

# TOTALITY!

JUL 2008

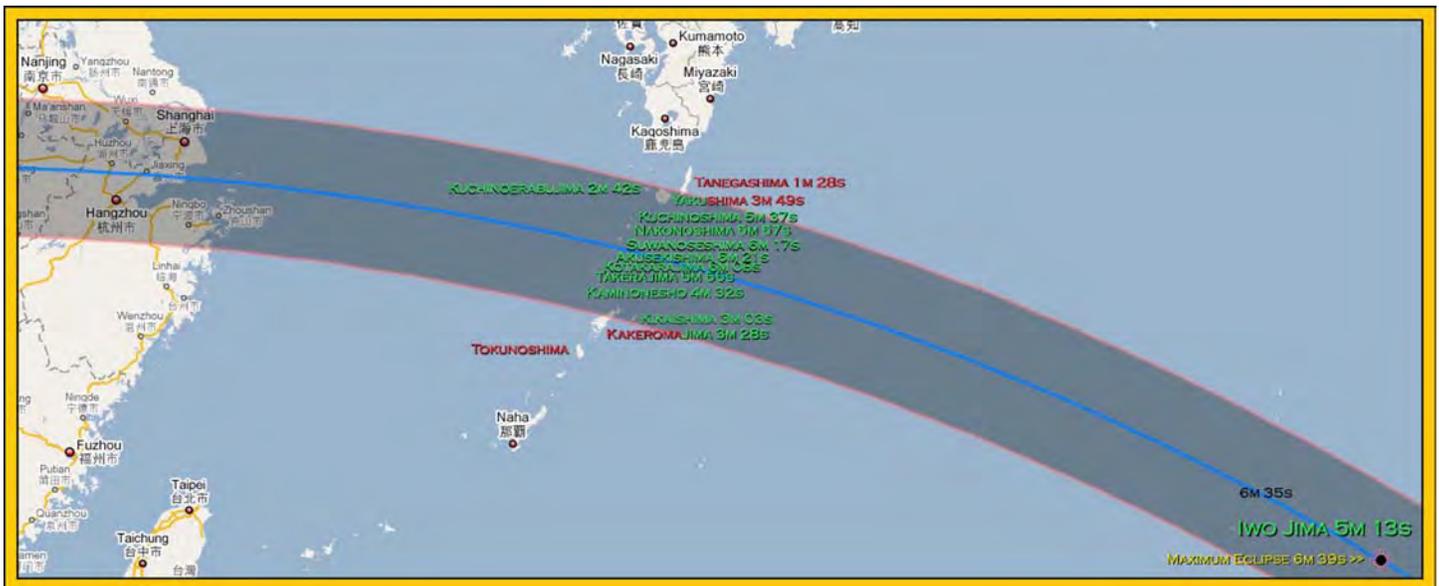
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The Path of Totality from Nanjing, China to Iwo Jima, Japan - 2009 July

adapted from maps by Xavier M. Jubier & Google

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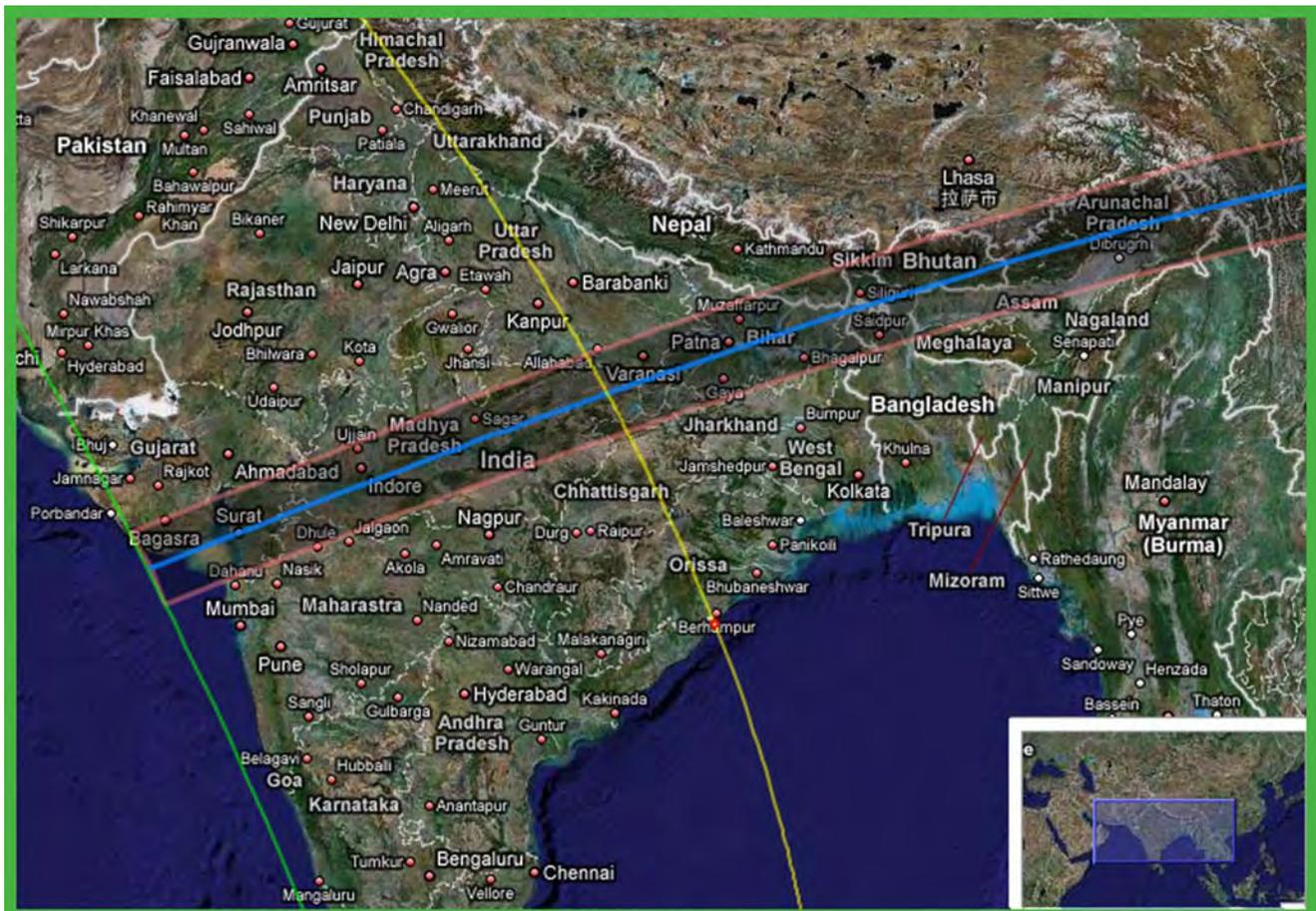
Now Booking; 2009 Total Solar Eclipse

Also Booking; 2010 Total Solar Eclipse

# LONGEST ECLIPSE OF THE 21<sup>ST</sup> CENTURY; 2009 JULY 22

Six minutes and Thirty-nine seconds, 6m 39s. That is the duration of the longest eclipse of the 21<sup>st</sup> century, and it will happen on 2009.07.22. This is a very respectable number, and eclipses that are of such duration you don't want to pass up. There are only four eclipses in the 21<sup>st</sup> century lasting longer than 6 minutes; 2009 of course, followed by 2027 (6m 23s), 2045 (6m 06s), and Saros 136 drops below 6 minutes after 2045, and Saros 139 climbs above the 6 minute duration, giving us the total eclipse of 2096 (6m 07s), but the eclipse of 2009 will not be surpassed until the TSE of 2132.06.13 (6m 55s). So let's take a look at where the Moon's shadow meets the Earth's surface.

## India



The beginning of the Path of Totality for 2009 July 22

Xavier M. Jubier & Google Maps

The western edge of the eclipse path begins along the west coast of India at sunrise, and even here, the eclipse lasts longer than 3 minutes as it begins the journey across north central India. The port city of Surat will be the first location on land to be on the centerline, where 3m 15s duration will be possible just after sunrise on the morning of July 22, and some 3,000,000 people will be given the opportunity to see the sunrise almost totally eclipsed, which will occur with the Sun just 2 degrees above the ocean horizon.

As the eclipse progresses inland, the centerline passes about 400 kilometers south of the city of Agra, where the Taj Mahal is located. The famous white marble mausoleum is a memorial to Mumtaz Mahal, favorite wife to Emperor Shah Jahan. Be sure to stop by and pay your respects to Mumtaz, and take on the wonders of this marvelous structure if you are in the area.

Now well into India, Varanasi is known as the “City of Temples,” among many others acronyms, and is a holy city where over 1,000,000 Hindus make pilgrimage each year in order to visit the temples along the Ganges [river]. Photographer Art Wolfe recently visited this area for an episode of Art Wolfe’s “Travels to the Edge” [season one] which aired on PBS last year. Here totality will last for 3m 05s, and for those making their pilgrimage in the city this morning will have much more to see, and talk about afterward.

Close to, but about 20 kilometers north of the centerline, we will come across Patna, a city of nearly 2,000,000 people. Here 3m 42s of totality can be observed, only 6 seconds off the maximum duration on the centerline nearest to this location.

### **Weather:**

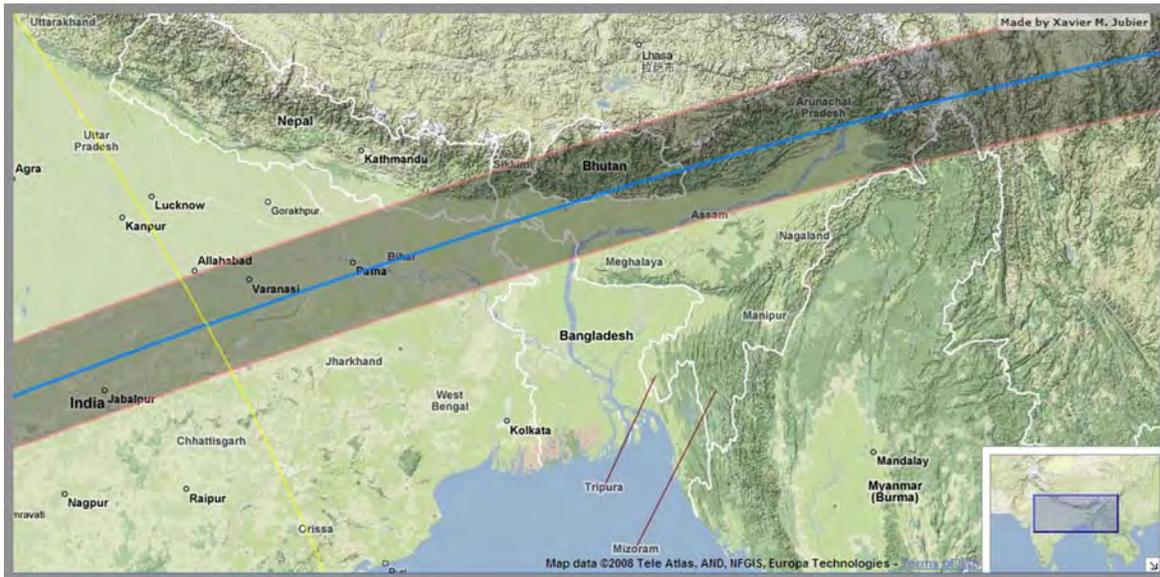
**The unfortunate thing about choosing India as an eclipse location at this time of year is this is the height of the monsoon season. Clear sky opportunities are very unlikely here and vary between 60% to 80% chance of overcast skies, and the best odds are near Patna.**

## **Nepal**

The path of totality spills over into Nepal, but the centerline remains outside of the borders of this high mountain country, and if you are hopeful that a high altitude local might help your odds, unlike the giant Himalayas, the southeast corner of the country does not exceed 2000m altitude, so no luck there.

## **Bangladesh**

The path continues spilling into the northernmost regions of Bangladesh, where a small area at low altitudes intersects the centerline, and 3m 59s is visible.



Eastern India, Nepal, Bangladesh, Buthan, Arunachal Pradesh, Myanmar and Western China

## Bhutan

The centerline returns to India very briefly before handing off to the small country of Bhutan. If Bhutan were 30 kilometers further to the south, the entire country would see totality. The northern edge of the path is high in the mountains at 5000 meters. In easternmost Bhutan maximum totality will reach 4m 10s.

## Arunachal Pradesh & India

Now the path of totality straddles India and the Arunachal Pradesh, an area in dispute between India and China. The disputed area is marked by a natural boundary of mountains and a low valley. The centerline in this area is entirely in the Pradesh, which extends for 400 kilometers before reaching Chinas undisputed border. Totality in the Pradesh starts at 4m 10s, and ends at the China border with 4m 24s.

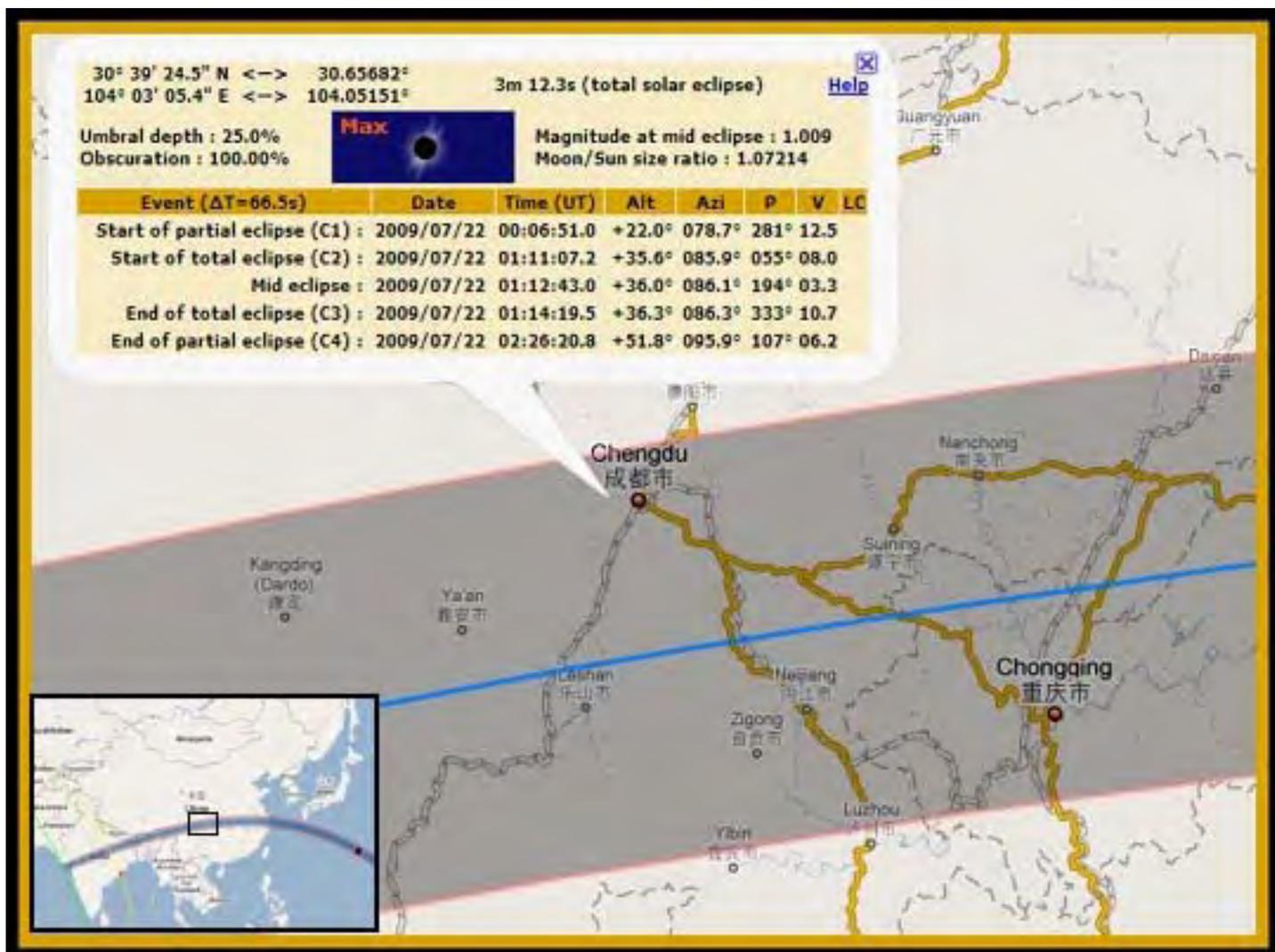
### Weather:

The absolute worst weather conditions along the path of totality comes near this area as we climb into the mountains. As soon as we move east of Patna [India] the cloud cover shoots up 20 percentage points where Bhutan has the worst conditions. The chances again drop, only to turn back toward 80 percent cloud cover shortly after entering the mountains of Tibet/China.

# China

Entering China, the mountains begin a climb to locations that exceed 4000 meters. Here the centerline marginally misses the northern tip of Myanmar, and totality falls just short of 4½ minutes. We come down from the mountains not far from the central southern border of China and head for some of the larger population centers in the country. It is possible that more people will view this eclipse than at any time in history due to these notable cities. We will focus on six of these prominent cities and their surroundings that lay in the path of totality.

The first location is in Chengdu (pronounce Shen-do). If that name seems familiar to you, it should. On 2008 May 12, 92 kilometers northwest of Chengdu, capital of Sichuan Province in China, a magnitude 7.9 earthquake hit and much of the city of Chengdu and the surrounding area was damaged, and claimed nearly 70,000 lives, leaving millions homeless. Chengdu is a major city for the manufacturing and IT industry in China, and home to over 11 million people. I very recently saw an episode of Martin Yan's China on PBS, and he visits his hometown of Chengdu, before the earthquake of course, and it is a very modern city.



Chengdu, China and the 2009 Solar Eclipse Path

Eclipse Maps - Xavier M. Jubier & Google Maps

Always conscious of how people still like to blame atypical events on other atypical events, I am relieved that the 2008 China earthquake took place well before the 2009 eclipse. If it had happened shortly after or even within several months after the eclipse, the superstitious would tend to blame such an event, something that us eclipse chasers continue to work to defer such connections. Many buildings collapsed from the earthquake and the aftershocks. New lakes were created, roads were obliterated and millions left homeless. Regardless of these facts, there is no stopping a solar eclipse, and on 2009.07.22, Chengdu will receive 3m 12s of totality, and 4m 54s will be visible about 90 kilometers southeast of Chengdu on the centerline. What more can we say, our hearts go out to those individuals, and we must put our faith in China to do what is necessary to take care of their people.

Approximately 200 kilometers to the east-southeast of Chengdu, we come to Chongqing (pronounce Shon-king). This city's official population is over 4 million, but the urban city seamlessly merges with the surroundings, and the actual population soars to over 31 million (2005). Chongqing will see 4m 09s of totality, and 5m 02s on the centerline about 50 kilometers north of the city center, nearly halfway to Chengdu.

About 650 kilometers further east, the city of Wuhan lies so close to the centerline that the 10 kilometer trip north of the city center will only add an additional 5 seconds more to the already 5m 24s that will be visible from this location. Over 15 million people in the urban and surrounding areas will be able to watch totality.

Hefei is nearly on the northern limit, but still inside the path of totality. Even here however, the city center will be able to see 1m 47s of totality for the 4½ million people living in the area, but a 100 kilometer trip south would give observers 5m 40s of totality. Nanjing however, a nearby city of some six million people, lies only 10 kilometers north of the eclipse path. A short 25 kilometer trip will bring a minute or two of totality, or if anyone from Nanjing can drive roughly 200 kilometers toward Hangzhou (but stopping about 60 kilometers short), then 5m 40s of totality would be visible. This region is perhaps the best chance, but not the last chance, to view the eclipse from the mainland.

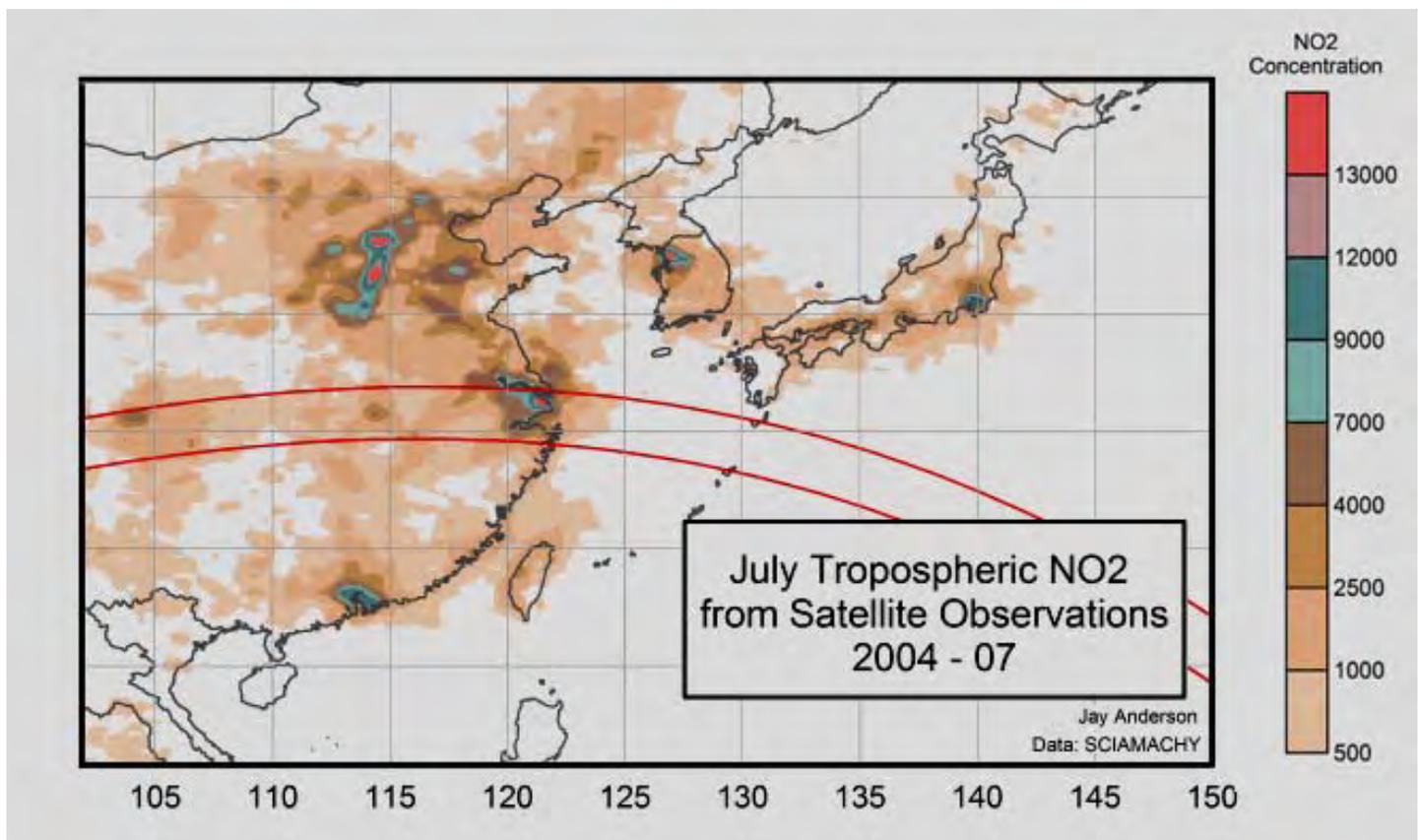
Over 6½ million people in Hangzhou will see 5m 23s, and Shanghai, one of the world's largest metropolitan areas, with 20 million residents, will have a chance to see 5m 03s of totality. The centerline intersects the highway between Shanghai and Hangzhou at Jiaxing, where 5m 53s of totality will be visible. This location will be a main point for land based observers, and its easy access will help for those flying in just for the eclipse. Only an additional 1 second of duration can be gained by standing on the Pacific coast where totality leaves the mainland behind, and only 45 seconds short of the maximum duration for this eclipse well into the Pacific Ocean.

## Weather:

For the most part, after coming down from the mountains on the western boarder, this area affords eclipse chasers with 50-50 odds of clear skies, and almost the best odds anywhere on the path.

## Smog:

Shanghai has been growing in size exponentially over just the last decade or so, and very soon could become the largest metropolitan city in the world. It is a major manufacturing and shipping location, but air pollution has impacted the area profoundly. I have heard stories that the smog is so bad that it is perpetually difficult to see a short distance. Fortunately near Hangzhou the Sun will be 55 degrees high in the sky at totality, hopefully reducing the effects of the smog. In the chart below you can track back across the eclipse path from east to west and see Shanghai, Wuhan, Chungqing and Chengdu, which all have levels of smog such that you can see where the cities lie on the map without seeing the cities themselves. Viewing from these locations it would be best to travel outside the city center(s) and into the countryside to view the eclipse.



From Jay Anderson comes the Sulfur Dioxide values near the eclipse path. For those venturing into China, especially near Shanghai, you may want to find a tour or rent a vehicle to take you a few kilometers inland to reduce the levels somewhat. Those fortunate enough to be on one of the Islands of Japan or on a cruise ship will not need to worry about smog, only clouds and typhoons.

# Japan

## and the Western Pacific



There are 4 main islands of Japan, starting with the northernmost and working south, they are Hokkaidō, Honshū, Shikoku, and Kyūshū, but the path of the eclipse completely misses all of these. However that does not exclude Japan entirely. South of Kyūshū there are a few small islands known as the Tokara-Retto islands, and they lie in a string across the path of totality. The key words here are “few” and “small.” These islands have very little if any infrastructure for tourist traffic, and certainly no ability to handle thousands of visitors. Because of these reasons limits have been imposed and a lottery will take place to select the 1300 visitors that will be allowed to visit. These were outlined in Issue 6, and are include again here;

Kuchinoshima	5m 37.7s TOTALITY, 120 individuals
Nakanoshima	5m 56.9s TOTALITY, 200 individuals
Suwanose-jima	6m 16.4s TOTALITY, 310 individuals
Akuseki-jima	6m 20.3s TOTALITY, 255 individuals
Kodakara-jima	6m 04.9s TOTALITY, 75 individuals
Takara-jima	5m 53.5s TOTALITY, 220 individuals

For specifics on these islands connect to Astrokay’s web site from here;

<http://www91.sakura.ne.jp/~kay2/TSE/TSE2009japan/TSE2009japan-tokara.htm>

An article also appeared in the 2008.03.15 in the Asahi Shimbun about the concerns of the islands about the tourist influx. Please review it at;

<http://www.asahi.com/english/Herald-asahi/TKY200803150116.html>

The island of Yakushima however, which lies north of these, does not fall within these limitations tourist limitations. Yakushima is a larger island than any of the others being about 500<sup>2</sup> kilometers in size, and home to 15,000 people. It is a UNESCO World Heritage site, and is a popular destination for Japanese visitors and birdwatchers, where some 300,000 people visit annually. Unlike the other islands it does have a good infrastructure and hotels to support the influx of tourists.

**Iwo To**, is the new name for Iwo Jima, which it received just last year [2007], and is a location that was coveted by many tour groups, but the logistics and permissions were not immediately forthcoming because of its significance to World War II history. Today it is Japanese territory with 400 troops stationed on the island, and according to Wikipedia “Civilian access to the island is restricted to those attending memorial services for American and Japanese fallen soldiers, construction workers for the naval air base, and meteorological agency officials.” The airstrip is also used by the U.S. Navy for touch and go’s for aircraft from carriers stationed in the region.

Now, word has come from at least one tour group that has acquired the necessary permissions, and that is “Ring of Fire Expeditions.” “Eclipse City” also boasts an Iwo Jima trip, but no details have yet been posted. Though Iwo To is a small island, about 8½ kilometers from the SW to NE tips, the duration of totality varies as much as 22 seconds. The northeast side will have a duration of 5m 19s, whereas on top of Mt. Suribachi the duration will be 4m 59s. Those viewing from the grassy area of the airfield will have an opportunity to view 5m 13s, and just a half kilometer hike to the nearest point from the airfield to the beach on the east side of the island will give observers an additional 3 seconds.

Iwo To today is a war memorial to the 48,612 that died fighting for and defending the islands’ airbase. Visitors to the island are very rare and usually only occurs during very special anniversaries, and access is very limited. Cruise ships do not stop here as there is no port, and to my knowledge no cruise ships send over any landing craft, as there are no visitor facilities to accommodate the people. If a cruise advertises that it visits Iwo To, it is likely they just pass it out at sea and view it from a distance. Eclipse viewers that visit the island will be some of the few that ever get to set foot on the island today, and should be considered a great privilege.



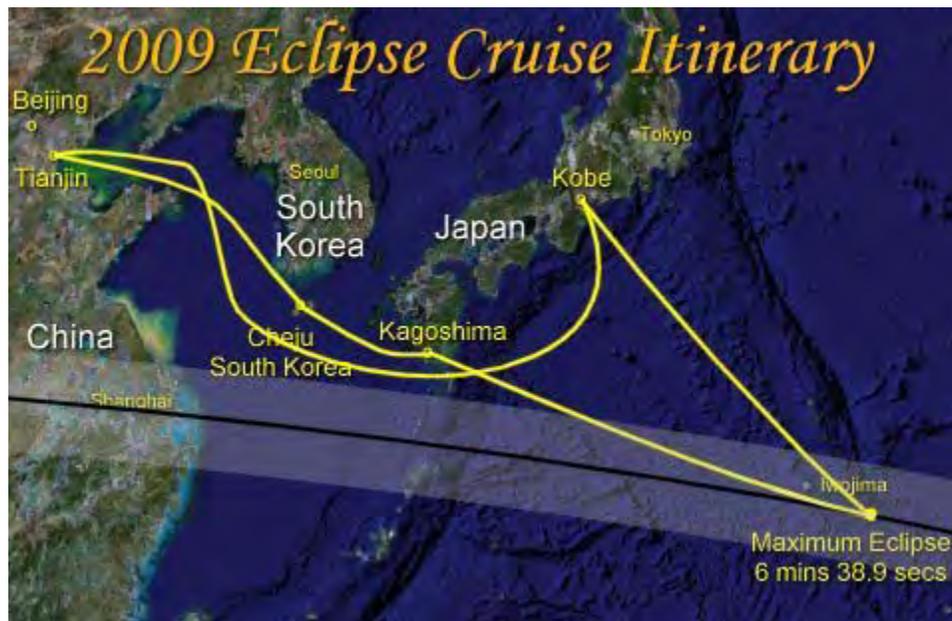
Google Earth satellite map of Iwo To (formerly Iwo Jima). Mt. Suribachi is at the lower left, and is furthest from the path. For those wishing the most duration, and enjoy a beachfront view of the eclipse, a hike to the northeast tip brings up to 5m 19.2s.



Ishinomura-Kitaio

**Ishinomura-Kitaio**, is a tiny island just northwest of Iwo To, and lies almost directly on the centerline. It is found just 300 kilometers west of the maximum duration possible, which is where only ocean resides. The island is just over 3 kilometers long, and the duration of totality changes by just 1 second from the south (6m 35s) to the north (6m 36s). “Eclipse City” is the only group that has identified this island as an eclipse viewing site that they will be booking, but I am told that numbers will be very limited and it will likely be somewhat expensive. We understand that this small island is heavily forested and the shoreline is steep, making it a challenge to set up and use your equipment here. Google maps identifies an area on the south side of the island that may be relatively flat, but the data is incomplete.

**Viewing** eclipses from cruise ships has been in full swing since the early ‘70’s, and likely there will be a few chartered for a trip to get the longest duration possible, 6m 39s. One that we know of is the Costa Classica, a 722 foot floating city of steel, where 1300 people and some of the 600+ crewmembers will be some of the limited few that will be able to get the longest duration possible for the 2009 TSE from a location not far NW of Iwo To.



Costa has extended one of their standard cruise to head toward Iwo Jima and encounter totality, adding several days to the cruise, this map is from Astronomy Vacations web site. The map has an error as Iwo Jima (Iwo To) is NOT north of the centerline, but rather south and east of the maximum duration of totality, south of the centerline.

## **Weather:**

**The biggest drawback of being on one of these islands is if clouds are impending, you have nowhere else to go to see the eclipse. With the fly in to Iwo To, it is possible to check weather forecasts for eclipse day, and divert to Shanghai if the weather is good there. If you are on a cruise ship, at least it is like a moving island, and unless bad weather blankets the whole Pacific, modifications may be made to reach a better location within limits of the time and distance constraints. As the weather map in this article indicates, the islands**

nearest Japan have a 45% chance for clear skies, and at Iwo To (Jima), the odds are 50-50, which is better than anywhere along the path of totality to this point.

## Typhoon Season:

The typhoon season typically runs from May to November, which makes any location in this area of the Pacific Ocean rather difficult to predict. The area of greatest typhoon percentage is in the Tokara-Retto island region, and decreases as you continue down the path in both the east and the west directions. In most cases, if you are on the islands of Japan, you are there for the duration, and cannot get away. If you want to get the most duration out of totality, you might consider a cruise. Within reason a cruise ship can change their plans and attempt to reach an area of clear weather.

# The South Pacific

No islands of significant size lay within the eclipse path in the South Pacific, however several tourist locals are only a short cruise away. Tahiti lies just east of the path of totality, but there are several other islands in the region that would be worth visiting, including Fiji, American Samoa, New Caledonia and Vanuatu. Here however, the path of totality ends at sunset, so the duration of the eclipse is considerably shorter than it is at apparent noon, which is near the island of Iwo To, but because of its long duration, it is still an eclipse with an average duration. Immediately before sunset, the duration of totality lasts 3m 09s. “Astronomical Tours” and “Travelquest International” are just 2 of some tour groups that have cruise packages from Fiji (Tahiti), and what a better place to start and end a trip from. Aboard the **Paul Gauguin**, 3m 26s will be visible with the Sun will be 7½ degrees above the horizon, some 2000kms NW of Tahiti & 1000kms NE of American Samoa.

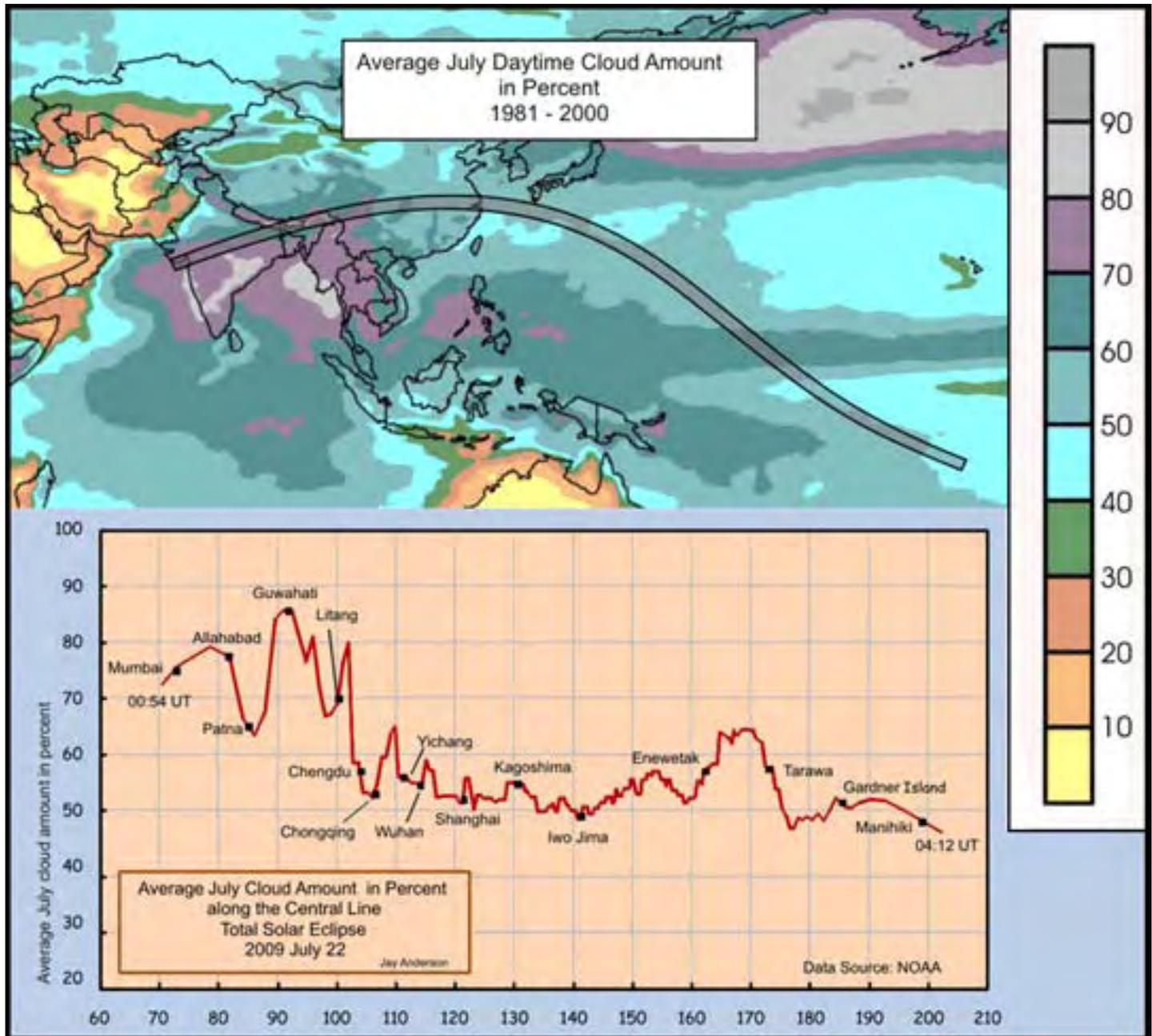


The end of the path of totality in the South Pacific

Xavier M. Jubier & Google Maps

## Weather:

The best chance for good weather comes in this region at the end of the eclipse path. Here the odds dip slightly under the 50-50 mark, with a 55-percent chance sunny skies but it also comes with the shorter duration of totality. Typhoons usually are not a threat to this area well out in the central ocean.



Courtesy Jay Anderson

The weather along the eclipse track is shown here in both map and graph form with the two matched to the same scale. As the path enters China, the better weather conditions become apparent, but is still a 50-50 chance of clear vs. cloudy skies

# Weather for 2009

Jay Anderson

## Overview

Summer – Northern Hemisphere summer – is the wet monsoon season across the sub-tropics, from Africa to India to Asia. Wet as in high humidity, instability, and numerous thunderstorms that bring high levels of cloudiness. Wet means that eclipse-seekers will have to accept lower probabilities of success than in recent past eclipses – and this is a 6-minute-plus eclipse, the longest for the rest of all our lifetimes.

However, it's not all gloomy. There are places tucked away along the track of the Moon that promise a little more sunshine than the rest and there are strategies to improve the odds.

Monsoons – the term means “seasonal wind” – are caused by the heating of the land by the high summer sun. Heating warms the atmosphere and creates a land-based low that draws air inland from the warm sub-tropical waters. In India, the flow is from the Arabian Sea and the Indian Ocean; in China, from Southeast Asia and the South China Sea. Over India, the monsoon flow extends northward to the slopes of the Himalayas, but in China and Japan, it pushes up against the cooler, drier, polar air from the north. This creates a broad frontal zone that moves back and forth over the Chinese mainland in response to forcing from larger weather patterns.

The frontal band is known as the *mei-yu* front in China and the *baiu* or *tsuyu* in Japan – rainy-season fronts, in effect. By mid-July, the *tsuyu* has begun to weaken over Japan, but the *mei-yu* retains its identity and structure in China, typically lying over the Yangtze valley in July and August. On just about any day, the *mei-yu* can be seen in satellite photos angling across inland China, or straddling the coast, bringing broken to overcast cloudiness to regions under its influence. When waves of low-pressure move along the front, cloudiness increases and steady rains – sometimes with flooding – can be expected. Away from the *mei-yu*, skies are dotted with convective clouds that frequently grow into thunderstorms in the afternoon, though still offering better chances of seeing the eclipse than sites along the front itself.

With or without the presence of the *mei-yu* front, the eclipse track is embedded in a humid and unstable airmass from India to the Cook Islands. Most North American and European travellers will find the humidity oppressive and energy-sapping on the continents, with dewpoints in the mid-twenties Celsius. Rain is often welcome, as it cools the air in spite of the 100% humidity that it brings. Air conditioning is eagerly sought – an oasis of cool in the sultry tropical heat. Even though dewpoints are similar on the Pacific islands, the surrounding ocean and intermittent cloudiness seems to make the weather more tolerable than in the centre of a 8-million-inhabitant metropolis.

In India and China, summer is also the season for tropical storms: typhoons in the Pacific and cyclones in the Bay of Bengal. Only a part of the eclipse track – over the Himalayas, deep in inland China, or along the equator – is completely immune from the possibility of an encounter with these rotating storms, though the typhoon season in India is typically in a mid-season quiet period at the time of the eclipse.

Once the eclipse track moves away from the Asian mainland, it drops sharply southeastward toward the equator. Weather patterns are now under the control of the Earth's large circulation systems: the belt of subtropical highs near 30° north latitude; the easterly trade winds that

occupy the zone south of the highs; and the region of cloudiness that marks the Intertropical Convergence Zone, about 5° north of the equator. These zones each have their own characteristic cloud patterns, and so the track alternately moves through regions of high and low cloudiness, some of which offer good eclipse-watching prospects.

## The Climate in Detail

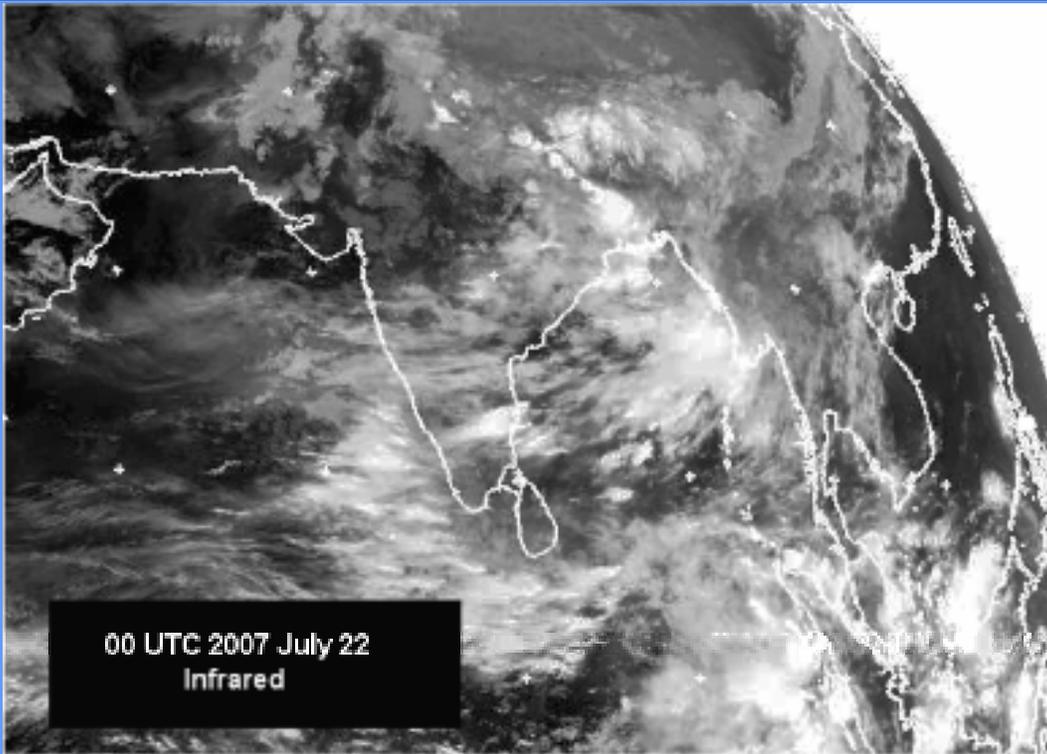
### India

With the monsoon season at its height, sunny weather is in short supply over India. Just about every day sees thunderstorms and showers forming along the eclipse track, building to an afternoon maximum as the sun warms the ground each day, or responding to upper atmospheric triggers to bring nighttime lightning and rain. The weather is tumultuous, with few safe havens for eclipse viewing. The modest refuges that can be found are tucked behind chains of hills that block some of the humid monsoon flow.

At Mumbai, prevailing winds are from the west through southwest, bringing moist air and sticky 25-degree dewpoints onshore from the Arabian Sea. Relative humidities in this muggy air average 85% when combined with typical eclipse-hour temperatures of 27°C ([Table 2](#)). Clear skies are entirely unknown in this season – and the frequency of broken to overcast cloud averages more than 92%. Apparently, the west coast of India is not the best location to go looking for this eclipse.

[Graph 1](#) shows that the mean cloudiness at Mumbai is actually slightly lower than sites farther inland, in spite of the gruesome statistics quoted above. Some of this is due to Mumbai's location on the coast where cooler temperatures and occasional sea breezes combine to limit slightly the daily cloudiness. At Bhopal, the frequency of overcast skies ([Table 1](#)) reaches nearly 50%, but a lower frequency of broken cloud, and even a one-half percent frequency of clear skies combines to give the city an average cloudiness similar to Mumbai. Dewpoints tend to be lower, 22°, but temperatures follow suit, and so eclipse observers can expect no relief from the high humidity.

Observing in India will have to make the best of an unfortunate lot. The satellite observations of cloudiness compiled in [Graph 1](#) show a minimum in the central-line cloud cover just to the east of Patna. This region, along the Ganges River, lies north of the 700-m-high Chota Nagpur Plateau; the air descending from the plateau to the Ganges warms and dries slightly to bring a small decrease in the cloudiness. According to the satellite data, the mean cloudiness drops from about 77% at Allahabad to 63% in the minimum east of Patna. These are not great numbers, but they are the best to be had for July. Ground observations are not so optimistic, but they do show a minimum cloudiness of 71% in the area, at Varanasi, about 200 km upstream from Patna. A separate measurement, the percent of possible sunshine, clearly shows the suitability of a location at Patna. The 48% recorded there is higher than any other in India. The percent of possible sunshine ([Table 1](#)) is the statistic that best represents the true likelihood of seeing the eclipse.



Infrared satellite image acquired at 0000 UTC 2007 July 22 over India. Grey tones represent the temperature in the scene: white colours are deep cold clouds while medium tones are mid and low-level clouds. The darkest tones depict emission from the surface.

Despite the trend to sunnier skies near Patna, the humidity in the atmosphere continues the same high values already noted at Mumbai and Bhopal. The average dewpoint at eclipse time is  $26^{\circ}$  in Patna, which, combined with the usual temperature of 28, gives a relative humidity of 91%. This sultry weather, in India and in China, will be a tough challenge for those used to the drier climates of most of North America and Europe.

Beyond Patna, the eclipse track heads northeastward, crossing parts of Nepal, Bangladesh, and Bhutan, all the while running along the southern slopes of the Himalayas. Winds flowing up the valley of the Brahmaputra River bring the monsoon air up against a steadily rising terrain, squeezed by the convergence of higher ground to the south and north. The resulting adiabatic cooling quickly saturates the airmass, creating a region with the world's highest rainfalls (near Cherrapunji, south of the eclipse track near Gauhati), with over 11 metres of precipitation each year.

This region is the cloudiest along the entire track, with average cloud amount near Gauhati reaching over 85% in the satellite data, and the percent of possible sunshine falling to a meagre 29%. Dibrugarh, at the head of the valley of the Brahmaputra, has an average cloudiness of 86% according to surface-based cloud observations from the local weather station.

In India, cyclones are a possibility from April to November, but the period from June to August or September tends to have little activity and the storms are usually weaker than those earlier or later. Cyclones bring a considerable amount of moisture and cloud, but those are already in

abundant supply and so it would be very bad luck indeed, if one of these storms were to be a significant factor on eclipse day.

## China

Past Dibrugarh, the central line moves into the mountainous terrain that separates India and China. Peaks in the region reach above 7,000 m and transportation is difficult and limited. Weather observations are also few in number but the satellite-based cloud observations show a zigzag series of ups and downs ([Graph 1](#)) in the average cloud amount in this region where the path crosses between the two countries. Each rise correlates with the windward-facing slope of the terrain, while declines in cloudiness are found in valleys on the leeward side. There is a general downturn to the average cloud amount from its peak in India, but cloudiness does not drop below 60% until the track has departed the higher mountains and begun its journey across the plains of China at Chengdu and Leshan.

China has its own monsoon flow, separate from that of India because of the barrier imposed by the Plateau of Tibet that arcs along its western border. Instead, winds bring moisture into China from the south and east, and so the west side of the higher terrain, where winds flow down hill, is favored for sunnier skies and better eclipse-watching prospects. For most North Americans and Europeans, the atmospheric humidity along the eclipse track will be a significant factor in their ability to enjoy the eclipse. The monsoon season brings an influx of tropical moisture across the track; there is no escape from the muggy weather except by retreating into air conditioning. In Canada, the combined effects of humidity and temperature are represented by humidity, the hot-weather equivalent of wind chill. Typical daytime highs (36°C) and dew points (24°C) in India and China ([Table 2](#)) give humidex readings of 47 and relative humidity's of 50%. These fall in a category denoted as "dangerous discomfort." Canadian forecasters issue warnings for values over 40, so eclipse watchers should take significant precautions to prevent heat stroke. It is essential that equipment that is carried outdoors from air-conditioned buildings (cameras especially) be given time to warm up, as they will immediately acquire a coating of dew that will take 10 minutes or more to evaporate.

[Graph 1](#) shows a decline in cloudiness to between 50 and 60 percent at Chengdu and Chongqing – a value that remains more or less constant across the rest of the eclipse path through China. Both these cities lie in the Yangtze River basin and so the descending monsoon air is compelled to warm and dry as it moves into the valley. Between Chongqing and Yichan, the cloudiness climbs about 10% as the track moves across the 2- to 3-thousand meter peaks of the Fangdou Shan.

Once across the Fangdou Shan, the eclipse track descends once again into the lush lowlands surrounding Wuhan. Space-based cloud observations show that Wuhan has sunshine prospects slightly lower than Chongqing, but surface-based observations give it the nod as the most promising inland site in China. Average cloud cover derived from local weather records ([Table 1](#)) is an unencouraging 61%, one of the best in China, but high compared to cloud amounts at recent eclipses in other parts of the globe.

Wuhan's biggest advantage over sunnier sites near the coast is noticeably cleaner skies ([Figure 3](#)), with much less haze and pollution. The city is relatively compact, but open sites in the countryside have to be sought out, as the area is extensively agricultural and sites for large groups a bit of a premium. The central line of the eclipse passes through the airport, so that sites within the city proper may be quite suitable, and Wuhan has a delicious assortment of public parks and waterside enclaves. It is an area well worth exploring for an eclipse site, as the

cleaner skies compared to sites near Shanghai will allow the distant corona to stand out more clearly against the sky.

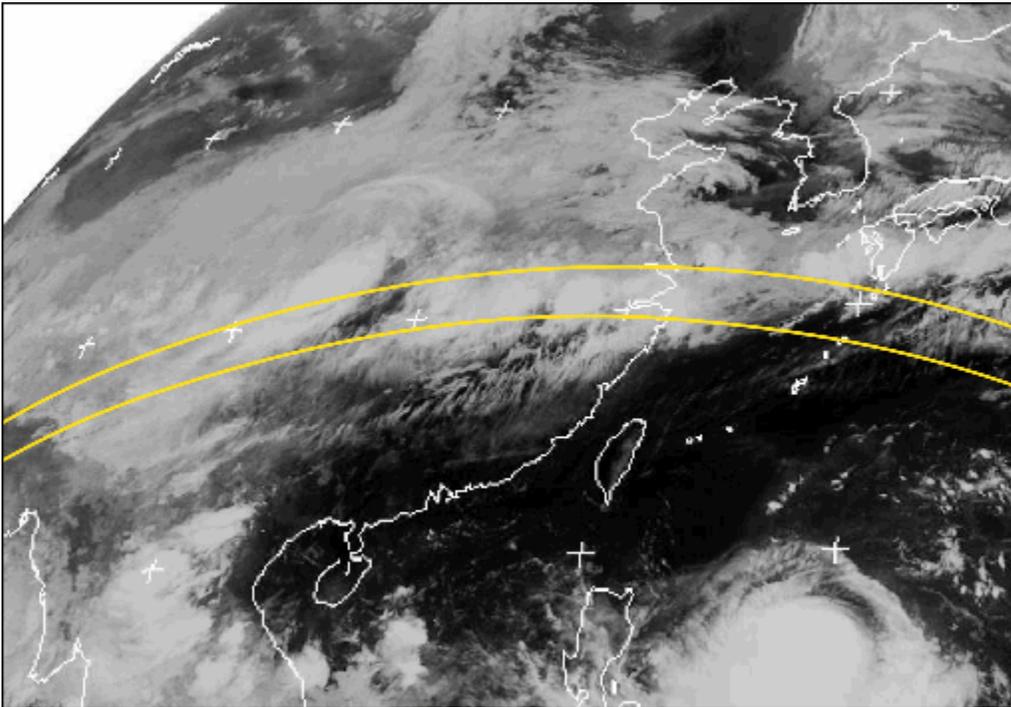
During a 2006 survey with TravelQuest's Aram Kaprielian, I found that Wuhan's skies were relatively sunny with temperatures climbing well into the 30s. The central line actually crosses the airport, but we found no suitable open areas that would give a wide view of the sky in the surrounding industrial areas. The only hotel was unattractive and open spaces were very limited. The airport was undergoing considerable expansion, then available could not be counted on to be the same on eclipse day. Several new hotels were being planned and these could be suitable viewing sites if construction is completed before the eclipse.



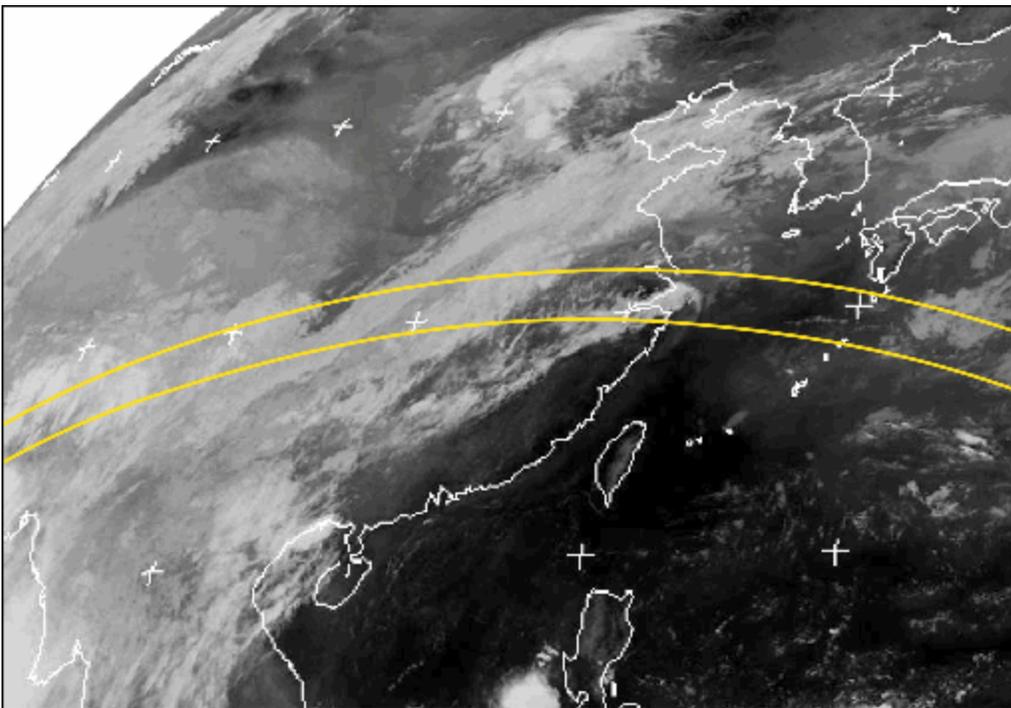
Wuhan and area. The photo on the left is a view of metropolitan Wuhan on our day of arrival. The weather remained sunny for the three-day visit. The right-hand photo shows a rural area to the north of the city on the following day. The weather is more convective than on the arrival day, but the low level cumulus cloud in this image would largely disappear during the eclipse. This photo was taken in the morning; the cumulus cloudiness increased through the day.

The countryside north of Wuhan is made up of small farm plots, numerous lakes, ponds, and inundated rice fields, with few significant open places for large groups of people. Roads were very good. We visited Wuhan Lake, a beautiful path of totality with wide open spaces, convenient services, and a cooling lake, though more than 15 km from the central line and a concomitant 16 second loss of totality. In Wuhan itself, a city of splendid parks, we fortuitously found a school yard directly adjacent to our hotel (the Mayflower) that would server admirably (35.5397N 114.3228E). It had no views of the horizons, but the sun was well overhead and the sports field could be kept semi-private, avoiding the large crowds that normally come with urban observing sites. If squeaking the last second out of the eclipse track is not your major objective, then Wuhan is an attractive site for eclipse-viewing.

East of Wuhan, the eclipse track crosses 1000-metre peaks of the Dabie Shan and descends onto the coastal plain to Shanghai and Hangzhou. Cloud amounts bump upward over the Shan, but then settle into the mid-50s on the plain, reaching the best that China has to offer. It's a grimy region, with plenty of pollution from the huge human presence, but the eclipse is high in the sky where the effects of the brownish haze are less evident on a sunny day.



Infrared satellite image of China acquired on 00 UTC 2006 July 22. The band of cloud beneath the track of the eclipse in eastern China that continues over southern Japan is the *mei-yu* front. Note the typhoon approaching from the southeast (lower right). Background image copyright EUMETSAT.



As above, for 00 UTC 2007 July 22. The *mei-yu* front is farther north this year, and weaker. Shanghai and areas westward along the track are mostly sunny. Background image copyright EUMETSAT.

Daily satellite images show a dynamic cloudiness across the whole of south and central China. A broad band of deep, cold-topped layers of overcast cloud marks the location of the *mei-yu* while broken patches of lower cloud dot the remaining landscape. Occasionally — too occasionally for the comfort of eclipse seekers — large areas of nearly clear skies will open up, lingering for a day or two before re-filling with cloud. Moreover, on rare occasions, the *mei-yu* seems to wither away to scattered cloudiness, bringing large areas of sunshine across the whole country. Examination of satellite images from 2006 and 2007 reveals that southern boundary of the front typically lies near Shanghai, leaving the city and the eclipse track in an area tantalizingly close to sunnier weather. Slight motions of the front northward or southward bring alternating periods

of overcast and sunshine through the month. The climatological behavior of the front cannot be reliably ascertained from just two years of monitoring but longer-term statistics anoint Shanghai with a little more sunshine than other parts of China.

Southeast of Shanghai, the eclipse track meets the coast and moves out onto the South China Sea. A part of the cloudiness associated with the monsoon climate is generated by instability and convection driven by daytime heating, so that sites along the coast should be somewhat sunnier than those inland because of the cooling that comes with proximity to the water. Shanghai has two airports, one inland (Hongqiao) and the other on the coast (Pudong). Cloud statistics in Table A show that the average cloudiness at Pudong is much lower than at Hongqiao (50 versus 67%). However, Pudong is a new airport, and statistics from the area are only available since 2004, a period too short to reflect accurately the climatological cloudiness. A comparison of the four years in common between the two airports reveals that Pudong's cloud cover is only about 4% lower than that at Hongqiao, a value that is much more in line with satellite data. In a climate where cloudiness rules, this 4% difference is significant, and argues strongly for a viewing site right on the waterfront, southeast of Shanghai where the central line crosses the coast. One of the better choices is at Jinshan (or Jinshanwei), a coastal city just north of the shadow axis. Jinshan has the distinction of being the site of a large artificial beach that is being constructed for the benefit of Shanghai and local residents.

Beachfront sites can be windy, and so prudence dictates a retreat of a few hundred metres inland to obtain shelter from the onshore winds. Prevailing winds in the Shanghai area are from the south and southeast, a direction that brings the cooler and cleaner air from the South China Sea onto the land – just what the doctor ordered.



A view of Shanghai from the Oriental Pearl Tower. Haze is relatively subdued during the daytime when it mixes more deeply through the boundary layer of the atmosphere. On this day, skies were a mixture of sun and cloud, though relatively sunny overall. How about here for an eclipse-viewing site?



Jinshan beach looking southward. Skies were overcast but the scene was relatively unpolluted because of a strong onshore wind.

## Offshore – the Japanese Islands

From India to the Chinese coast, the general trend of the cloud cover graph ([Graph 1](#)) is downward, with occasional upward jumps as the track crosses the higher terrain along the way.

This trend continues as the path moves out over water, reaching a minimum near Iwo Jima, about 2000 km southeast of Shanghai. The cloud statistics get a little confused here: the satellite cloud statistics show a small rise in cloudiness through the Nansei Islands (known in English as the Ryukyu Islands), whereas the land-based observations show that sunshine is more abundant here than anywhere else along the track. Okinoerabu shows a percent of possible sunshine of 67%, somewhat out of character when compared to other Japanese stations in the region. Cloud-cover statistics for Okinoerabu ([Table 1](#)) are more in line with other nearby stations.

Similarly, while Iwo Jima has one of the most favourable cloud climates in the satellite record, it has more cloudiness than areas along the Chinese coast, according to the surface-based observations. Satellite statistics are averaged over 100-km-square regions while an observer on land is limited to his or her horizon, perhaps 30 km distant. Cloud tends to form on small islands as the air is warmed or lifted, and so observations by humans on the land will tend to be cloudier than those that encompass a large area of open water. In all likelihood, the observations from satellite are more characteristic of the cloud conditions along this part of the track. Thus, a shipboard expedition in the vicinity of Iwo Jima would sample one of the most promising sections of the eclipse track. Satellite images offer the best method of following and avoiding cloud patches, which tend to be small in size and relatively easy to avoid in these waters. With clean skies and more than six minutes of totality, a shipboard platform is an entrancing option.

The Japanese islands present some challenges as eclipse-viewing sites. Iwo Jima is regarded as a shrine by both the Japanese and Americans, and access to the island is generally restricted to those with a connection to the battles of WWII. Permission is needed to travel to the island. Cruise boats heading for the area seem to be promising a view of the island, but no landing. Kita-Iwo-Jima (also Kitaiojima or North Iwo Jima) is better positioned with respect to the central line, but the island is uninhabited, steep-sided, and covered in jungle. Landing there is impractical, and the island is a nature preserve that requires prior permission to visit. In the Nansei Islands, there are a number of small islands under the shadow that offer more than 6 minutes of totality, but the accommodation for large groups is limited. Suwanose-shima seems to be best equipped, with over 1200 available places in tourist homes and campgrounds, and an eclipse duration that lingers for 6 m 21 s (thanks to Keiko Chaki for this information).

## Northwest Pacific Typhoons

Typhoons are the western Pacific's equivalent of hurricanes, though they tend to be a little stronger and longer lasting than those found in the Atlantic. July is in the midst of the typhoon season. The more northerly storms approach the Asian coast from the southeast and east, and tend to curve to the right as they approach or cross the mainland. Similarly, Atlantic and Caribbean hurricanes curve northward to run into or parallel to the North American coast. Without exaggerating too much, the track of the eclipse, from about Wuhan to Iwo Jima, can be considered to be through the 'graveyard' of Pacific typhoons ([Figure 6](#)).

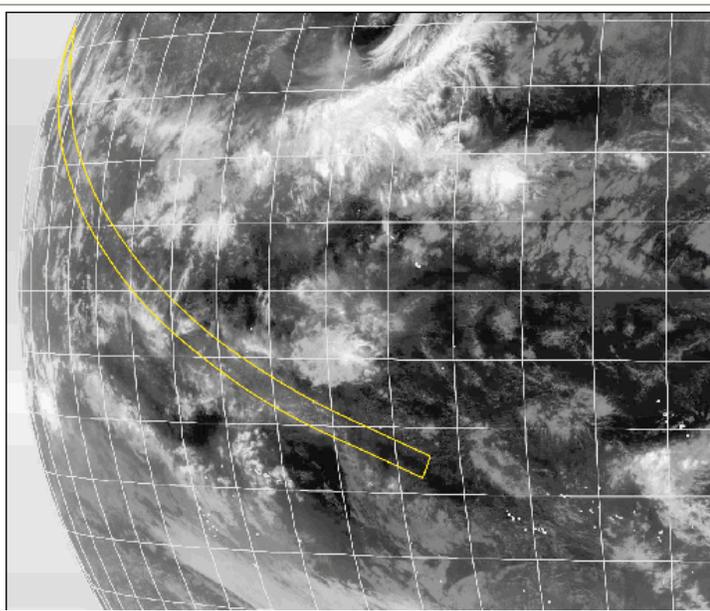
Aside from destructive winds and huge rainfalls (occasionally above 250 mm), typhoons can leave a legacy of heavy cloudiness on the Chinese interior if their path takes them across the coast. During our scouting expedition in 2006, the moisture from two storms that moved inland over southern China filled the countryside with deep layers of cloud as far inland as Wuhan. Typhoon cloudiness is already incorporated into the cloud statistics ([Table 1](#)), so the main impact of such storms will be to restrict movement (or require it in the case of ships) and force

the adoption of safety precautions. Typhoon-force winds drop rapidly once the storms move over land but heavy rains may continue until the systems run down several days later.

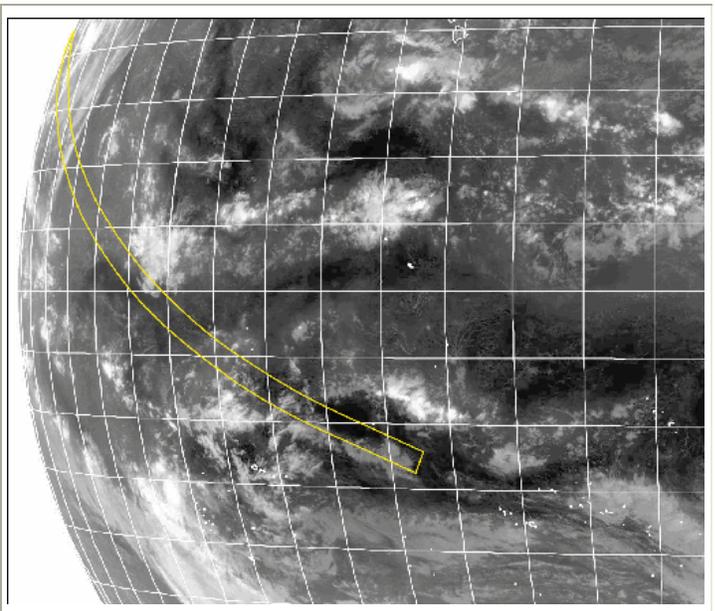
If past climatology is a to be a guide, the probability of a typhoon in the three days centered on eclipse day is around 5% at Shanghai, 8% in the Nansei Islands south of Japan, and about 6% at Iwo Jima. The frequency of typhoon weather drops rapidly, to less than 2%, a short distance inland from the coast.

## The South Pacific

The eclipse track turns southward after leaving Iwo Jima, eventually intercepting a number of enchanting tropical islands in the equatorial Pacific. Those islands are like a miniature history lesson: Eniwetok in the Marshall Islands where the H-bomb was tested; Butaritari, home to Robert Louis Stevenson for a time; and Tarawa, scene of a fierce WWII battle and close to where Emelia Earhart disappeared. From Iwo Jima, cloudiness increases steadily ([Graph 1](#)) until the track passes the Marshall Islands. Cloudiness then begins to fall, reaching an initial minimum in the anonymous waters between Tarawa and Gilbert Island and then a second minimum at the very end of the track. The end of the Moon's shadow path appears to offer the very best cloud prospects, though only a few percentage points below that at Iwo Jima. Observations from weather stations on the track support this conclusion, as shown by the climate statistics from Manihiki ([Table 1](#)), which has an average cloudiness of just 34%.



Infrared satellite image of the central Pacific acquired on 00 UTC 2006 July 22. French Polynesia and Tahiti lie just beyond the end of the track. Background image copyright EUMETSAT.



Infrared satellite image of the central Pacific acquired on 00 UTC 2007 July 22. Background image copyright EUMETSAT.

This part of the eclipse track is also subject to the occasional typhoon, though the frequency is much lower than in the South China Sea. On average, a tropical storm can be expected in the waters surrounding the Marshall Islands every 3-4 years, and a typhoon every 10 years. El Niño years bring a higher probability of a typhoon.

South of the Marshalls, over Kiribati, typhoons are essentially unknown, although guidebooks seem to believe otherwise. The storms avoid waters along the equator thanks to the very weak Coriolis force there. However the end of the track just reaches into the storm-prone areas of the Southern Hemisphere, and so the Cook Islands do see the occasional, but uncommon, cyclone (tropical storms change their title from typhoon to cyclone on the south side of the equator).

## Conditions at Sea

With over six minutes of totality over water, and discouraging cloud prospects over land, many eclipse chasers are likely to take advantage of the mobility offered by a ship-based expedition. The main limitation to viewing eclipses from a ship is the effect on photography – in general, short exposures and lower magnifications are required unless special efforts are made to overcome the pitch and roll of the vessel.

The state of the sea is usually given using two figures – the swell wave and the wind wave. In the South China Sea, the swell averages around 1.7 m in July and the wind wave, about 2 m; combined that's a 2.6 m wave (the square root of the sum of squares). Near Iwo Jima, the swell averages 1.9 m, the wind wave 2.1 m, and the combined wave is 2.8 m. Both wave and swell tend to decline along the track through the Marshall Islands and Kiribati, but then pick up toward the end of the track. Typical values near Manihiki in the North Cook Islands are 2.4 m for the wind wave and 2.2 m for the swell, giving a combined wave of 3.2 m.

## Summary

It is most unfortunate that an eclipse of such long duration does not come in a more favourable season with a better cloud climatology than is available for this one. Nevertheless, there are a few promising places, many that are marginal, and a few that are almost hopeless. The best land-based site is probably on the coast near Shanghai. For water-based expeditions, either Iwo Jima or a site near the end of the track will do, and both of these are a little more likely to be successful than anywhere on land, given modest assumptions about the mobility of ships. Above all, the climatology can be kept in perspective by recognizing that some unfavourable regions will have very good conditions for the eclipse, and some favourable locations are likely to be plagued by cloud (as shown in the satellite images above). Such are the vagaries of weather.

## Links

### Satellite Imagery

1. <http://www.sat.dundee.ac.uk/>. Dundee Satellite Receiving Station. Free registration is required to use the site, which contains satellite imagery from around the globe. Archive data is also available.
2. <http://www.ssd.noaa.gov/mtsac/nwpac.html>. Site for MTSAT Northwest Pacific Imagery:
3. <http://cimss.ssec.wisc.edu/tropic/real-time/indian/images/images.html>. India Satellite images and loops.
4. <https://metocph.nmci.navy.mil>. Naval Maritime Forecast Centre. Many choices are available, with large-scale sectors for some regions of the Pacific.

5. <http://www.jma.go.jp/en/gms/>. Japan Meteorological Agency. An interactive Java map allows selection of higher-resolution quadrants and animation.

### **Numerical (computer) forecasts**

1. [http://weather.unisys.com/gfsx/9panel/gfsx\\_pres\\_9panel\\_easia.html](http://weather.unisys.com/gfsx/9panel/gfsx_pres_9panel_easia.html). A site operated by Unisys that provides numerical weather charts for the globe. Charts are available for 10 days into the future. The relative humidity chart (Rel Hum/Show) will be most useful in predicting cloud patterns.

2. <http://www.weatherzone.com.au/models/>. Global numerical forecasts from Weatherzone in Australia. Select "International Charts" under "computer models" and then "Asia" on the tab above the map.

Forecasts extend to 180 hours (7.5 days) and are based on the U.S. GFS model. Charts are low-resolution but include both India and China. Both low and mid-level relative humidity charts are available.

3. <http://rtws.cdac.in/>. Center for Development of Advanced Computing (CDAC) in India. This agency runs the WRF model developed by NCAR in the U.S. A very impressive list of outputs is available over a domain that includes all of China.

4. <http://ddb.kishou.go.jp/grads.html>. A Japanese site with an interactive map server that allows you to pick out a region of interest anywhere in the world and display computer forecast fields for the area. The number of fields is limited, but "dew point depression" at several levels in the atmosphere (850, 700, 500 mb) will give an indication of where the model is predicting high levels of atmospheric moisture. Limit the display region to a small range of latitude and longitude to get the best display.

5. <http://weather.uwyo.edu/models>. A University of Wyoming site that allows you to select from several locations around the globe and obtain model output for that area. Numerical predictions

## **Now Booking; 2009 Total Solar Eclipse**

This eclipse may be the biggest eclipse event of the century as it will be the longest totality of the century. The longest it can possibly last is 6m 38.9s in an area of ocean where little land exists. There are a few tour groups booking some locations already, with more to come. So far I have only found a couple that are already taking reservations, and they are on mainland China, where the longest available time will be 5m 54s southwest of Shanghai. In a future issue we will look at this specific eclipse and weather expectations.

The following groups are listed as they have posted their itinerates;

### **A Bridge to China - NEW LISTING!**

Eclipse Guide > Dr. Douglas Duncan

<http://www.abridgetochina.net/Home/A+Bridge+to+China+Home/default.aspx>

#### **Total Solar Eclipse 2009 > 11 day tour**

JUL 13 to JUL 23 > TOTALITY 5m 53s from in Jiaxing

\$3195.USD ex. Arrive Beijing, leave Shanghai

<http://casa.colorado.edu/~dduncan/eclipse/Ad4.pdf> &

<http://www.abridgetochina.net/Total+Solar+Eclipse+2009/Itinerary/default.aspx>

### **A Classic Tours Collection**

<http://aclassictour.com>

Eclipse Guide > Dr. Jay Pasachoff

China > Viewing near Hangzhou, followed by a Silk Road tour, ending in Tibet before returning home or going on to Shanghai or Beijing extensions (details to be Posted Later)

### **Adventure Bhutan - NEW LISTING!**

<http://www.duyul.com/>

#### **Total Solar Eclipse Tour > 7 day tour**

JUL 19 to JUL 25 > TOTALITY viewed from Punakha, Bhutan

\$1400.USD ex. Bangkok

### **Astronomical Tours - NEW LISTING!**

<http://www.astronomicaltours.net/2009/index.html>

#### **China Total Solar Eclipse Tour > 9 day tour**

JUL 20 to JUL 28 > 5m 39s TOTALITY near Jiaxing

\$2795.USD arrive Shanghai / depart Beijing

<http://www.astronomicaltours.net/2009/China/itinerary.shtml>

#### **Brief Kiribati Total Solar Eclipse Tour 2009 > 6 day tour**

JUL 18 to JUL 23 > 4m 48s TOTALITY near the Butaritari airstrip

\$2895.USD ex Nadi

<http://www.astronomicaltours.net/2009/Kiribati/itinerary.shtml>

#### **Relaxed Fiji and Kiribati Total Solar Eclipse Tour 2009 > 11 day tour**

JUL 18 to JUL 28 > 4m 48s TOTALITY near the Butaritari airstrip

\$4795.USD ex Nadi

<http://www.astronomicaltours.net/2009/Kiribati/Relaxitinerary.shtml>

#### **Fun Fiji and Kiribati Total Solar Eclipse Tour 2009 > 11 day tour**

JUL 16 to JUL 26 > 4m 48s TOTALITY near the Butaritari airstrip

\$4925.USD ex Nadi

## **Astronomy Vacations**

<http://www.astronomyvacations.com/Classicalinerary.html>

### **2009 Eclipse Cruise > 11 day tour**

JUL 16 to JUL 29 > TOTALITY nearly 6m 39s target location: 24° 12.2' North and 144° 07.0 East  
aboard the cruise ship Costa Classica, a 722'/1300 passenger vessel  
Starting at \$2952.USD, ex Beijing

## **British Deaf Astronomers Association - NEW LISTING!**

<http://www.defastronomers.co.uk/>

### **Dragon's Eye Tour 2009 > 8 day tour**

JUL 17 to JUL 24 > TOTALITY nearly 6m near Suzhou  
£1135.GBP ex London, Heathrow Airport  
<http://www.defastronomers.co.uk/chinaeclipse.htm>

## **Dao of Well Being Tours - NEW LISTING!**

### **Qigong Total Solar Eclipse China 2009**

<http://www.qigongchinatrip.com/index.htm>

<http://www.qigongchinatrip.com/solarEclipse2009Tour.htm>

e-mail request to [rebecca@qigongchinatrip.com](mailto:rebecca@qigongchinatrip.com) for more info

## **Eclipse of the Century - NEW LISTING!**

<http://www.eclipseofthecentury.com/>

### **Total Solar Eclipse 2009 > 11 day tour**

JUL 17 to JUL 25 > TOTALITY nearly 6m 30s about 12 nautical miles from Yakushima Island  
aboard the cruise ship Superstar Libra, a 216m/1480 passenger vessel  
Starting at £1395.GBP + Insurance, ex Taipei

## **Explore! - NEW LISTING!**

<http://www.explore.co.uk/>

### **China Discovery & Eclipse 2009 > 13 day tour**

#### **Eclipse Guide > Prof. Paul Murdin**

JUL 17 to JUL 25 > TOTALITY nearly 6m near Anji  
£1645.GBP / £2445.GBP, ex London Heathrow; arrive Hong Kong, depart Shanghai  
<http://www.explore.co.uk/Explore/UI/Dossier/2008Dossiers/SCE7.pdf>

### **Cultural Treasures & Eclipse 2009 > 09 / 10 day tour**

#### **Eclipse Guide > Dr. Fransisco Diego**

JUL 13 to JUL 23 > TOTALITY nearly 6m near Anji  
£1249.GBP / £1849.GBP, ex Beijing - Shanghai / ex London Heathrow arrive Beijing, depart Shanghai  
<http://www.explore.co.uk/Explore/UI/Dossier/2008Dossiers/SCE9.pdf>

### **Encounter Japan & Eclipse 2009 > 13 / 14 day tour**

JUL 17 to JUL 30 > TOTALITY on Yakushima Island 3m to 4m depending on location on the island  
£2249.GBP ex Tokyo / £2899.GBP ex London Heathrow arrive Tokyo, depart Tokyo  
<http://www.explore.co.uk/Explore/UI/Dossier/2008Dossiers/SJE2.pdf>

### **Imperial China & Eclipse 2009 > 18 / 19 day tour**

JUL 19 to AUG 06 > TOTALITY from Shanghai of nearly 6m  
£1345.GBP ex Shanghai / Beijing / £1945.GBP ex London Heathrow arrive Shanghai, depart Beijing  
<http://www.explore.co.uk/Explore/UI/Dossier/2008Dossiers/SCE4.pdf>

(cont)

### **Poetic China & Eclipse 2009 > 10 / 11 day tour**

JUL 19 to JUL 29 > TOTALITY from Suzhou of nearly 6m

£899.GBP ex Shanghai / £1549.GBP ex London Heathrow arrive Shanghai, depart Shanghai

<http://www.explore.co.uk/Tour+Detail+Page.htm?TourCode=SCE10&BrochureCode=EW2008>

### **Shanghai to Hong Kong & Eclipse 2009 > 12 / 13 day tour**

JUL 19 to JUL 31 > TOTALITY from Coastal Shanghai of nearly 6m

£1645.GBP ex Shanghai – Hong Kong / £2445.GBP ex London arrive Shanghai, depart Hong Kong

<http://www.explore.co.uk/Explore/UI/Dossier/2008Dossiers/SCE8.pdf>

### **Shanghai, Suzhou & Eclipse 2009 > 5 / 6 day tour**

JUL 19 to JUL 24 > TOTALITY from Anji of nearly 6m

£549.GBP ex Shanghai / £1199.GBP ex London Heathrow arrive Shanghai, depart Shanghai

<http://www.explore.co.uk/Explore/UI/Dossier/2008Dossiers/SCE13.pdf>

### **Shogun Trail & Eclipse 2009 > 13 / 14 day tour**

JUL 11 to JUL 24 > TOTALITY from Yakushima of nearly 3m to 4m

£2249.GBP ex Tokyo / £2749.GBP ex London Heathrow arrive Tokyo, depart Tokyo

<http://www.explore.co.uk/Explore/UI/Dossier/2008Dossiers/SJE1.pdf>

### **Silk Road Odyssey & Eclipse 2009 > 26 / 27 day tour**

JUN 30 to JUL 26 > TOTALITY from Shanghai of nearly 6m

£2199.GBP ex Tashkent - Beijing / £2999.GBP ex London Heathrow arrive Tashkent, depart Beijing

<http://www.explore.co.uk/Explore/UI/Dossier/2008Dossiers/SCE1.pdf>

### **Taste of China & Eclipse 2009 > 9 / 10 day tour**

JUL 15 to JUL 24 > TOTALITY from Shanghai of nearly 6m

£949.GBP ex Beijing - Shanghai / £1599.GBP ex London Heathrow arrive Beijing, depart Shanghai

<http://www.explore.co.uk/Explore/UI/Dossier/2008Dossiers/SCE12.pdf>

## **Focus on Nature Tours (FONT)**

### **Birding in the Summer – Southern Japan > 15-days**

JUL 12 to JUL 26 > up to 3m 46s TOTALITY on Amami-Oshima

\$2795.USD ex arrive Okinawa / depart Osaka

<http://www.focusonnature.com/JapanJul'09TotalSolarEclipseFeature.htm>

## **Harvard Museum of Natural History Travel Program**

### **Total Solar Eclipse Cruise and Exploration of Japan > 17-days**

#### **Eclipse Guides > Dr. Mark Van Baalen, Dr. Edward Bertschinger & Prof. Edwin Turner**

JUL 15 to JUL 31 > up to 6m 39s TOTALITY aboard the Costa Classica cruise ship

\$9895.USD ex arrive Beijing, China / depart Kyoto, Japan

[http://www.hmn.harvard.edu/travel/t\\_asia\\_japan\\_eclipse.htm](http://www.hmn.harvard.edu/travel/t_asia_japan_eclipse.htm)

## **Houston Museum of Natural Science**

### **thru Easton Resource Development, Inc. - NEW LISTING!**

### **Total Solar Eclipse Trip to China 2009 > 14-days**

#### **Eclipse Guide > Dr. Carolyn Sumners**

JUL 10 to JUL 23 > TOTALITY from or near ShaoXing

\$3397.USD ex. arrive Beijing, depart Shanghai

[http://www.hmns.org/files/education/HMNS\\_Eclipse\\_Trips\\_2008\\_and\\_2009.pdf](http://www.hmns.org/files/education/HMNS_Eclipse_Trips_2008_and_2009.pdf)

## **Jasmine's China Adventure Tours**

<http://www.jasminechina.com/ecl2009.htm>

### **Dragon River Eclipse Tour**

#### **Option 1 > 21-days**

JUL 12 to AUG 01 > nearly 6m TOTALITY

\$4750.USD ex Beijing

<http://www.jasminechina.com/ecl2009.htm#option1>

#### **Option 2 > 21-days**

JUL 12 to AUG 01 > nearly 6m TOTALITY

\$4350.USD ex Beijing

<http://www.jasminechina.com/ecl2009.htm#option2>

#### **Option 3 > 16-days**

JUL 17 to AUG 01 > nearly 6m TOTALITY

\$3950.USD ex Shanghai

<http://www.jasminechina.com/ecl2009.htm#option3>

#### **Option 4 > 16-days**

JUL 17 to AUG 01 > nearly 6m TOTALITY

\$3550.USD ex Shanghai

<http://www.jasminechina.com/ecl2009.htm#option4>

#### **Option 5 > 8-days**

JUL 17 to JUL 24 > nearly 6m TOTALITY

\$1900.USD ex Shanghai

<http://www.jasminechina.com/ecl2009.htm#option1>

## **Melita Trips - NEW LISTING!**

<http://www.melitatrips.com/>

### **Grand Yangtze River Cruise aboard the Victoria Prince – 14 day trip**

JUL 13 to JUL 26 > nearly 5m+ TOTALITY from Three Gorges Dam

Request brochure for pricing, arrive Beijing / depart Shanghai

<http://www.melitatrips.com/china/index.html>

## **MIT Alumni Association - NEW LISTING!**

[Eclipse Guide > Prof. Richard Binzel](#)

### **Total Solar Eclipse in China – 10 day trip**

JUL 15 to JUL 24 > nearly 6m TOTALITY from Zhu Jia Jiao and on the shore of Dingshan Lake

\$3895.USD, ex arrive Beijing / depart Shanghai

<http://alum.mit.edu/lt/travel/2009/china/index.html>

## **MWT Associates, Inc. - NEW LISTING!**

<http://www.melitatrips.com/>

### **Grand Yangtze River Cruise – 14 day trip**

JUL 13 to JUL 26 > 5m+ TOTALITY from Three Gorges Dam region on the Yangtze

Request a brochure to receive a price list > [http://www.melitatrips.com/brochure\\_request\\_china.html](http://www.melitatrips.com/brochure_request_china.html)

**DOES include round trip airfare from major US gateways**

<http://www.melitatrips.com/china/index.html>

## **Oriental Travel - NEW LISTING!**

<http://www.orientaltravel.co.uk/>

### **China Solar Eclipse Tour 5 days**

JUL 19 to JUL 23 – at least 5m 20s TOTALITY near Hangzhou  
from £650.GBP / \$1270.USD / €995.EURO ex Shanghai

<http://solar-eclipse.orientaltravel.co.uk/5days.html>

### **China Solar Eclipse Tour 10 days**

JUL 14 to JUL 23 – at least 5m 20s TOTALITY near Hangzhou  
from £1290.GBP / \$2530.USD / €1970.EURO ex arrive Beijing / depart Shanghai

<http://solar-eclipse.orientaltravel.co.uk/10days.html>

### **China Solar Eclipse Tour 13 days**

JUL 11 to JUL 23 – at least 5m 20s TOTALITY near Hangzhou  
from £1620.GBP / \$3700.USD / €2890.EURO ex arrive Beijing / depart Shanghai

<http://solar-eclipse.orientaltravel.co.uk/10days.html>

## **Philworld Travel Resources - NEW LISTING!**

<http://philworldtravel.com/default.aspx>

### **2009 Total Solar Eclipse Program – 8 day trip**

JUL 16 to JUL 23 > TOTALITY from Darjeeling  
Ex Delhi. India

<http://philworldtravel.com/solareclipse2009.aspx>

## **Rick Brown's Eclipse Safaris - NEW LISTING!**

[Eclipse Leader > Rick Brown](#)

### **Eclipse 2009, China – 14 day trip**

JUL 14 to JUL 27 – 5m 29s TOTALITY near Wuhan  
\$3295.USD arrive Shanghai / depart Beijing

<http://www.eclipse-chasers.com/esafari/default.htm>

## **Ring of Fire Expeditions - NEW LISTING!**

[Eclipse Leader > Paul D. Maley](#)

### **Tour #1 – China Coast Total Solar Eclipse – 7 day trip**

JUL 19 to JUL 25 – 5m 52s TOTALITY near Jiaying  
\$2899.USD ex Shanghai, a post tour to Beijing is also available

<http://www.eclipsetours.com/china09.html>

### **Tour #2 – Iwo Jima Total Solar Eclipse**

JUL 18 to JUL 24 – 5m 12s TOTALITY  
One 737 plane load, 124 passenger limit

\$3499.USD ex Guam

<http://www.eclipsetours.com/iwo.html>

## **Siemer & Hand Travel - NEW LISTING!**

<http://www.siemerhand.com/cgi-bin/travel/index.html>

### **2009 Total Solar Eclipse Cruise & Exploration of Japan > 17 day tour**

JUL 15 to JUL 31 > TOTALITY nearly 6m 38.9s aboard the cruise ship Costa Classica  
\$9895 ex Taipei

<http://www.siemerhand.com/cgi-bin/travel/trip/52/2009-Total-Solar-Eclipse-Cruise-Exploration-of-Japan.html>

## **Sirius Travel**

### **Option A - Tibet & China > 18 day trip**

JUL 13 to JUL 30 > 5m 00s TOTALITY at 3099 meters on Mt. Emei Shan  
\$4325.USD

<http://www.siriustravel.com/tibet09/itinerary.cfm>

### **Option B - Tibet & China > 12 day trip - **NEW LISTING!****

JUL 13 to JUL 24 > 5m 00s TOTALITY at 3099 meters on Mt. Emei Shan  
\$3850.USD

<http://www.siriustravel.com/tibet09/itinerary.cfm>

## **South America Classic Tours**

<http://www.solar-eclipse-tours.com/>

### **Trip 1 - China – Mt. Emei Shan 3077m ASL > 14 day trip**

JUL 12 to JUL 25 > 4m 42s TOTALITY at 3099 meters on Mt. Emei Shan  
\$3190.USD ex arrive Beijing / depart Shanghai

[http://www.solar-eclipse-tours.eu/eclipse\\_2009\\_emei.htm](http://www.solar-eclipse-tours.eu/eclipse_2009_emei.htm)

### **Trip 2 - China – Hangzhou > 8 day trip**

JUL 17 to JUL 24 > 5m 53s TOTALITY near Hangzhou  
\$1590.USD ex Shanghai

[http://www.solar-eclipse-tours.eu/eclipse\\_2009\\_hangzhou\\_8days.htm](http://www.solar-eclipse-tours.eu/eclipse_2009_hangzhou_8days.htm)

### **Trip 3 - China – Hangzhou > 14 day trip**

JUL 17 to JUL 25 > 5m 53s TOTALITY near Hangzhou  
\$2690.USD ex arrive Beijing / depart Shanghai

[http://www.solar-eclipse-tours.eu/eclipse\\_2009\\_hangzhou\\_14days.htm](http://www.solar-eclipse-tours.eu/eclipse_2009_hangzhou_14days.htm)

## **Spears Travel**

<http://www.spearstravel.com/astronomy/upcoming.htm>

**Southern China – Details not yet available**

## **Travel and Trek - **NEW LISTING!****

<http://www.travelandtrek.com/index.html>

### **Bhutan Solar Eclipse Tour - July 2009 > 8 day trip**

JUL 19 to JUL 26 > 3m to 4m TOTALITY in Bhutan depending on location  
£630.GBP ex Paro

<http://www.travelandtrek.com/Bhutan.htm#Eclipse>

## **Travel Wizard - **NEW LISTING!****

<http://www.travelwizardtravel.com/astro.htm>

**Eclipse Leader > Stephen D. Last**

**China's Eclipse Tour > Info yet to be posted**

## **TravelQuest International- **NEW LISTING!****

<http://www.tq-international.com/index.htm>

### **China's Footsteps of Emperors > 6 day trip**

JUL 18 to JUL 23 > 5m 53.5s TOTALITY near Shanghai  
\$2230.USD ex Shanghai

<http://www.travelquestinternational.com/China2009/Chinaitinerary.htm>

### **China's Footsteps of Emperors > 9 day trip**

JUL 15 to JUL 23 > 5m 53.5s TOTALITY near Shanghai

\$2840.USD ex arrive Beijing / depart Shanghai

<http://www.travelquestinternational.com/China2009/Chinaitinerary.htm>

### **Total Solar Eclipse Cruise > 15 day trip**

#### **Eclipse Leaders > Rick Feinberg & Owen Gingerich**

JUL 15 to JUL 29 > 3m 26s TOTALITY Aboard SS Paul Gauguin well NW of Tahiti

Starting at \$6995.USD + \$395.USD for port fees & taxes > ex Papeete, Tahiti

<http://www.travelquestinternational.com/CookIslands/NCIhome.htm>

### **Tropical Sails Corp**

<http://www.tropicalsails.com/>

#### **Eclipse 2009 China Total Solar > 14-day trip**

JUL 11 to JUL 24 > approximately 5m 51s TOTALITY near Shanghai

\$2898.USD ex arrive Beijing / depart Shanghai

<http://www.tropicalsails.com/eclipse/page2.html>

### **Twilight Tours - NEW LISTING!**

<http://sciencecenter.net/twilighttours/>

#### **China Total Solar Eclipse Tour >14-day trip**

JUL 13 to JUL 26 - 5m 50s TOTALITY near Hangzhou

\$2995.USD ex arrive Beijing / depart Shanghai

<http://sciencecenter.net/twilighttours/200907/itinerary.pdf>

### **Winco Eclipse Tours - NEW LISTING!**

<http://www.wincoclipsetours.com/>

#### **China 2009 Eclipse Expedition >18-day trip**

JUL 06 to JUL 24 - 5m 55s TOTALITY south of Shanghai

\$4495.USD ex arrive Beijing / depart Shanghai

<http://www.wincoclipsetours.com/id51.htm>

### **Wilderness Travel**

<http://www.wildernesstravel.com/>

#### **Eclipse Leader > Alex Filippenko, PhD**

#### **Total Solar Eclipse in Polynesia > 15-day trip**

JUL 15 to JUL 29 > Almost 3½mTOTALITY

\$6995.USD - **SOLD OUT!**

<http://www.wildernesstravel.com/itins/evpolyne.html>

## **Also Now Booking; 2010 Total Solar Eclipse**

The eclipse of 2010 July 11 is almost entirely visible from the waters of the South Pacific Ocean, with very small interjections of reefs and tiny islands. It passes close to Tahiti, and much further totality envelopes Rapa Nui (Easter Island). Whether going to Tahiti or Rapa Nui, space may be very limited, and like the TSE of 2005, will likely sell out well in advance. An article posted to the USAToday web site last year stated that the lodging at the hotels on Rapa Nui was booked 8 years in advance<sup>1</sup>. I have little doubt that there will be several eclipse camps set up here, but just how many will be able to get to, and with LAN Airlines only making 6 flights a week from Santiago to Rapa Nui, perhaps they will gear up for the assault.

Eclipse chasers trying to squeeze out every second will likely make a pilgrimage to the area along the northeast and eastern shores of Rapa Nui, will be poised for 4m 47s of totality, less than 2 seconds off the maximum visible along the centerline out in the ocean. But even people on the southeast side of the island, in Hanga Roa, will witness 4m 40s of totality, only 7 seconds less than the observers on the northeast shore.

Tahiti lies just outside the eclipse path, and those venturing on the seas only 120kms south will have a chance for 3m 55s of totality, with longer durations the further east you travel, and the nearby small island of Mahetia will glimpse 1m 45s of totality, and several precarious atolls to the east of Tahiti come very close to the centerline. Most tour groups are only compiling lists of individuals wanting to travel to these areas, so get on a list requesting more information. To date, the following are the only groups actively advertising their rates and are taking reservations;

### **A Classic Tours Collection**

<http://aclassictour.com>

**Rapi Nui Trip > Details to be posted when it becomes available**

### **Enrichment Tours - NEW LISTING!**

<http://www.dennismammana.com/tours/upcoming.htm>

**Mongolia >18-day trip - Balikun / Yiwu area**

JUL 19 to AUG 05 – nearly 2m TOTALITY

\$5265.USD

<http://www.wincoeclipse.com/id39.htm>

### **Ring of Fire Expeditions - NEW LISTING!**

**Eclipse Guide > Paul D. Maley**

**Annular Solar Eclipse in Uganda > 8-day trip**

JUL 09 to JUL 16 – 2m 27s of Bailey's Beads along the southern edge of annularity (graze zone)

\$3683.USD ex arrive Kigali, Uganda / return Entebbe, Uganda

<http://www.eclipsetours.com/uganda.html>

**Solar Eclipse Cruise in French Polynesia – 11 day trip**

JUL 08 to JUL 18 – 4m 01s TOTALITY near Moorea, Society Islands

\$3526.USD and up (\$3058.USD + \$468.USD Port, fuel and gratuity surcharges) ex Papeete, Tahiti

<http://www.eclipsetours.com/tahiti.html>

## **South America Classic Tours**

<http://www.solar-eclipse-tours.com/>

Solar Eclipse Tour 2010 (Easter Island) **Details Pending**

## **TravelQuest International**

<http://www.tq-international.com/index.htm>

Easter Island Total Solar Eclipse 2010 **Details Pending**

<http://www.travelquestinternational.com/EasterIs2010info.html>

French Polynesian Voyage to Totality 2010 **Details Pending**

3m 45s TOTALITY

<http://www.travelquestinternational.com/FrenchPolyinfo.html>

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<sup>1</sup> USA Today - [http://www.usatoday.com/travel/news/2007-10-25-eclipse-travel\\_N.htm](http://www.usatoday.com/travel/news/2007-10-25-eclipse-travel_N.htm)

## 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. More listings will be added when they become available and be indicated with a **NEW LISTING!** value on the previous pages.

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 tours 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, is all about doing 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), 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 to describe the events of a total solar eclipse to first time eclipse chasers (FTEC’s). No matter what, plan to have a great sight seeing 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 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 always, 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.

# ECLIPSE SPECIALTY TOUR GROUP Web Sites ...

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## **A Classic Tours Collection**

<http://aclassictour.com>

## **Eclipse City**

<http://www.eclipse-city.com/>

## **Far Horizons**

<http://www.farhorizon.com/2006-solar-eclipse.htm>

## **Mayhugh Travel – Astronomy Vacations**

<http://astronomyvacations.com/>

## **MWT Associates (Astronomical Tours)**

<http://www.melitatrips.com/>

## **Ring of Fire Expeditions**

<http://www.eclipsetours.com>

## **Sirius Travel**

<http://www.siriustravel.com/>

## **Sita World Tours - Solar Eclipse Tours**

<http://www.eclipsetours.net/>

## **Spears Travel**

<http://www.spearstravel.com/astronomy/>

## **TravelQuest International**

<http://www.tq-international.com/index.htm>

## **Travel Wizard**

<http://www.travelwizardtravel.com/astro.htm>

## **Winco Eclipse Tours, Inc.**

<http://www.wincoeclipsetours.com>

## Other Useful Eclipse Web Sites ...

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NASA Eclipse Home Page

<http://eclipse.gsfc.nasa.gov/eclipse.html> - **NEW WEB PAGE!**

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](http://xjubier.free.fr/en/site_pages/SolarEclipsesGoogleMaps.html)

IAU Solar Eclipse Working Group

<http://www.eclipses.info/>

Jay Pasachoff – Past Eclipse Expeditions

<http://www.williams.edu/Astronomy/eclipse/>

Sheridan Williams' Web Site

<http://www.clock-tower.com/>

Eclipses Online – HMNAO, CCLRC

<http://www.eclipse.org.uk/>

Glenn Schneider: Umbraphile - **NEW LISTING!**

<http://nicmosis.as.arizona.edu:8000/UMBGRAPHILLIA.html>

Bill Kramer's Site - **NEW LISTINGS!**

<http://www.eclipse-chasers.com/default.html> < New and Improved Web Format

Where Are the Eclipse Chasers

<http://www.eclipse-chasers.com/where.htm>

Dan McGlaun's – Eclipse2017.org - **NEW LISTING**

<http://www.eclipse2017.org/>

Jeffrey R. Charles – Eclipse Chaser Journal

<http://www.eclipsechaser.com/>

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Larry A. Stevens

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Some future issues will occasionally use photos that have been posted to web sites that are saved at 72 dpi, and likely will not be as sharp as others posted at 128 dpi.

Please send any correspondence, suggestions or submissions to [TOTALITYnewzine@aol.com](mailto:TOTALITYnewzine@aol.com).

Photo submissions can also be sent to the [TOTALITYnewzine@aol.com](mailto:TOTALITYnewzine@aol.com), please format @128dpi.

