



ANCIENT WORLD TOURS



Total Eclipse of the Sun

29th March 2006

Peter Meadows

• Introduction

"A total eclipse of the Sun is the most sublime and awe-inspiring of all celestial events. As the Moon's black disk blots out the Sun's brilliant orb, the landscape is shrouded in the eerie twilight of the lunar shadow. The Sun's glorious corona bursts into view for the all-too-brief period of totality and vanishes just as quickly with the return of daylight."

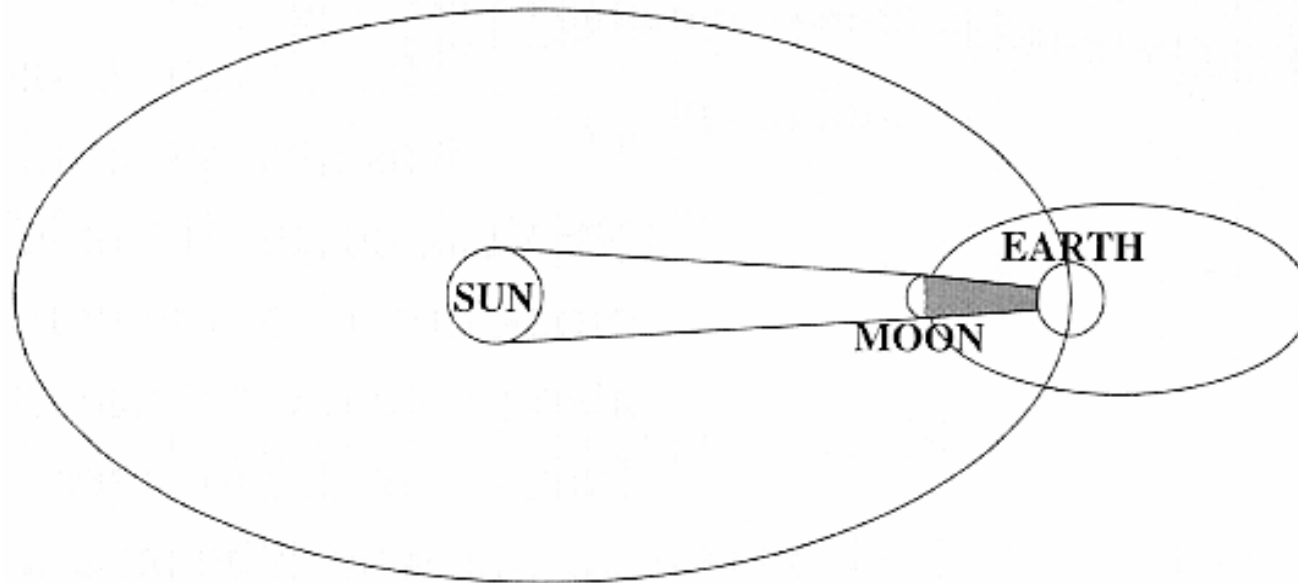
Fred Espanak and Jay Anderson, Sky & Telescope, January 2006

"...when asked what single instrument he would select for observing an eclipse, replied, "A pillow." The spectacle of total eclipse is a naked eye one and is best seen without the use of shaded glasses or instruments of any kind."

Walter George Bell, The Daily Telegraph Guide to the Eclipse, 1927

- **Total Eclipses of the Sun**

- These occur when the Moon passes directly between the Earth and the Sun.



- The duration of the total phase depends on the apparent size of the Moon and Sun and the alignment of the three bodies: the longest possible total eclipse of the Sun is 7m 31s.
- There are approximately 70 total eclipses per century.

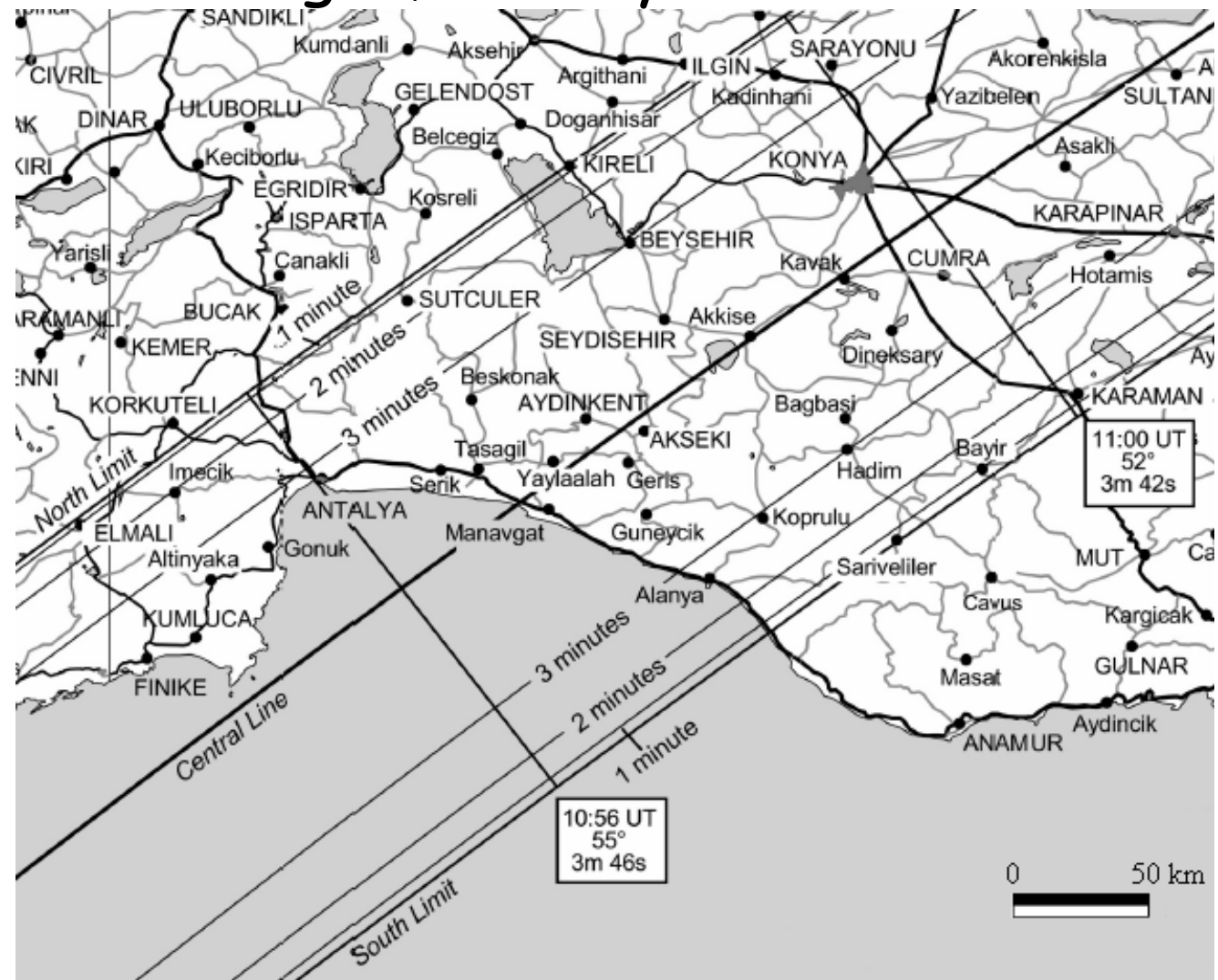
• Total Eclipse of the Sun 29th March 2006

- Eclipse begins in Brazil at 08:36 UT (or GMT).
- Greatest eclipse in Libya at 10:11 UT with a duration of 4m 7s, a path width of 184 km and an altitude of 67°.
- Eclipse ends in Mongolia at 11:48 UT.
- During 3h 12m, the Moon's shadow travels 14,500 km and covers just 0.4% of the Earth's surface.



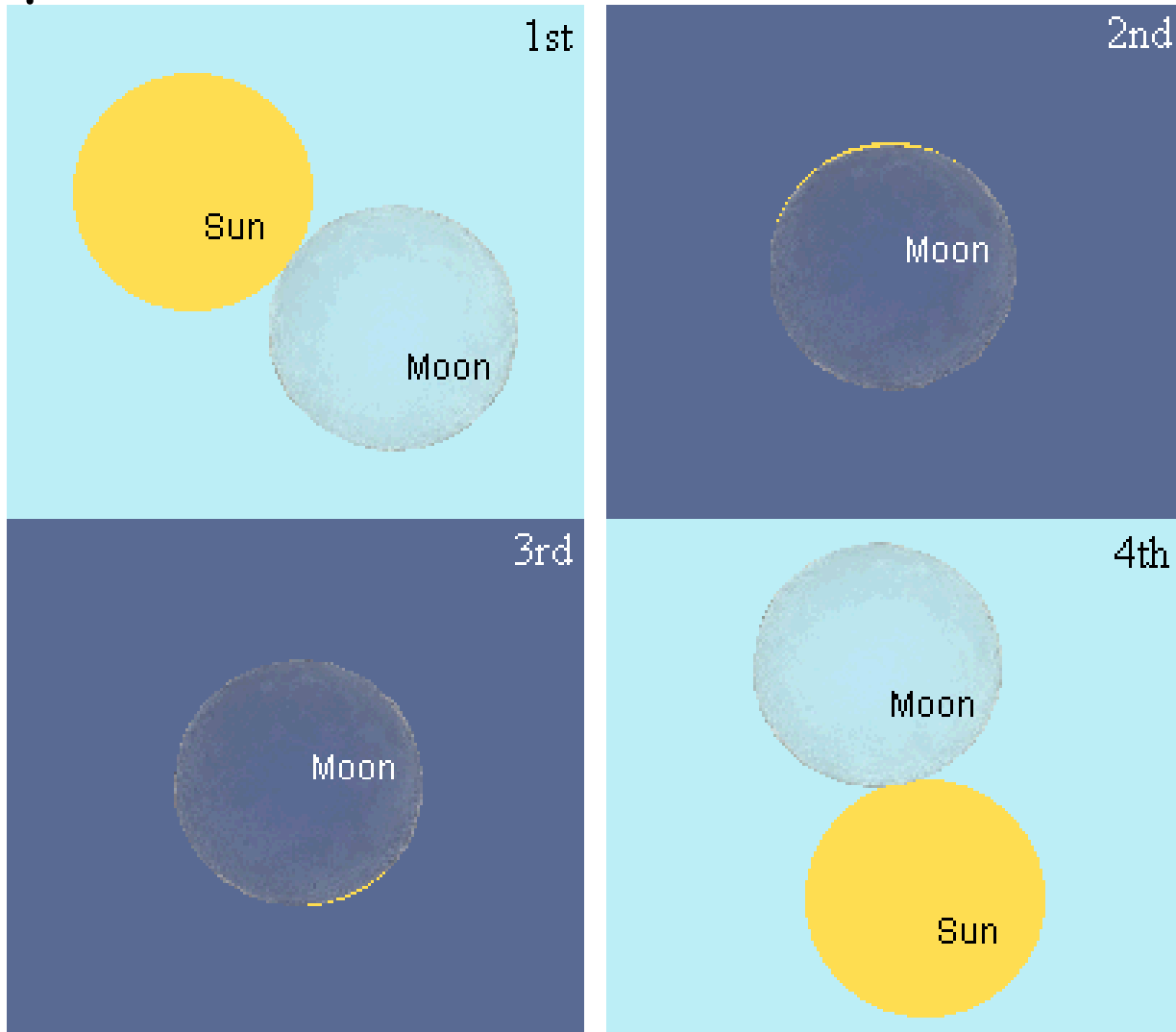
- The eclipse from Manavgat, Turkey

- Mid eclipse at 10:57 UT, 11:57 BST, 13:57 local time.
- Eclipse duration of 3m 45s.
- Solar altitude of 54° .
- Solar azimuth of 204° (24° W of S).



• Phases of the Eclipse

- 1st contact at 09:38 UT, 12:38 local time, alt = 56° , azi = 170° (10° E of S).
- 2nd contact at 10:55 UT, 13:55 local time.
- 3rd contact at 10:59 UT, 13:59 local time.
- 4th contact at 12:14 UT, 15:14 local time, alt = 45° , azi = 230° (50° W of S).



- **What can be seen during the eclipse**

T - 1h 17m 1st contact & start of partial phase. **Never** look at the Sun during the *partial phase* without the eclipse viewer or correct filters for cameras, binoculars or telescopes. Look for sunspots but as we are approaching the minimum of the 11 year solar cycle any sunspots may be small and few in number.

T - 60m Partial phase easily seen with the protected naked eye.



T - 30m Look at own shadow cast on the ground (one side should be fuzzier than the other). Look for tiny crescent Sun shapes under trees or using a pin-hole in a piece of card.



T - 15m The approaching shadow of the Moon should be visible towards the south-west horizon. Have you noticed a change in the light, colours, temperature, and behaviour of birds and animals?

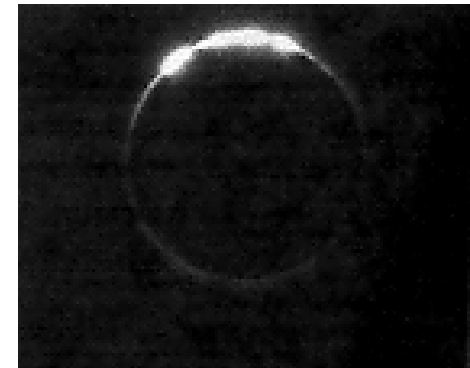


T - 10m Block out Sun with hand and look for Venus to the west. Check again for approaching Moon's shadow. Light levels will now be changing and colours will not be as vivid as before.

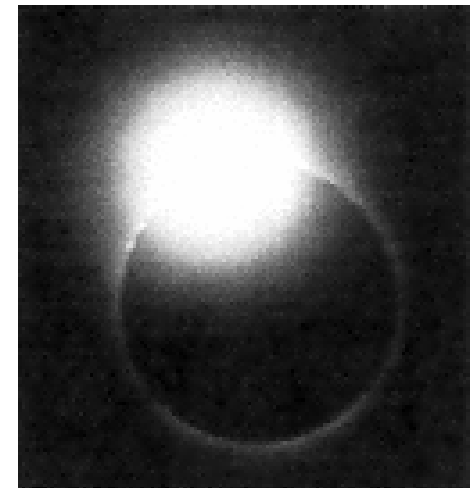
T - 2m For 30 seconds look for shadow bands as they ripple across the ground. They are 10-15cm wide and up to 1m apart and are caused by irregular refraction of light in the Earth's atmosphere.



T - 10s Still using solar filters, look for Baily's beads and prominences on upper part of the solar disk.



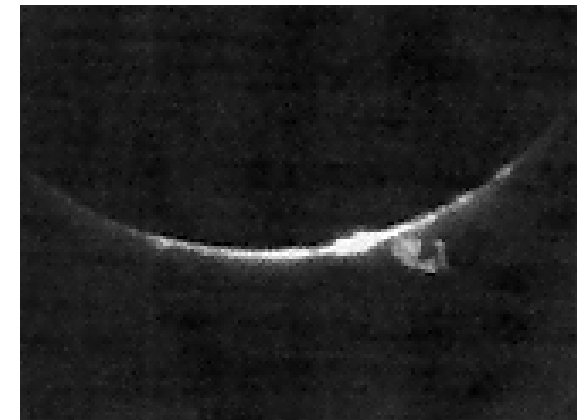
T - 5s As the final part of the Sun disappears, the 'diamond ring' will become visible.



T Second contact and start of totality!
No need for any solar filters. The solar corona will be the most obvious feature but also look for prominences around the leading edge of the Moon. Use averted vision for the size and structure of outer corona.



T + 3m Nearing end of total phase. Look for prominences around Moon's trailing edge. Take last look at solar corona. At solar minimum, the corona is quite elongated with polar plumes compared to being almost circular at solar maximum. Diamond ring and Baily's beads should become visible again.

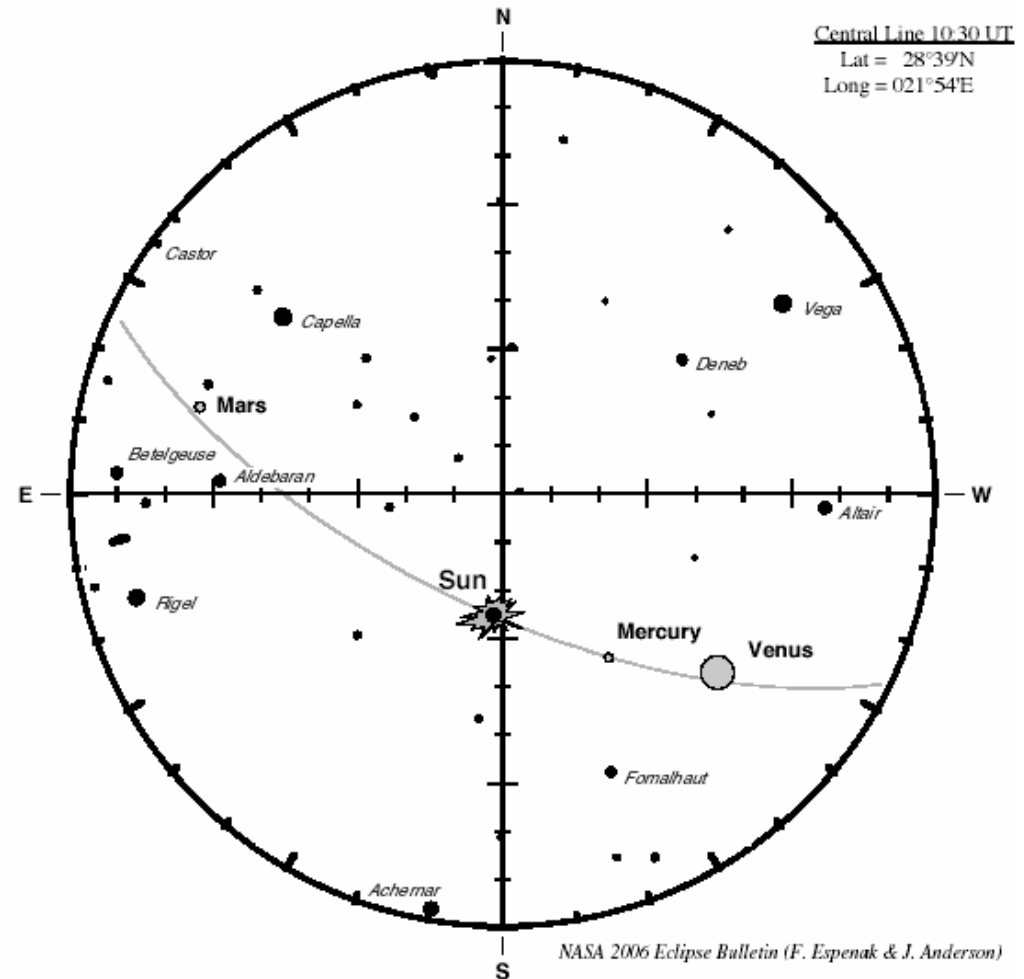


T + 3m45s Third contact and end of totality as the Sun re-appears. Look on the ground again for shadow bands. Use eclipse glasses and filters for looking at the crescent Sun. The Moon's shadow will be seen towards the north-east. When's the next total solar eclipse!

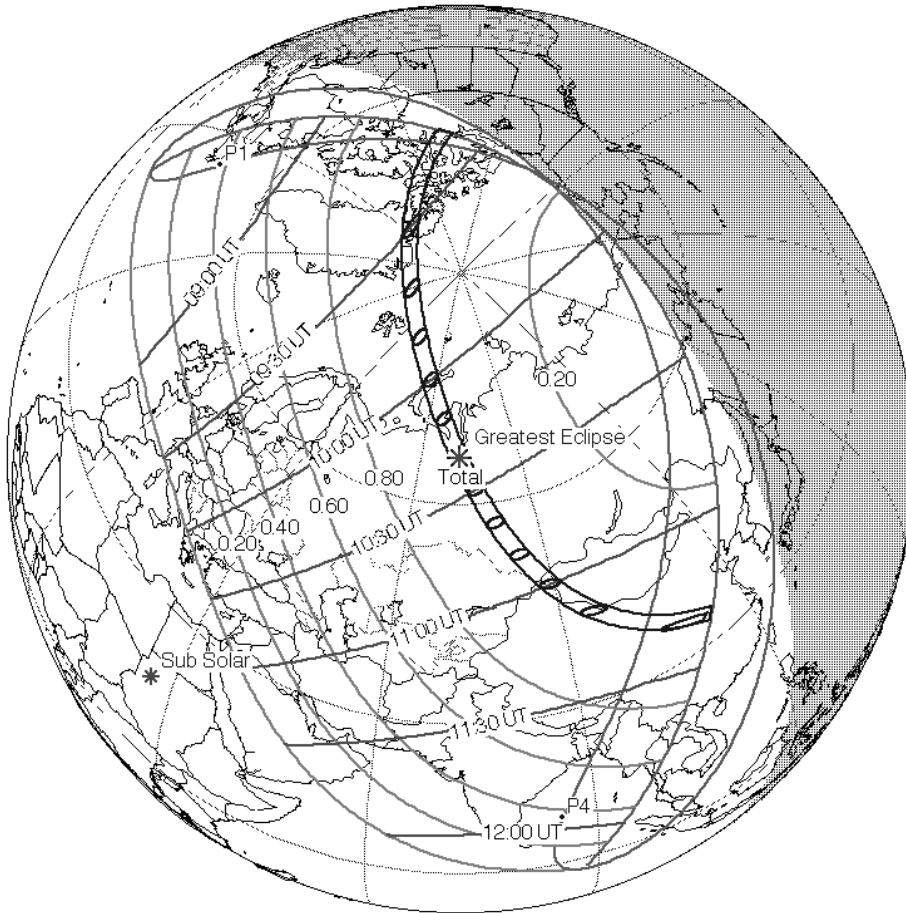
T + 1h 18m Forth contract and end of partial phase.

- The sky during totality

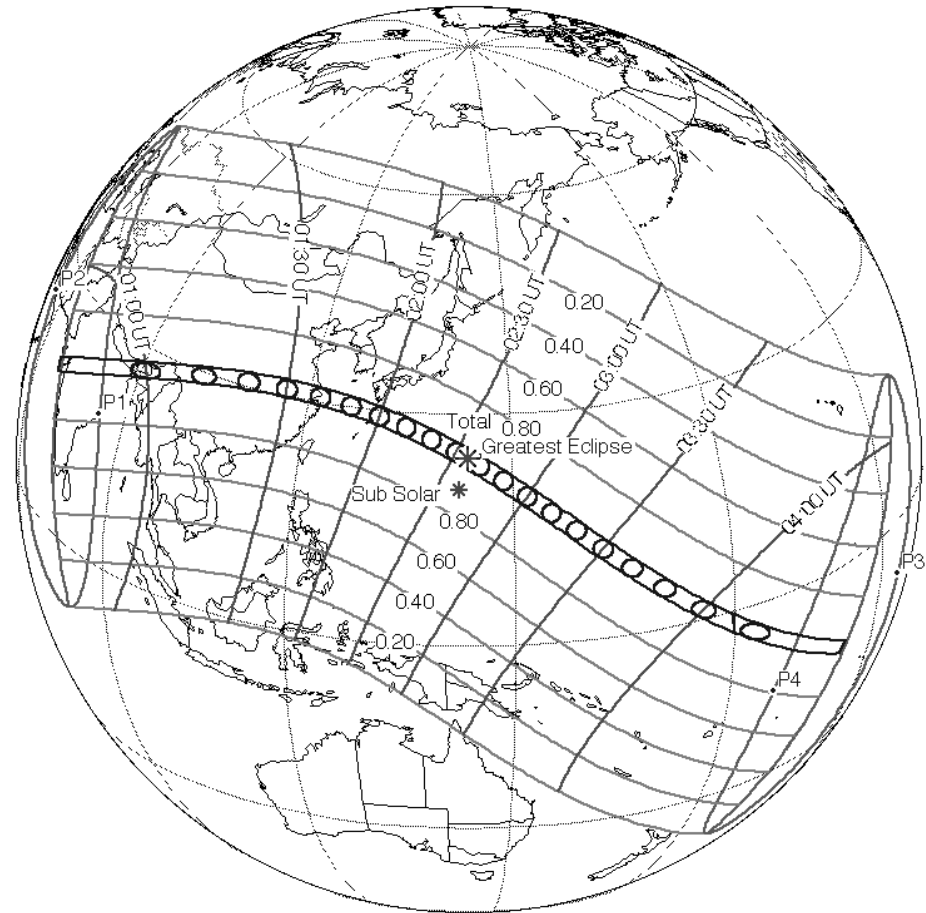
- The sky resembles evening twilight about half an hour after sunset.
- Three naked eye planets and bright stars will be above the horizon.
- Venus will be the most conspicuous 47° W of the Sun.
- The plot is for Libya but will be similar for Turkey (Sun etc further towards the west).



- Future Total Eclipses of the Sun



1st August 2008 (2m 27s)



22nd July 2009 (6m 39s)

• Eye Safety

- **Never** look at the Sun during the *partial phase* without the eclipse viewer or correct filters for cameras, binoculars or telescopes. A 99% eclipsed Sun is bright!
- This even applied to looking at the Sun with the naked eye.
- To use the eclipse viewer, first look down or ahead, put on the viewer and then look up at the Sun. To remove the viewer, look down and then take off.

School alert after eclipse blinds boy

Schools will be urged to do more to warn children of the dangers of watching eclipses after a boy wrote to Tony Blair to tell him of his experience.

Conor Howard, 10, said he could no longer hope to become an airline pilot after he lost the sight of one eye watching a partial eclipse from his school at Cranleigh, Surrey.

• References

- Pages 3, 9 & 10: diagrams (except shadow bands) from Williams, Sheridan, *UK Solar Eclipses from Year 1*, Clock Tower Press, ISBN: 1-85142-093-2, 1996.
- Pages 4, 5 & 12: diagrams from NASA's *Total Solar Eclipse of 2006 March 29*, Espenak, F. and Anderson, J., NASA/TP-2004-212762, 2004.
- Pages 4, 5 & 6: timing and solar position information from NASA's *Total Solar Eclipse of 2006 March 29*.
- Pages 6, 7 & 8: diagrams produced using *Redshift 4* planetarium program, Focus Multimedia, 2000.
- Pages 7 to 11: timing information from *An Eclipse Timetable*, Steve O'Meara, Sky & Telescope, April 2006.
- Page 10: shadow bands diagram from *The Daily Telegraphy Guide to the Eclipse*, Walter George Bell, 1927.
- Page 13: diagrams from *NASA Eclipse Home Page*, <http://sunearth.gsfc.nasa.gov/eclipse>.
- Page 14: newspaper clip from *The Daily Telegraph*, 7th January 2006.