not coincide). If I do not know the actual angle of the camera lens's field, I will take some photos at night, just some simple 30 second exposures or less on a tripod; then I compare them with that of a star chart. You can determine the altitude and azimuth of the eclipse from C1 to C4 and you can determine if your lens will allow it to fit. It is important to make each image at the same interval of time; the most popular is a 10-minute period, which leaves just the right amount of space between frames. Today's DSLRs can easily be programmed to take a series of frames, and also to take a series of bracketed images that can later can be selected for the best

exposure and stacked together in Photoshop to make the completed image. You should bracket your exposures so when the Sun is low to the horizon it will be properly exposed. For your location determine when mid-totality (to the nearest minute) will be, then count backwards in 10 minute intervals until you arrive at or before 1st contact, and count forward until 4th contact or after. Now you can count the number of intervals that you will have to program your camera for.

Observers along the path of annularity in southeast China will be able to position their cameras with the foreground landscape in the image since the eclipse happens when it will be low to the horizon as it occurs shortly after sunrise. Although I am not familiar with this coastal area, there are lots of islands and parks here, and I am sure there is also some vantage point looking to the east-northeast with a view of the buildings in Hong Kong that could make a great image; just remember that the central phase of the eclipse occurs with the Sun about 5° above the horizon, and climbs to only 20° by the end of the eclipse, so take your building images before sunrise, then you can composite them in your sequence image later. Haze may also play a role into your filtering for the eclipse from this location. Shanghai is about 200 kilometers off the path of annularity, however the entire eclipse is visible from there and the obscuration is over 81%, and the eclipse ends with the Sun 32° above the horizon.

In Japan, the eclipse will be higher in the sky and will be visible in its entirety, which will last for about 2h 42m. However, taking an image of the sequence will require a wide angle lens, especially if you wish to include any foreground subject in your photograph. Slightly off the centerline, but still within the path of annularity is Japan's most iconic location, Mt. Fuji. Imagine a sequence above this amazing stratovolcano with a significant amount of snow on its peak as spring melds into summer. Unfortunately, the cherry blossoms will be past their prime and no lake will be in the foreground to reflect the mountain in as they are to the north, not facing the eclipse since you will have to locate in to the southwest of Mt. Fuji. The Pacific coast is also another wonderful location for your eclipse sequence in Japan from Minamisoma to Choshi.

In North America, anyone west of a line from San Clemente, California, to just west of Winnipeg, Manitoba, and continuing into Hudson Bay will get to view the entire eclipse before sunset. The eastern coast of North America misses the eclipse entirely as the Sun will be set before it reaches them, but all others will get to view varying portions of the eclipse. The coastal and desert southwest of the U.S. is full of amazing scenery that can be used as a foreground object where the path of annularity is visible. For ASE2012, there are loads of great locations to take advantage of along the path of annularity, from the California shore to the Shiprock monument and beyond, several, but certainly not all, have been noted in this issue. Also consider Devil's Tower in eastern Wyoming where the Sun will be 68% obscured at mid-eclipse, and sunset occurs just before last contact. Not far off the path of annularity you could do a multiple exposure from Arches National Park if you could find the right arch to shoot it through and the right camera position where the Sun will be over 9° above the horizon and nearly 86% obscured at mid-eclipse. For that matter it can be a farm field with a foreground farmhouse and silo. Look around your area and find something that will work well as a subject and use it for the foreground, or travel to somewhere that will work better (remember that you will be shooting your composite image of the foreground after sunset, unless you are somewhere where there is a lot of haze of light clouds.)

Test your ability to do the sequence you want ahead of time from your back yard, you may not have the same orientation, but at least you will have done a run through ahead of time to work out any problems figuring out the camera's settings if you have never used these functions beforehand. Issue 8 of TOTALITY! featured Geoff Sims's multiple image above his viewing site in western Mongolia for TSE2008, and on page 26 of that issue it describes the exposures and equipment he used, the

difference here is the exposure at mid-eclipse was without the solar filter since it was a total eclipse, and your foreground image will be either before or after sunrise/sunset, depending on your location.

With today's equipment, it is easier taking individual images of the eclipse as it progresses. This can be done using the built-in interval system in your camera. Also, use your bracket function if it is available. These can usually take up to 9 steps in 0.3 (1/3) stop, 0.7 (2/3) stop or full stop intervals. Set your camera to take images at 5-minute intervals. This may be too crowded for what you want as a final image, but this gives you the ability to build the image in Photoshop either or both ways. Usually 10-minute intervals are the best, but if you are in a location where you only see half of the eclipse, it will allow you to use a slight telephoto lens and zoom in more, which will give you more room in your image to let this work well at the 5-minute interval timeframe. You likely will end up with hundreds of images, but those that are not of any value can be discarded, and it does not cost you a thing but the time to delete them. Since you will be taking separate images for each frame of the eclipse, there is no real rule against taking several shots of different landscape positions, but I encourage everyone to be true to your location. By this I mean don't build a photo with the eclipse sequence with your foreground subject being Palomar Mountain, since Palomar is not where annularity was visible; it should be something that was within a few steps of your viewing location.

No matter where the landscape scene is, you might consider having your setup there all day and catching your scenery as before and just after sunrise, as well as before and after sunset. Some of your exposures could render the scenery dark like a silhouette, but could also be exposed to lighten the subject, so just like your eclipse pictures, vary your exposures to capture the foreground landscape best, and you will have a wide selection of images to choose from to build the very best image you can.

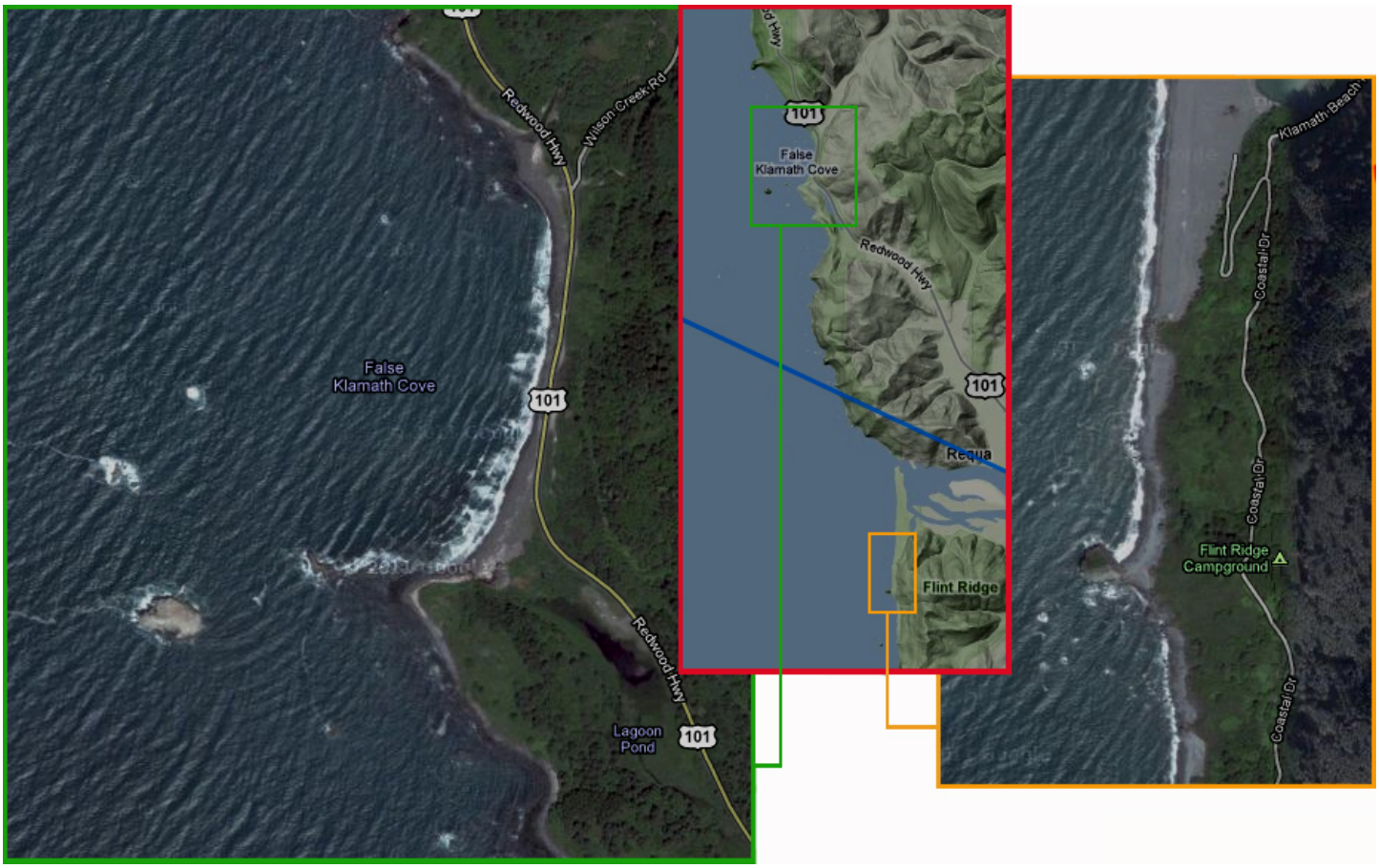
Do not bother to do a series at mid-eclipse with the filter off; you will just end up with images with terrible lens flare like that of my photo during ASE1984, but likely much worse. If however you are doing a series at a total solar eclipse, you definitely want to take time to do this. You will be doing this with your camera steps anyway, but during a total, you will need to remove your filter for the total phase, and since you are doing several steps then, you can even combine all of your images together during the steps to create a more realistic image rather than one that is washed out too much.

Here is a list of things that could help;

- Take your camera to the back yard and set it to manual mode, put your filter on, focus and position the camera and take a series of test exposures of the Sun to determine the optimal exposure for this camera and lens. Keep in mind, the exposure may change as the Sun gets closer to the horizon or is eclipsed or is filtered by a cloud. I recommend you set your camera to bracket in full stop increments.
- Determine at what times your shots need to be taken and use a 5-minute interval. The start and end times should be determined by the point of mid-eclipse
- Dedicate a camera and a tripod to the task of your multiple exposure imaging and set it up where nobody will come close to it. Rope it off if you have to in order to keep people, including yourself, away from the camera.
- Set up at a landscape you have determined is scenic and find where the Sun will be setting according to the azimuth (0^o starts in the north, and the circle sweeps around clockwise, so 90^o is east, 180^o is south, and 270^o is west). Be sure not to block your Sun sequence with your selected landscape.
- Determine the field of view of the series of shots you need.
- If you set your optimum exposure at 1/250 sec, you will take exposures of 1/15, 1/30, 1/60, 1/125, 1/250, 1/500, 1/1000, 1/2000, and 1/4000.
- If the eclipse were to last 3 hours, with 9 steps and 37 increments from the very start of the eclipse, you would have a total of 333 images, plus those for the scenery.
- Compute the extent in azimuth that the eclipse will subtend and use the maximum value of the altitude to determine if it will fit in your lens.
- You can experiment further by doing a series for the Moon.

EXAMPLE SEQUENCE

A few miles south of Crescent City, California, the centerline comes ashore at the mouth of the Klamath River. Now picture yourself camping at Flint Ridge Campgrounds (where there are 11 campsites, and they are free of charge), part of the Redwood National Park and on a ridge overlooking the Pacific Ocean where the beach lies some 450' below. This is a short distance off of Highway 101 near the town of Klamath. You set up your campsite and then drive down to the beach below and check out the sea stacks, one 2/3 mile south of the mouth of the Klamath River, and another about 2/3 mile further south. Then head back to the Redwood Highway (101) and travel north 7 miles to the False Klamath Cove; just offshore you will find a collection of sea stacks here. There may be other equally good or better locations; I am just using this as an example as they are the nearest to the centerline. Remember, these are just two locations of hundreds across the western U.S. and Canada, whether it is an annular where you are, or just a partial eclipse.



You need to find the best location where the sea stack(s) will not obscure your view of the eclipse, and also not overwhelm the photo as this is your secondary subject, the eclipse being your primary subject, of course. We look up the eclipse stats on Xavier Jubier's 5K Eclipse Database[1] and get the specifics for your exact location. The values in the box are general values taken directly from the centerline where it comes ashore just north of the mouth of Klamath River, and equal distance between these two sites, and any differences will be very slight, and not really worth that much precision.

Your camera lens will need to have a total angle of 50^{o} or more in the orientation you like best so your image will have some room to breathe, you don't want to pack it full if you can help it, and you can always crop the image later if you have too much; just remember, the wider the lens, the smaller your

images of the Sun. Before the Sun enters your field of view, place your foreground object in the bottom portion of the frame, which would be different depending on the orientation you selected. We will center the sequence at mid-eclipse and work backward from that to the beginning, and forward until the end of the eclipse (or the horizon for those where the whole eclipse is not visible. Since mid-eclipse occurs at 6:27pm, for the first half of the eclipse, decrement 5 minutes from there until you arrive at the start time either just before or on that time, and the same for the last half of the eclipse, by incrementing by 5 minutes. This will give you the sequence for an image once every 5 minutes. Many prefer to have an image every 10 minutes as the frame is not packed quite so full, but since we now live in the digital age of photography, take a frame every five minutes, and then you can make both versions in Photoshop and see which you like best.

Eclipse begins @ 5:08:30pm, AZ=265.5°, ALT=36.3°
Mid-eclipse @ 6:26:46pm, AZ=278.3°, ALT=21.7°
Eclipse ends @ 7:35:33pm, AZ=288.9°, ALT=9.2°
8:18pm – Sunset

Compute the total field of view the sequence will require;
Azimuth from 265.5° to 288.9° which equals a total of 23.4°
Altitude from 36.3° to 09.2° which equals a total of 26.9°
(since we want to get the entire sequence and the scenery in the image below the horizon, you will need a lens that will allow at least a 50° field of view in the orientation you like best since it has to show more than 36° above the horizon)
Your images will be taken at these times;
5:07 (first image) / 5:12 / 5:17 / 5:22 / 5:27 / 5:32 / 5:37 / 5:42 / 5:47 / 5:52 / 5:57 / 6:02 /6:07 / 6:12 / 6:17 / 6:22 / 6:27 (mid-eclipse) / 6:32 / 6:37 / 6:42 / 6:47 / 6:52 / 6:57 / 7:02 / 7:07 / 7:12 / 7:17 / 7:22 / 7:27 / 7:32 / 7:37 (last image)

Total of 31 intervals
Times listed above are in Pacific Daylight Time (PDT)

In the box above is the pertinent information for your multiple phase sequence and all of these must be taken with a safe solar filter firmly attached to your camera lens. There is one set of frames missing from this sequence however, and it is the series of shots of the landscape, it is why you located yourself here. You will want to take some exposures at mid-eclipse without a solar filter, just do not look through the viewfinder. If you have a "Live View" function, you may want to use this, otherwise just take a series of exposures and you can view them as they are taken, and bracket your shots so you will have a good one to pick from later. Also, keep your camera in place until well after sunset, where you can take additional sets of images to pick from for a good landscape image to be combined later with your multiple Sun images. Easily some of the best shots could come up to a half hour after sunset. For locations east of Utah, the Sun will set before fourth contact, and mid-eclipse comes at sunset in northwestern Texas. From here you only have exposures that lead up to mid-eclipse, but you still need to take your landscape shots then and after sunset.

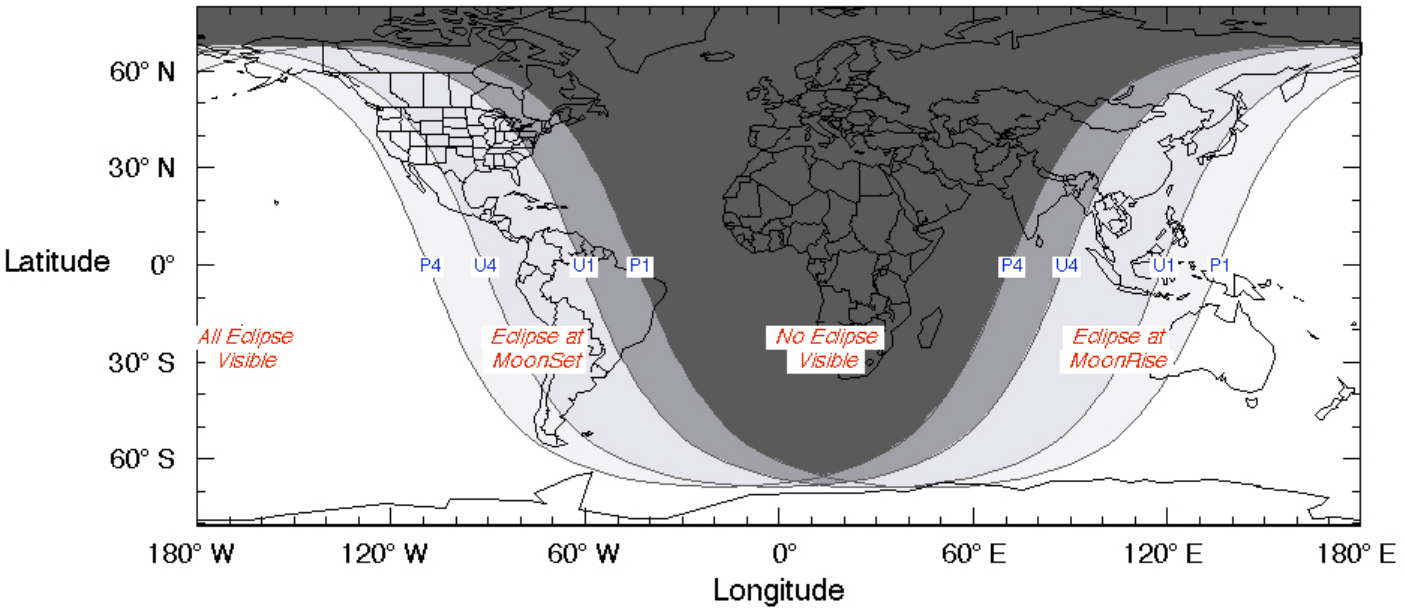
A FEW SUGGESTED LOCATIONS THAT WILL MAKE A GOOD MULTIPLE EXPOSURE ECLIPSE SEQUENCE

LOCATION	C1 / Mid / C4	Altitude	Azimuth	Max Obscuration
SHANGHAI, CHINA	05:15:03 am CST	+03°	068°	
	06:19:43 am CST	+16°	076°	81%
	07:33:12 am CST	+32°	084°	
MT. FUJI. JAPAN	06:18:18 am JST	+19°	078°	
	07:33:00 am JST	+34°	088°	83%
	09:00:09 am JST	+52°	102°	
MT. RAINIER, WA	05:03:11 pm PDT	+35°	263°	
	06:19:14 pm PDT	+22°	277°	78%
	07:27:08 pm PDT	+11°	288°	
GOLDEN GATE BRIDGE SAN FRANCISCO, CA	05:15:49 pm PDT	+34°	270°	
	06:32:37 pm PDT	+19°	282°	84%
	07:39:54 pm PDT	+06°	291°	
OLD FAITHFUL GEYSER YELLOWSTONE NP, WY	04:14:23 pm MDT	+26°	274°	
	05:24:11 pm MDT	+13°	285°	74%
	06:27:09 pm MDT	+03°	296°	
DEVILS TOWER NM, WY	04:17:00 pm MDT	+21°	278°	
	05:23:21 pm MDT	+09°	289°	68%
	06:23:46 pm MDT	00°	300°	
CHIMNEY ROCK NHS, NE	04:20:57 pm MDT	+19°	281°	
	05:26:55 pm MDT	+07°	291°	73%
	06:26:52 pm MDT	- 03°	301°	
ARCHES NP, UT	04:22:39 pm MDT	+22°	279°	
	05:31:59 pm MDT	+09°	289°	86%
	06:34:09 pm MDT	- 02°	298°	
METEOR CRATER, AZ	06:27:06 pm MST	+22°	280°	
	07:36:46 pm MST	+08°	289°	87%
	08:38:50 pm MST	- 03°	298°	

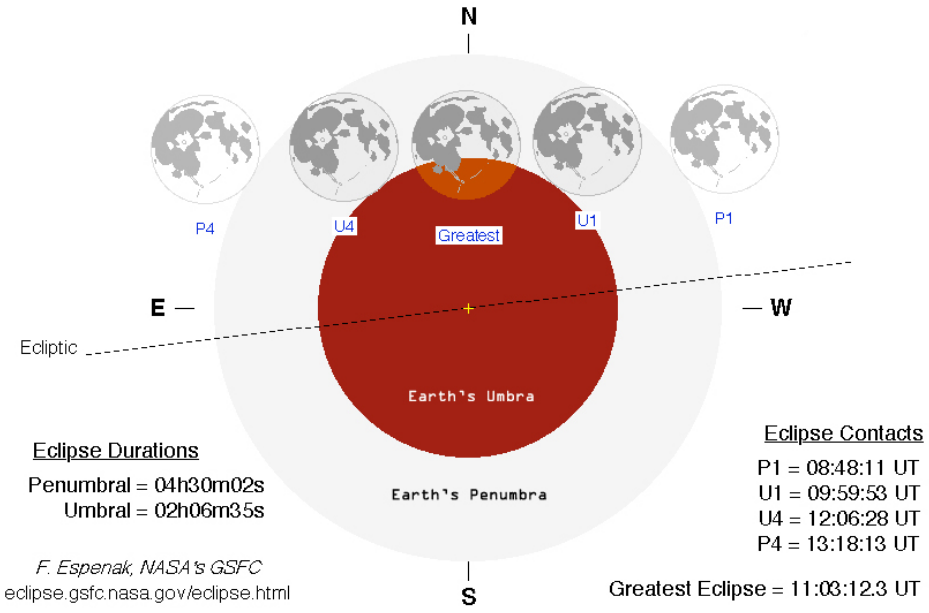
Values where the Sun is below the horizon are indicated in red

- Partial Lunar Eclipse -
- 2012 June 4 & 5 -

With the annular eclipse past, just one-half lunation later the Moons orbit is still near the node, which this time places the Moon into a partial lunar eclipse. The southern edge of the Moon will pass through the northern umbra of the Earth's shadow, and at maximum will be 37% eclipsed. Like the annular eclipse, the lunar eclipse will best be visible over the Pacific basin, so observers in eastern Australia, New Zealand, Papua New Guinea, Hawaii, southwestern Alaska and Antarctica will get to see all of the eclipse starting and ending with the penumbral phases. Observers who got to see annularity in China, Japan, and the U.S. will get to see most of the eclipse, perhaps missing a small amount of the penumbral phases. Greenland, Africa, Europe, most of Russia and western Asia will, however, see no eclipse at all.



Charts courtesy Fred Espenak, NASA/GSFC



Transit of Venus
2012 June 05-06

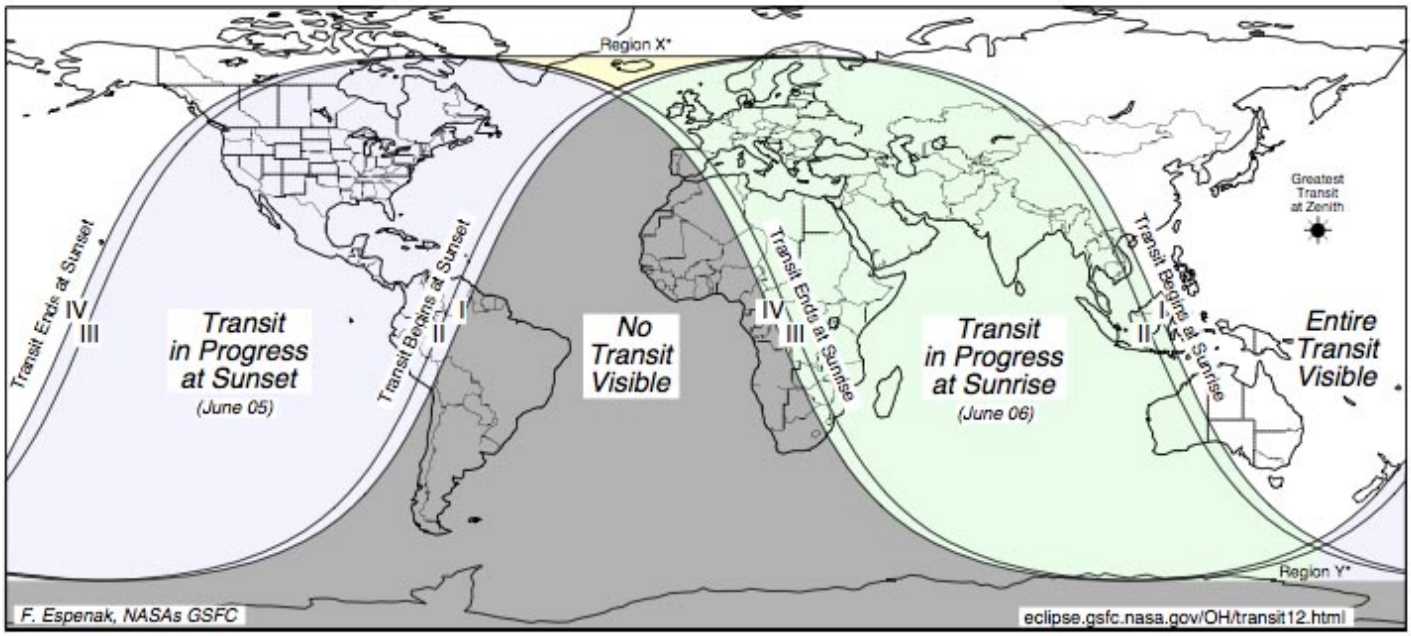
The transit of Venus is an annular solar eclipse in miniature. Venus subtends 57.8 seconds of arc, or 32x smaller than what it takes to cover the entire Sun, however it is large enough to be visible without a telescope using only a safe solar filter or "Eclipse Glasses." The partial lunar eclipse occurs just 2 days before the transit of Venus, which occurs on 2012 June 05-06, and happens over the Pacific basin; it is very similar to the area covered by the lunar eclipse, with one primary exception: instead of being visible from the Antarctic, instead, it is visible in the Arctic region. This is the last transit of Venus for 105 years when a pair of transits occur on 2117 December 11, and again on 2125 December 08. All transits of Venus come in pairs, and the 2012 transit is the 2nd of this pair; the first occurred on 2004 June 08.

Eastern Russia, China, and Australia, and all of Mongolia, Japan, Papua New Guinea, Hawai'i, Alaska, Yukon, and parts of British Columbia and the Northwest territories, part of Nunavut, and the northernmost region of Scandinavia will be well placed to see the entire transit, which lasts over 6½ hours from start to finish, depending on your location. Iceland is actually in a region where the transit begins before sunset on June 5th, the Sun sets, then rises and the end of the event is visible after sunrise on the 6th.

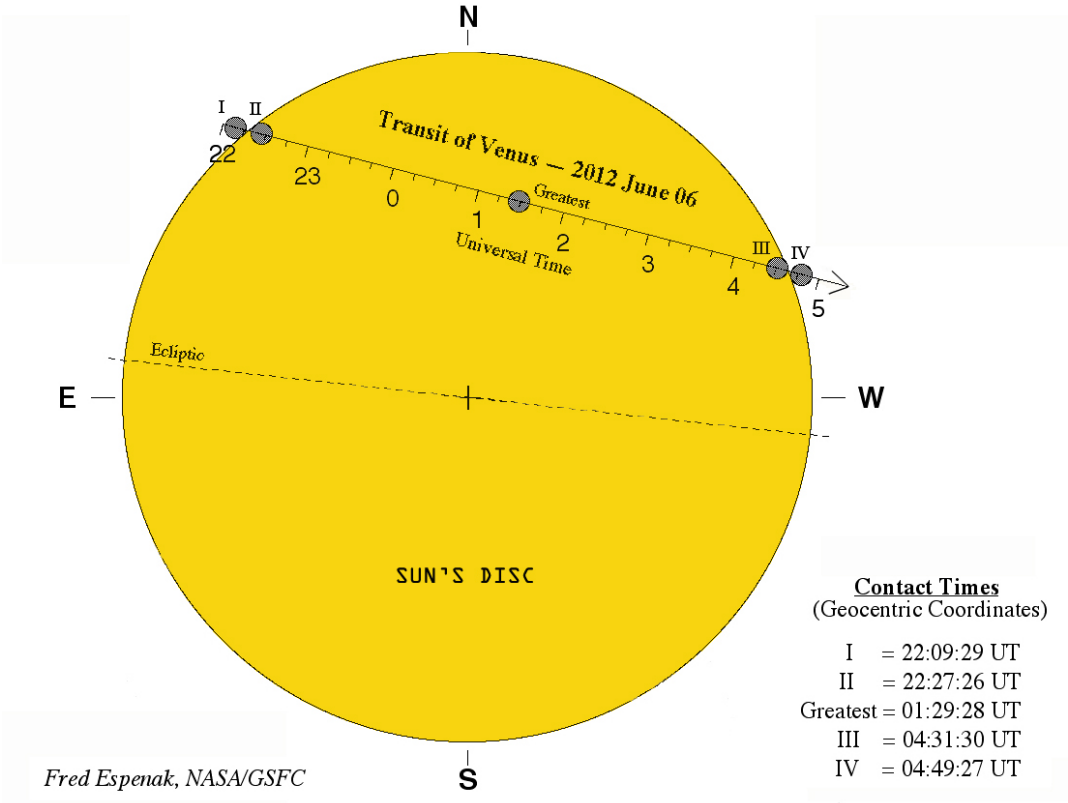
You must have a safe solar filter to observe using a telescope or binocular in white light where, as for a solar eclipse, you will not be able to actually see the exact moment of 1st or 4th contacts. If you have a Hα solar telescope, you should be able to view the dark disk of Venus as it obscures the bright solar prominences, chromosphere, and the innermost corona, until it touches the edge of the solar disk, and several hours later when it repeats these steps in reverse sequence.

Much of the world gets an opportunity to see at least a portion of the transit with the exception of Antarctica, two-thirds of southeastern South America, and one-third of southwestern Africa. Those located west of the International Date Line will observe the event starting on June 06, and those found east of the International Date Line will observe the event starting on June 05.

Global Visibility of the Transit of Venus of 2012 June 05/06



* Region X - Beginning and end of Transit are visible, but the Sun sets for a short period around maximum transit.
* Region Y - Beginning and end of Transit are NOT visible, but the Sun rises for a short period around maximum transit.



One of the best places on Earth to observe the transit is atop Mauna Kea on the big island of Hawai'I where the world famous astronomical observatory exists at 13,796 feet (4200m). Since there are a few tours scheduled to observe from Mauna Kea in Hawai'i, and because of its central location for viewing, I am listing the circumstances here, however Prof Jay Pasachoff reminds me that it is a location where it is very cold and windy, and on the top of the mountain the oxygen levels make it difficult to function without precautions. Those observing lower on the mountain may have better chances of success, even though it may be a small difference. Another alternative is to view on the neighboring island of Maui at 10,023 feet (3055m) on Haleakal• volcano, but wind may still be a factor. Only 15 minutes after the transit ends, you will be able to experience a fantastic sunset, assuming skies have been clear to this point.

Using Xavier Jubier's Venus Transit Calculator (http://xjubier.free.fr/en/site_pages/VenusTransitCalculator.html), here we are displaying the local circumstances for those viewing from Mauna Kea in Hawai'i and Reykjavik, Iceland;

MAUNA KEA OBSERVATORY / HAWAII – Local Circumstances

EVENT	Local Time*	Alt	Az	Pos∠
Sunrise	**05:42 am HST on June 05**			
1st Contact	12:10:09 pm HST on June 05	86.3°	040.0°	40°
2nd Contact	12:27:40 pm HST on June 05	86.7°	330.1°	38°
Maximum	03:26:13 pm HST on June 05	48.6°	282.4°	345°
3rd Contact	06:26:37 pm HST on June 05	06.2°	291.9°	292°
4th Contact	06:44:29 pm HST on June 05	02.3°	293.3°	289°
Sunset	**07:00 pm HST on June 05**			

* Hawai'i does not observe Daylight Savings T

Notice that there are slight differences in the times and durations of the events depending on your location on the Earth. Use Xavier Jubier's Venus Transit Calculator to determine the best times for your location.

REYKJAVIK / ICELAND – Local Circumstances

EVENT	Local Time*	Alt	Az	Pos∠
1st Contact	22:03:37 pm GMT on June 05	05.2°	314.2°	41°
2nd Contact	22:21:10 pm GMT on June 05	03.9°	318.1°	39°
Sunset	**23:44 pm GMT on June 05**			
Maximum	01:28:36 am GMT on June 06	-03.2°	0.5°	345°
Sunrise	**03:09 am GMT on June 06**			
3rd Contact	04:36:05 am GMT on June 06	04.3°	43.0°	291
4th Contact	04:53:39 am GMT on June 06	05.6°	46.8°	288

* Iceland does not observe Daylight Savings Time

Now Booking: 2012 Annular Solar Eclipse

Annular eclipse plans under consideration, total eclipse plans for 2012 are online
Scientific expert: Prof Jay Pasachoff

Annular Solar Eclipse & the Transit of Venus

http://astro-expeditions.com/Annular%202012.aspx
May 20 to June 07, £N/A, 19 day tour
Arrive: Las Vegas, Nevada – Depart: Kona, Hawaii

Annular Eclipse USA

http://www.astro-trails.com/index.php/itinerary/?i=annular-eclipse-tour
May 18 to May 28, £1145.GBP / $1832.USD / $1718.AUD / €1317.EUR, 11 day tour
Arrive: Las Vegas, Nevada – Depart: Los Angeles, California
View the eclipse from Horseshoe Bend near Page, Arizona - Annularity duration: 4m 27s

Annular Eclipse & San Francisco

http://www.astro-trails.com/index.php/itinerary/?i=annular-eclipse-and-san-francisco
May 18 to May 31, £1315.GBP / $2104.USD / $1873.AUD / €1512.EUR, 11 day tour
Arrive: Las Vegas, Nevada – Depart: San Francisco, California
View the eclipse from Horseshoe Bend near Page, Arizona
Airfare from Los Angeles, California to San Francisco, California is not included

Annular Eclipse & Transit of Venus 2012

http://www.astro-trails.com/index.php/itinerary/?i=annular-eclipse-and-the-transit-of-venus
May 18 to June 06, £1745.GBP / $2792.USD / $2618.AUD / €2007.EUR, 20 day tour
Arrive: Las Vegas, Nevada – Depart: Hilo, Hawaii
View the eclipse from Horseshoe Bend near Page, Arizona
Airfare from Las Vegas, Nevada to San Francisco, California is not included and
Airfare from San Francisco, California to Hilo, Hawaii is not included

Betchart Expeditions INC.

Discover the Grand Canyon & see the Annular Solar Eclipse
http://www.solareclipsetrips.com/na-canland_2012.htm
May 18 to May 24, $3695.USD and up, 8 day tour
Arrive: Las Vegas, NV – Depart: Las Vegas, NV
View the eclipse from Grand Canyon National Park, Arizona

·clipse city

USA Southwest & Eclipse (may also have an extension to Hawaii for the Transit of Venus)
http://xjubier.free.fr/eclipse-city_tours/Solar_Eclipse_Tours.html
Contact Xavier Jubier for details through the link shown here
A la carte from Los Angeles and/or Las Vegas (and Mauna Kea, Hawaii)

explorers

U.S. National Parks
http://astronomytours.co.uk/tours/us-national-parks
May 12 to May 25, $4198.USD and up, 14 day tour
Includes round trip airfare from London, England (or $3288.USD without airfare)
View the eclipse from Bryce Canyon National Park, Utah

U.S. Observatories & Eclipse
http://astronomytours.co.uk/tours/us-observatories-and-eclipse
May 17 to May 03, $4741.USD and up, 18 day tour
Includes round trip airfare from London, England (or $3936.USD without airfare)
View the eclipse from Bryce Canyon National Park, Utah

U.S. Annular Eclipse
http://astronomytours.co.uk/tours/us-annular-eclipse
May 18 to May 24, $3223.USD and up, 7 day tour
Includes round trip airfare from London, England (or $1923.USD without airfare)
View the eclipse from Bryce Canyon National Park, Utah

EXPLORE!

USA Annular Eclipse Tour
http://www.exploreworldwide.com/holidays/details/usa-annular-eclipse-tour
May 12 to May 25, $1599.USD and up, 14 day tour
Arrive: Los Angeles, California – Depart: Las Vegas, Nevada
Viewing near Monument Valley Navajo Tribal Park, Utah/Arizona –
Eclipse Duration: Slightly under 4m

US Annular Eclipse
http://www.grandamericanadventures.com/tours/us-annular-eclipse.html
May 18 to May 23, $1809.USD, 6 day tour
Arrive: Las Vegas, Nevada – Depart: Las Vegas, Nevada
View the eclipse from Bryce Canyon National Park, Utah
Astro Guide: Dr. John Mason

Arizona & New Mexico Annular Eclipse
http://www.melitatrips.com/destinations/2012/annulareclipse/arizonanewmexico2012.html
May 17 to May 23, N/A, 7 day tour
Arrive: Phoenix, Arizona – Depart: Albuquerque, New Mexico
View the eclipse near Canyon de Chelly National Monument
Airfare is included from select gateway cities - Astro Guide: Dr. Alex Filippenko

Annular Eclipse of the Sun over the American Southwest
http://www.eclipsetours.com/2012ase.html
May 15 to May 22, $1599.USD and up, 8 day tour
Arrive: Las Vegas, Nevada – Depart: Las Vegas, Nevada
View the eclipse from Zion National Park, Utah – Eclipse Duration: 4m 29s

Annular Eclipse 2012
http://www.siriustravel.com/southwest/2012_SW_contract.pdf
May 14 to May 23, $3650.USD and up, 10 day tour
Arrive: Albuquerque, New Mexico – Depart: Tucson, Arizona
View the eclipse from Horseshoe Bend near Page, Arizona – Annularity duration: 4m 27s

South America Classic Tours

Annular Eclipse Tour 2012 USA

http://www.solar-eclipse-tours.com/index.php?option=com_content&view=article&id=60&Itemid=70

May 15 to May 28, €3890.EUR and up, 14 day tour
Arrive: Albuquerque, New Mexico – Depart: Tucson, Arizona
Viewing from Chaco (Canyon) Cultural National Historic Park – Pueblo Bonito ruin – Annularity duration: 4m 11s

travelNation
Round the World and Adventure Travel Experts

US Annular Eclipse

http://www.travelnation.co.uk/cgi-bin/search.pl?id=9806&continent_id=6

May 18 to May 23, £1099.GBP, 6 day tour
Arrive: Las Vegas, Nevada – Depart: Las Vegas, Nevada
View the eclipse from Bryce Canyon National Park, Utah - Astro Guide: Dr. John Mason

US National Parks and Eclipse

http://www.travelnation.co.uk/cgi-bin/search.pl?id=9807&continent_id=6

May 12 to May 24, £1879.GBP, 13 day tour
Arrive: Las Vegas, Nevada – Depart: Las Vegas, Nevada
View the eclipse from Bryce Canyon National Park, Utah - Astro Guide: Dr. John Mason

TRAVELQUEST
International

Arizona / New Mexico Astronomy & Annular Eclipse – Program 1 (Presently waitlisted)

http://www.travelquesttours.com/AZNMSkies2012/Arizona_New_Mexico_2012_Itinerary.htm

May 14 to May 25, $3590.USD and up, 11 night tour
Arrive: Tucson, Arizona – Depart: Albuquerque, New Mexico
Viewing from Chaco (Canyon) Cultural National Historic Park – Pueblo Bonito ruin – Annularity duration: 4m 11s

Arizona / New Mexico Astronomy & Annular Eclipse – Program 2

http://www.travelquesttours.com/AZNMSkies2012/Arizona_New_Mexico_2012_Itinerary.htm

May 15 to May 27, $3890.USD and up, 12 night tour
Arrive: Albuquerque, New Mexico – Depart: Tucson, Arizona
Viewing from Chaco (Canyon) Cultural National Historic Park – Pueblo Bonito ruin – Annularity duration: 4m 11s

Tropical Sails Corp

China Annular Solar Eclipse

http://tropicalsails.com/China_Annular_Solar_Eclipse_Tour_2012.pdf

May 06 to May 25, $3895.USD and up, 19 day tour
Arrive: Beijing, China – Depart: Shanghai, China
Price includes 4 domestic flights
View the eclipse from Guangzhou, China

Now Booking: 2012 Transit of Venus

ASTRO EXPEDITIONS

Annular Solar Eclipse & the Transit of Venus

http://astro-expeditions.com/Annular%202012.aspx

May 20 to June 07, £N/A, 19 day tour
Arrive: Las Vegas, Nevada – Depart: Kona, Hawaii

ASTRO TRAILS

Transit of Venus Hawaii

http://www.astro-trails.com/index.php/itinerary/?i=transit-of-venus-hawaii-2012-1

May 31 to June 06, £875.GBP / $1400.USD / $1313.AUD / €1006.EUR, 7 day tour
Arrive: Hilo, Hawaii – Depart: Kona, Hawaii

San Francisco & Transit of Venus Hawaii June 2012

http://www.astro-trails.com/index.php/itinerary/?i=san-francisco-transit-of-venus-hawaii-2012

May 28 to June 06, £1245.GBP / $1992.USD / $1868.AUD / €1432.EUR, 10 day tour
Arrive: San Francisco, California – Depart: Kona, Hawaii
Airfare from San Francisco, California to Hilo, Hawaii is not included

Annular Eclipse & Transit of Venus 2012

http://www.astro-trails.com/index.php/itinerary/?i=annular-eclipse-and-the-transit-of-venus

May 18 to June 06, £1745.GBP / $2792.USD / $2618.AUD / €2007.EUR, 20 day tour
Arrive: Las Vegas, Nevada – Depart: Hilo, Hawaii
View the eclipse from Horseshoe Bend near Page, Arizona
Airfare from Las Vegas, Nevada to San Francisco, California is not included and
Airfare from San Francisco, California to Hilo, Hawaii is not included

Betchart Expeditions INC.

Discover Hawaii

http://www.betchartexpeditions.com/pdf_files/hawaii_to_venus2012x.pdf

June 04 to June 12, $3495.USD and up, 9 day tour
Arrive: Kona, Hawaii – Depart: Hilo, Hawaii
View from observation site atop Mauna Kea at a height of 13796’ (4205m)

Siberia & Lake Baikal

http://www.solareclipsetrips.com/europe_lakebaikal_2012.htm

June 01 to June 12, $5995.USD and up, 12 day tour
Arrive: Moscow, Russia – Depart: Vladivostok, Russia

explorers

Hawaii Transit of Venus

http://astronomytours.co.uk/tours/hawaiian-transit-venus

May 31 to June 09, $6473.USD and up, 10 day tour
Includes round trip airfare from London, England (or $5598.USD without airfare)
View from observation site on the slopes of Mauna Kea at a height of 8000’ (2438m)

Insight Cruises
THE JOURNEY WITHIN

Transit of Venus 2012

http://www.insightcruises.com/top_g/st03_top.html

Jun 03 to June 07, $1999.USD and up, 5 day tour
Arrive: Kona, Hawaii – Depart: Kona, Hawaii
View either from 13,800’ (4206m) atop Mauna Kea . . . .
or at the Onizuka Visitors Center at 9300’ (2835m)

MWT Associates, Inc.

Hawaii: Transit of Venus

http://www.melitatrips.com/destinations/2012/hawaii/hawaii2012.html

June 02 to June 07, N/A, 6 day tour
Arrive: Kona, Hawaii – Depart: Hilo, Hawaii
Airfare is included from select gateway cities
Astro Guide: Dr. Alex Filippenko

Transit of Venus Expedition to Turkmenistan

http://www.eclipsetours.com/tov2012.html
May 25 to June 07, $5399.USD and up, 14 day tour
Arrive: Almaty, Kazakhstan – Depart: Ashgabat, Turkmenistan
View the transit from Darvaza, Turkmenistan

South America Classic Tours

VT 01 - Australia

http://www.solar-eclipse-tours.com/2012_tour01_venustransit_program_en.pdf
June 03 to June 12, €31906.EUR and up, 9 day tour
Includes all airfares and round trip airfare from Frankfurt, Germany
Viewing from Tennant Creek, Australia

VT 02 - Tahiti

http://www.solar-eclipse-tours.com/2012_tour02_venustransit_program_en.pdf
June 02 to June 12, €2130.EUR - Ground only, 11 day tour
(add €1985.EUR for round trip airfare from Frankfurt, Germany)
Arrive: Papeete, Tahiti – Depart: Moorea
Viewing from the grounds of Radisson Resort or from Point Venus, Tahiti

Spears Travel

Transit of Venus in Hawaii June 2012

http://spearstravel.com/astronomy/transit2012/index.htm
June 02 to June 08, $2875.USD and up, 7 day tour
Arrive: Hilo, Hawaii – Depart: Kona, Hawaii
View from observation site at the summit of Mauna Kea at a height of 13,796' (4205m)
Astro Guide: Fred Espenak

travelNation
Round the World and Adventure Travel Experts

Hawaiian Transit of Venus

http://www.travelnation.co.uk/cgi-bin/family_search.pl?id=9804&continent_id=6
May 31 to June 08, £3699.GBP and up, 9 day tour
Arrive: Los Angeles, California – Depart: Los Angeles, California
View from observation site on the slopes of Mauna Kea at a height of 8000' (2438m)

Tahiti Transit of Venus

http://www.travelquesttours.com/TransitVenusTahiti12/Transit_of_Venus_2012_Tahiti_home.htm

June 03 to June 12, $2980.USD and up, 10 day tour
Arrive: Papeete, Tahiti – Depart: Moorea
Viewing from Point Venus, Tahiti

Venus Transit Maui

http://www.tropicalsails.com/Venus_transit_tour.pdf

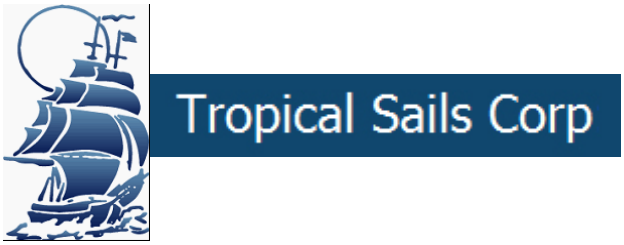
4 Night Tour

4 Nights - June 03 to June 07, $469.USD and up, 4 night tour
Arrive: Kona, Hawaii – Depart: Hilo, Hawaii

5 Night Tour

5 Nights - June 02 to June 07, $749.USD, 5 night tour
Arrive: Kona, Hawaii – Depart: Hilo, Hawaii

ECLIPSE SPECIALTY TOUR GROUP WEB SITES . . .



TOUR GROUPS LISTINGS > DISCLAIMER & ADVICE PAGE

At **TOTALITY!**, we have done a GOOGLE web search to find travel agents that are presently booking eclipse tours. Because they are listed here is in no way an endorsement for the veracity of any agent or agencies. We present these brief overviews for your convenience and to be a reference for your further examination to help you find the package that best fits your travel desires and prices. Please use the links to review all of the accompanying details about each trip.

Nearly ALL packages do NOT include airfare to and from your country of origin if other than the country you reside in, and visas are also extra, unless noted otherwise. Meals are sometimes included and sometimes not; please read these itineraries carefully. All prices listed are usually the starting price; single supplements (one person/per room) prices are usually notably higher, and I encourage anyone traveling alone to find a travel buddy so higher costs can be avoided. A good travel buddy will also watch your back, just like a diving buddy, and keep strangers at a distance when you are making an ATM withdrawal abroad.

Additional trip extensions are also often available.

There is a distinction between tour groups that specialize in eclipse and astronomical tours, and tour groups that are including the eclipse into either their regular tours, or perhaps have modeled a tour to take advantage of the eclipse in a region they often cover in their tours. As a rule, even the eclipse/astronomy tour groups frequently contract out to local tour groups familiar with the sites of the host country. The difference is when a tour group engages an experienced eclipse guide, the day of the eclipse, and even a couple of days leading up to the eclipse, in order to do anything within reason to get everyone to a location where the Sun will be visible at the time of totality, even if it means racing to find a hole in the clouds (heaven forbid), and even if it means moving the tour hundreds of miles in an attempt to view totality. That is why they call it "Eclipse Chasing." Also, the eclipse guide can monitor the weather patterns, as well as describe the events of a total solar eclipse to first time eclipse chasers (FTEC's). No matter what, plan to have a great sightseeing trip, and even if it is cloudy, you will still have had a fascinating tour.

If your group does NOT have an "eclipse leader," and if you have eclipse experience, you may need to step up to be sure that on eclipse day, the focus is getting to and giving ample time for the experienced eclipse chasers to set up equipment. It is important to have a lot of time to set up and align your equipment, with plenty of time to spare.

In most cases expect there to be a fee for a visa to the country or countries you will be visiting, and some can be a fairly hefty sum, in addition to requiring you to acquire it months ahead of time, so the more countries, the more fees, and these are usually not included in your basic tour price. And almost <u>always</u>, the tour cost does NOT include your international airfare. Often your tour company can arrange your international flights, but with careful work, you may find better fees if you book yourself; it may, however, be difficult matching your arrival and departure times with that of the tour. In some cases, if you land in one country in order to get to another, even that short time in the airport may require another visa.

OTHER USEFUL ECLIPSE WEB SITES . . .

NASA Eclipse Home Page
http://eclipse.gsfc.nasa.gov/eclipse.html
Fred Espenak's Web Site
http://www.mreclipse.com/
Jay Anderson – Eclipse Weather Predictions
http://home.cc.umanitoba.ca/~jander/
Xavier Jubier's Google Earth Eclipse Maps
http://xjubier.free.fr/en/site_pages/SolarEclipsesGoogleMaps.html
Bill Kramer's – Eclipse Chasers Web Site
http://www.eclipse-chasers.com/
International Astronomical Union - Solar Eclipse Working Group
http://www.eclipses.info/
Jay Pasachoff – Past Eclipse Expeditions
http://www.williams.edu/Astronomy/eclipse/
Sheridan Williams's Web Site
http://www.clock-tower.com/
Eclipses Online – HMNAO, CCLRC
http://www.eclipse.org.uk/
Glenn Schneider: Umbraphile
http://nicmosis.as.arizona.edu:8000/UMBRAPHILLIA.html
Dan McGlaun's – Eclipse2017.org
http://www.eclipse2017.org/
Jeffrey R. Charles – Eclipse Chaser Journal
http://www.eclipsechaser.com/

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Eclipse Predictions by **Fred Espenak**, NASA/GSFC
Eclipse Weather Predictions by **Jay Anderson**
Google Eclipse Maps and Predictions by **Xavier M. Jubier**
Additional Eclipse Maps by **Michael Zeiler**

And with special thanks to . . . **Prof Jay Pasachoff**

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