

'Monster' solar eclipse takes on Asian giants

July 20 2009, by Giles Hewitt



This picture shows the sun partially covered by the moon during an eclipse as seen from Jakarta in January 2009. Total solar eclipses have struck awe or fear into hearts for millennia, but scientists are more interested in the unusual mathematics behind the gold-and-indigo lightshow.

The world's most populous nations will gaze skywards Wednesday as the longest total solar eclipse of the 21st century lays a carpet of darkness across India and China, from Mumbai to Shanghai.

The event is being hyped in the obscure world of eclipse-chasers as a once-in-a-lifetime opportunity which, due to its trajectory over some of the most densely inhabited areas on Earth, could end up being the most watched eclipse in history.

"This is a very important milestone. None of us will live long enough to

see another one like it," said Federico Borgmeyer, the German-based manager of the specialist travel agency Eclipse City.

The American astrophysicist and acclaimed eclipse expert Fred Espenak has simply labelled the July 22 event "a monster."

Total solar eclipses occur when the moon comes between the Earth and the sun, completely obscuring the sun.

The excitement this time around is largely due to the unusually long duration of the instant of greatest eclipse, or "totality" -- when the sun is wholly covered.

At its maximum, this will last six minutes and 39 seconds -- a duration that will not be matched until the year 2132.

The up to 258-kilometre- (161-mile-) wide shadow cast along the "path of totality" will first make landfall on the western Indian state of Gujarat shortly before 6:30am (0100 GMT).

It then races across India, blacking out the holy city of Varanasi on the banks of the Ganges, squeezing between the northern and southern tips of Bangladesh and Nepal before engulfing most of Bhutan, traversing the Chinese mainland and slipping back out to sea off Shanghai.

Its next landfall is Japan's southern Ryukyu Islands, after which it curves southeast through the Pacific Ocean where the maximum duration of totality will occur.

For those in its direct path, the early morning eclipse will effectively provide a double sunrise, as the moon takes the low-lying sun hostage and then slowly releases it again.

The total transit will obscure the sun by 50 percent or more for an estimated two billion people, from the salt flat farmers of Gujarat to herdsman in the foothills of the Tibetan Himalayas.

Some have seized on the natural phenomenon as a unique business opportunity.

Travel firm Cox and Kings has chartered a Boeing 737-700 aircraft that will take off from New Delhi before dawn, "intercept" the total eclipse at around 41,000 feet and then chase its path to the western state of Bihar.

All 21 sun-side, window seats have been sold at 79,000 rupees (1,600 dollars) a pop, with customers including amateur astronomers, photographers and a family of four planning a mid-air picnic in the shade.

In Shanghai, hotels offering special eclipse packages were booked out well in advance by guests from Japan, the United States and Europe.

Shanghai Sculpture Park, one of the best viewing locations in the city, has sold more than 2,000 tickets, which include special glasses and a commemorative T-shirt.

On a less commercial note, 1.5 million Hindu pilgrims are expected at the holy site of Kurukshetra in northern India, where bathing in the waters during a solar eclipse is believed to further the attainment of spiritual freedom.

In India and China, tradition views eclipses with a mixture of wonder and foreboding.

Raj Kumar Sharma, an astrologer in Mumbai, described July 22 as a

"very dangerous moment in the universe," with the blocking of the sun's rays akin to a disease or virus.

"If the sun, the leader of the stars, is sick, then definitely there's going to be some bigger problems happening in the world," he told AFP.

In ancient China, eclipses were often associated with natural disasters or the death of an emperor, and some similar superstitions persist.

There are also less otherworldly concerns -- the potentially massive audience for this eclipse has raised fears that many could end up with permanent retina damage from viewing the event with the naked eye.

Delhi-based eye surgeon Rituraj Barauh said the most dangerous phase was immediately after totality when the sun re-emerged.

"It's this quick shift from darkness to very bright light that does the damage," he said.

Indian and Chinese authorities have used the media to educate people on the importance of wearing protective lenses, while others recommend live web casts at sites like www.live-eclipse.org and www.atlaspost.com/2009tse.

Solar eclipse: Of celestial mechanics and the Eye of God

Total solar eclipses have struck awe or fear into hearts for millennia, but scientists are more interested in the unusual mathematics behind the gold-and-indigo lightshow.

Superstition has always haunted the moment when Earth, Moon and Sun

are perfectly aligned. The daytime extinction of the Sun, the source of all life, is associated with war, famine, flood and the death or birth of rulers.

Desperate for an explanation, the ancient Chinese blamed a Sun-eating dragon. The Vikings believed the culprits were two giant wolves, Skoll and Hati, which chased the Sun around the sky. Among Indians in South America, an eclipse was simply, terrifyingly, "the Eye of God."

But a remarkable act of celestial geometry explains it all.

When the Moon glides between Earth and the Sun, it casts a cone-shaped shadow, called an umbra, that races from West to East.

The Sun is 400 times wider than the Moon, but it is also 400 times farther away. Because of the symmetry, the umbra, for those on the planetary surface, is exactly wide enough to cover the face of the Sun.

At an eclipse's height, a halo of gold, called a corona, flares around the darkened lunar disc, while the sky turns an eerie dark blue, disorienting birds and causing bats to emerge from their roosts in the belief that night has fallen.

Total solar eclipses are exceptional events, and the one that crosses Asia on Wednesday is especially so.

If the clouds hold back, it could be the most-watched eclipse in history, for its path of totality traverses the world's two most populous countries, China and India.

People living outside totality, from Japan in the north to parts of Indonesia in the south, will be in the penumbra, or partial shadow, which means a "bite" seems to have been taken out of the Sun.

The lunar shadow will first strike the Gulf of Khambhat, off western India, at 0053 GMT, taking eight minutes to cross the centre of the country before entering northern Bangladesh and the eastern tip of Nepal.

It then slices through some of China's biggest cities, including Chengdu, Chongqing and Wuhan, before arriving at Shanghai, a city of 20 million souls.

"This may be the most people that have ever been in the Moon's shadow at once," say NASA eclipse experts Fred Espenak and University of Manitoba meteorologist Jay Anderson.

The umbra then flits across the western Pacific, where at one point the path of totality will be 258 kilometers (161 miles) wide, while the maximum duration of totality will be six minutes, 39 seconds.

By eclipse standards, this is "a monster," Espenak and Anderson estimate in the US magazine *Sky & Telescope*. We will have to wait until 2132 before the totality duration is beaten.

A total solar eclipse usually occurs every 18 months or so. Any given spot on Earth's surface will host a total eclipse on average once every 375 years.

Until now, the most-watched eclipse occurred on August 11, 1999, when the umbra raced from Britain, across Western Europe, part of the Middle East and India.

The last total solar eclipse was on August 1 2008, and also crossed China.

The next will be on July 11 2010, but will occur almost entirely over the

South Pacific, where Easter Island -- home of the legendary moai giant statues -- will be one of the few landfalls.

That will be wonderful news to "eclipse junkies," an eclectic army that pursues total eclipses around the world, sometimes hiring seats on planes or ships to get the best view.

+ SAFETY FIRST: Eclipses, even partial ones, should NOT be viewed with the naked eye or through binoculars, a telescope, beer bottle or photographic film, as this can permanently damage the retina. Observers should use proper optical filters such as welding-goggle glass, eclipse spectacles or a solar projection kit for their telescope. The safest way to view is on television or the Internet.



An Indian astronomy researcher explains solar eclipses in Kolkata on July 19. Indian astrologers are predicting violence and turmoil across the world as a result of this week's total solar eclipse, which the superstitious and religious view as a sign of potential doom.

Solar eclipse pits superstition against science

Indian astrologers are predicting violence and turmoil across the world as

a result of this week's total solar eclipse, which the superstitious and religious view as a sign of potential doom.

But astronomers, scientists and secularists are trying to play down claims of evil portent in connection with Wednesday's natural spectacle, when the moon will come between the Earth and the sun, completely obscuring the sun.

In Hindu mythology, the two demons Rahu and Ketu are said to "swallow" the sun during eclipses, snuffing out its life-giving light and causing food to become inedible and water undrinkable.

Pregnant women are advised to stay indoors to prevent their babies developing birth defects, while prayers, fasting and ritual bathing, particularly in holy rivers, are encouraged.

Shivani Sachdev Gour, a gynaecologist at the Fortis Hospital in New Delhi, said a number of expectant mothers scheduled for caesarian deliveries on July 22 had asked to change the date.

"This is a belief deeply rooted in Indian society. Couples are willing to do anything to ensure that the baby is not born on that day," Gour said.

Astrologers have predicted a rise in communal and regional violence in the days following the eclipse, particularly in India, China and other Southeast Asian nations where it can be seen on Wednesday morning.

Mumbai astrologer Raj Kumar Sharma predicted "some sort of attack by (Kashmiri separatists) Jaish-e-Mohammad or Al-Qaeda on Indian soil" and a devastating natural disaster in Southeast Asia.

An Indian political leader could be killed, he said, and tension between the West and Iran is likely to increase, escalating into possible US

military action after September 9, when fiery Saturn moves from Leo into Virgo.

"The last 200 years, whenever Saturn has gone into Virgo there has been either a world war or a mini world war," he told AFP.

It is not just in India that some are uneasy about what will transpire because of the eclipse.

In ancient China they were often associated with disasters, the death of an emperor or other dark events, and similar superstitions persist.

"The probability for unrest or war to take place in years when a solar eclipse happens is 95 percent," announced an article that attracted a lot of hits on the popular Chinese web portal Baidu.com.

Sanal Edamaruku, president of the Indian Rationalist Association, dismissed such doomsday predictions.

"Primarily, what we see with all these soothsayers and astrologers is that they're looking for opportunities to enhance their business with predictions of danger and calamity," he told AFP.

"They have been very powerful in India but over the last decade they have been in systematic decline."

Astronomers and scientists are also working to educate the public about the eclipse.

Travel firm Cox and Kings has chartered a Boeing 737-700 aircraft to give people the chance to see the eclipse from 41,000 feet (12,500 metres).

Experts will be on board to explain it to passengers, some of whom have paid 79,000 rupees (1,600 dollars) for a "sun-side" seat on the three-hour flight from New Delhi.

The eclipse's shadow is expected to pass over the aircraft at 15 times the speed of sound (Mach 15), said Ajay Talwar, president of the SPACE Group of companies that promotes science and astronomy.

"It's coming in the middle of the monsoon season. On the ground, there's a 40 percent chance of seeing it in India. On the aircraft you have almost a 90 percent chance of seeing the eclipse," he added.

Siva Prasad Tata, who runs the Astro Jyoti website, straddles the two worlds.

"There's no need to get too alarmed about the eclipse, they are a natural phenomenon," the astrologer told AFP.

But he added: "During the period of the eclipse, the opposite attracting forces are very, very powerful. From a spiritual point of view, this is a wonderful time to do any type of worship.

"It will bring about good results, much more than on an ordinary day."

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