Why so many visibility models?

For thousands of years, astronomers have tried to calculate the first visibility of the crescent moon. This goes back before Islam (and the last Prophet, *sallalahu alaihi wassallam*) mainly well before the Babylonian era but it is generally accepted that the Babylonians were the main pioneers of this science.

In 358 CE the Jewish Rabbi Halel 2nd accepted Greek Philosopher Meton`s (431BC) astronomical calculation of New moon. By introducing the calculations, Rabbi Halel 2nd initiated opposition to the Prophetical way of non-conditional moon sighting.

The Prophet of Islam (610 CE) not only rejected the way (of the Metonic New moon calculation) of the Jews to start the month but clearly taught and ordered Muslims to sight the moon in the Prophetical manner, and that is without the use of any conditional calculation.

However in the Islamic era of second century Hijrah after ``Khairul Qorun`` there were many scientists who attempted to introduce calculations to predict the first visibility of New moon after Khalif Mansoor Abbasi (136H/754CE) and his grand & great grandsons (namely Haroon 786CE and Mamoon Al Rashid 813CE) translated the Babylonian science and Greek Philosophers' books.

Primarily they used the Metonic calculation for the beginning of the Islamic month, with the Moon`s sighting now depending on the Metonic astronomical new moon theory, they would refuse witnesses without the theory!

The Jews changed the way they performed moon sighting in the quest to acquire the "certainty benefit" by predetermining the calendar on the Metonic theoretical calculation for the new moon. Similarly, would be Islamists,

are in full swing to announce predetermined Islamic new moon dates (Ramadhaan, Eid and Hajj) based on this calculation by claiming the Metonic theory has (somehow) become more accurate than before. Is it more accurate? No, certainly not.

To further make matters obscure (for themselves), they argue this is not the method of the Jewish calendar. However they must protect their principles over and above the Prophet, *sallalahu alaihi wassallam,* and of course in doing so further make matters obscure (for themselves). These so called Islamists are trying very hard to change the Islamic path left by the Prophet of Islam and replace it with the Metonic way of the Jews, announcing Islamic dates in advance for ease of certainty. They argue that the fixed calendar (like the Jewish fixed calendar) is more certain than the unconditional naked eye moon sighting method taught by the Prophet Muhammad, sallalahu alaihi wassalam (even with the calculations!).

As the Jews of old replaced or even omitted parts of their religion for seeking 'benefit', the 'fixed calendar' protagonists now do this against Islam and the Prophet`s true path by arguing the benefits obtained in many communal, financial and social life. This surely means Allah, subhanahu wata'alaa, the Creator, and His Prophet, sallalahu alaihi wassalam, the last Messenger, were unaware of these benefits (*La Hawl Wala Quwwat Illa Billah*).

Let us examine what their experts said before and now about the accuracy of astronomical calculation. The most well known scientist of them Al Biruni (973-1048 CE), concluded in his book:

"*The computation of the appearance of the new crescent is a very long and difficult procedure.*"

During the modern era too despite the technological advances many different methods have been developed which is used to

justify whether or not testimonies or shahadah from Muslims are accepted or not. But despite this Dr Ilyas, one of the leading Muslim scientists in the field of Islamic astronomy states:

"there are numerous ill informed astronomers assuming the role of experts who on occasions have made claims about astronomical calculability of the visibility far beyond the limit permitted by the then status of our standing of the underlying physical phenomenon...the ability 'to land man on the lunar surface' has been wrongly assumed to be a valid defence of the astronomical calculability. This reflects the lack of understanding of the physical aspects of a New Moon's first visibility as distinct from locating the body accurately".

(A Modern Guide to Astronomical Calculations of Islamic Calendar, Times and Qibla)

Even the US Naval Observatory to this day acknowledges that:

"The visibility of the lunar crescent as a function of the Moon's "age" - the time counted from New Moon - is obviously of great importance to Muslims. The date and time of each New Moon can be computed exactly (see, for example, Phases of the Moon in Data Services) but the time that the Moon first becomes visible after the New Moon depends on many factors and cannot be predicted with certainty"

Despite this conclusion from USNO and Dr Ilyas and others many Muslim astronomers, sadly both professional and amateur, attempt not just to predict first visibility but use these visibility models to actually reject sighting claims, and contrary to what they claim, help the Kazi to make an informed decision. The way of these "scientists" is to thrust their decisions on the rest of the Ummah and to patronise the Scholars.

Here are some of the various visibility models that are around:

Babylonian: Age at sunset>24hrs & Lag>48 mins

This means >48mins (ie the difference in RA of sun and RA of moon at sunset was >12 degrees) and moon's age at sunset was >24 hours.

Ibn Tariq: Alt, Lag

Well known scientist of the 8th Century, Ibn Tariq's criterion depends on moon altitude at sunset and moonset lag.

Fotheringham: Alt, Rel Azi

In 1910 Fotheringham developed a moon visibility criterion using Schmidts observations in Athens over a period of 20 years. Fotheringham plotted a scatter diagram of moon's altitude at geometric sunset versus the difference in azimuth (relative azimuth) between the sun and the moon at sunset. A curve was drawn separating the 'visible' moons from the 'unsighted' moons. This curve was then used to predict the likelihood of sighting young moons - if a new moon's alt/rel azi. falls above the curve it is sightable, if it falls below the curve it is sightable.

Maunder: Alt, Rel Azi

In 1911, Maunder carried out some more observations to supplement Schmidt's data and developed a model which resulted in a curve which was lower than Fotheringhams.

Bruin: Alt, Crescent width

In 1977 Bruin released details of his criteria based on crescent width and sun/moon altitude. Bruin used 0.5 minutes as the limiting crescent width.

Ilyas 1:   <u>Alt, Elong</u>

Dr Ilyas developed at least three criterion. The first criterion depends on the 'moon's relative altitude at sunset' and the angular separation between the sun and the moon.

Ilyas 2:   <u>Lag, Alt.</u>

Dr Ilyas in his second criteria compensates for latitude (eg at latitude 0 deg: lag 41 min; 30 deg: 46 mins, 40 deg:49 mins, 50 deg: 55mins).

Ilyas 3:   <u>Alt, Rel Azi</u>

This criteria depends on the moon's relative altitude at sunset and the difference in azimuth between the sun and moon at sunset.

RGO: <u>Alt, Elong</u>

According to the Royal Greenwich Observatory the best time and place for first visibility are when the moon is vertically above the sun at sunset so that their azimuths are equal (ie relative azimuth at sunset=0) and where the apparent altitude of the moon at sunset is 10 degrees. If the sky is clear and the horizon is flat, sighting should be possible just before the sun reaches a geocentric altitude of -5 degrees.

B Yallop: Rel Alt, Crescent Width

Professor Bernard Yallop of the RGO used almost 300 moon sightings / non-sighting records of the late 80s and early 90s compiled by Dr Schaefer and Doggett. A parameter 'q' is derived from the relative geocentric altitude of the moon (ARCV) and topocentric crescent width.

Other Models:

There are also many other models for instance by Mohammed Odeh, Manzur Ahmed, Khalid Shaukat and others. Dr. Khalid Shaukat says, Alhamdolillah, that ``*his website is not in the business of making, implementing or dictating decisions on the start of Islamic months*''. Mohammed Odeh has also repeatedly said similarly on the ICOP website but some members have used the resource to emphasise their own agenda of following a certain formula of their own making.

See these websites:

www.moonsighting.com

www.icoproject.org

www.ummah.net/ildl/mooncalc.html

So why all these different models if, as some suggest, we have advanced so far in predicting crescent visibility?

The truth is there are differences in outcomes between the present day models. You just have to look at the differences between the Crescent Watch prediction for 19 September 09 and the Odeh Visibility Graph to establish the first of Shawwal 1430.

Also we know from scientists like Martin Elsasser that the visibility models do not take into account experience of the observer, weather conditions (and air quality) and height of the observer. All these can make a difference when attempting to sight the first crescent, the Hilal. The visibility models not only use the location of the moon in relation to the sun and the horizon but are also modelled on the basis of observations previously carried out. Were all these observations carried out in clear weather conditions and at optimal altitude? Due to the latter fact it is therefore possible

for the models to be further improved and there is definitely scope for errors, although proponents would have you believe otherwise.

The calculations apply a average visibility model. They do NOT take local weather conditions into account and they do not consider local elevation. You can easily see that from the perfect curves in the visibility graphs.

Climbing a mountain is just like climbing to better and better weather. Climbing a mountain can drastically improve the local seeing conditions in terms of dust and humidity and thus greatly improve your chances to see the more difficult crescents.

On the other hand, your own body will have more and more problems with the reduced air pressure at great elevations and thus going to high to fast might not be useful. Example: Driving from sea level to 4000m of elevation can be quite a problem for most people.

Martin

So when rejecting testimonies it is important to critically appraise the visibility model which is being used as a basis to determine crescent visibility and not to always doubt the valid testimony of witnesses.