

## Total Solar Eclipse

By: **Germán Morales Chávez**

A Total Solar Eclipse occurs when the Moon, in its orbit around the Earth, interposes itself between the Earth and the Sun, in such a way that from some places on our planet, the Sun is completely covered by the Moon.

Every year, there are a minimum of 4 eclipses (2 of the Moon and 2 of the Sun), sometimes a maximum of 7 eclipses are reached, either 3 of the Moon and 4 of the Sun or vice versa.

With some exceptions, every year there will be a Total Solar Eclipse<sup>1</sup>. However, the privileged place to observe it is reduced to a narrow strip that is around 150 km wide. Those who are outside that strip will only be able to see a partial eclipse, and for those who are even further away from that strip, they will not see any eclipse.

### What Will Be Seen from Bolivia?

In Bolivia, we will only appreciate a partial eclipse of the Sun. Those who will see the highest percentage of the Sun covered will be from the south of the country, from where the reduction of the visible solar disk will reach 29% (corresponds to a fraction of 0.41 of the solar diameter covered). The north of the country will barely have 6% of the solar disk covered.

The partial phase is not very striking, and does not have the impact of being able to witness the totality (which is the climax of the eclipse), which is somewhat overwhelming.

Trying to observe the partial phase involves its risks, since the sunlight is still very intense and can damage the eye, which is why the use of suitable filters is essential. The safest thing is to project the solar image with a suitable telescope.

All the propaganda that circulates in the media and social networks does not apply to what will be seen from our country; therefore, false expectations should not be held.



Fig. 1 - Approximately, this will be the aspect of the eclipse at the moment of the maximum, possible to observe from Cochabamba. From the north of the country, a smaller fraction of the solar disk will be covered, and from the south a bit more. From Bolivia, only a partial eclipse will be possible to observe. The photograph corresponds to the sequence obtained in the eclipse of last year, by the author of this note.

<sup>1</sup> Some years, there are no total eclipses of the Sun, only annular ones or strictly partial eclipses (the latter occur in the polar regions). On some occasions, you can have two total eclipses of the Sun per year.

## Is there a place to observe totality?

To see totality, you have to travel south, quite south. Totality can be seen from the southern regions of Argentina (Neuquén, Río Negro) and Chile (Araucanía). The greatest of the eclipse will occur on Argentine territory (maximum observable duration of totality at local noon).

This eclipse will have a maximum duration of totality of 2 minutes 10 seconds. The entire process will take almost 3 hours.

Travelling to observe the eclipse is a considered and planned alternative, although totality occurs a thousand kilometers further south of the 2019 total eclipse.

Last year, we made the trip to Chile, and in 2020 we were planning to travel to Argentina, however, the pandemic situation and the restrictions (and uncertainties of these) have led us to cancel the trip. Unfortunately, the next total eclipses in the following decades will occur in much more remote regions of the planet, to which travel by land is not possible. Therefore, any trip should include a bigger budget. The alternative to observing totality is to do so through Internet or TV broadcasts.

## At what time will the eclipse occur in Bolivia?

The beginning, maximum, and end time of a solar eclipse depends on the geographic location. For those interested, we give the data for some cities of the country, which show the variations in observation conditions and give a guide for the citizens of the country of what they will observe from other regions of Bolivia.

Local conditions for observing the Total Solar Eclipse of 2020 / Dec / 14 (partial from Bolivia)					
Locality	Beginning Time. (hh:mm)	Maximum Time. (hh:mm)	End Time. (hh:mm)	Solar diameter fraction hidden by the Moon.	Hidden percentage of the solar disk.
Cochabamba	10:47	<b>11:56</b>	13:09	0.29	<b>18%</b>
<i>Cities, North / South extremes</i>					
Cobija	10:50	<b>11:39</b>	12:30	0.13	<b>6%</b>
Tarija	10:47	<b>12:05</b>	13:27	0.41	<b>29%</b>
<i>Cities, West / East extremes</i>					
La Paz	10:41	<b>11:48</b>	13:00	0.29	<b>18%</b>
Santa Cruz	10:57	<b>12:07</b>	13:19	0.28	<b>17%</b>



Total Solar Eclipse 2019/Jul/02  
Germán Morales  
Astronomía Sigma Octante  
La Higuera – Chile – 20:38:53.9 UTC

Fig. 2 – This is how totality looks, which cannot be appreciated from Bolivia; You will have to travel much further south than last year to see it. In addition, the situation of sanitary restrictions prevents it in several places. This type of observation was planned to be carried out this year, but COVID has forced the scheduled trip to be canceled.

It can be inferred that, in a general and approximate way, the moment of the maximum eclipse for the country will occur around noon, beginning the astronomical phenomenon a few minutes before 11 o'clock and concluding around 1 o'clock.

### **How reliable are the references that circulate on social networks?**

Unfortunately, with increasing frequency, we see wrong or misinterpreted information circulating on the Internet and other networks. Sometimes, even the media spread news or assessments that are far from the reality of what will be observed, or the importance of the astronomical phenomenon for our country.

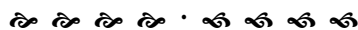
Another source of confusion is the summary infographics, which mention and mix different observable phenomena in the month, without categorization or explanation that clarifies where, what and how to observe, nor the specific conditions for the region. **We have already seen news published by the press circulating these days saying that a total eclipse would be seen in Bolivia, which is not correct, since from our country it will only be a partial eclipse, as we have already indicated.**

For a long time, ASO has collaborated permanently with different media, giving a thorough explanation and orientation of the astronomical phenomena that can be observed from our region. Today, there are few media that maintain this healthy habit; many others, besides educational institutions and people, consider that by copying the information that circulates on the networks, it already makes them experts on the subject and that they can go without the advice of those who have known and worked in astronomy for decades.

For this reason, we recommend you to be aware of our publications (be it on web pages, on Facebook, etc.), or write to us requesting information and advice.

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Translated from Spanish by: Micaela Morales



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