

III



IYNT 2015

Task № 4
«Sunset»



Team «MG 12»

Statement of the Task

The visible sun disk touches the sky line and some time later it disappears below the horizon. How long does this process last? Explain the optical phenomena observed at sunset.

Hypothesis:

We assumed that the duration of sunset and accompanying phenomena depend on the observer's location as well as on a season.

Objectives:

- To calculate the sunset length in different latitudes
- To find out which optical phenomena occur at sunset

Research Problems

- To study scientific publications on optical phenomena
- To find out which optical phenomena occur at sunset
- To calculate the sunset length on the equator
- To calculate the sunset length in the local latitude
- To compare the calculated values

Sunset

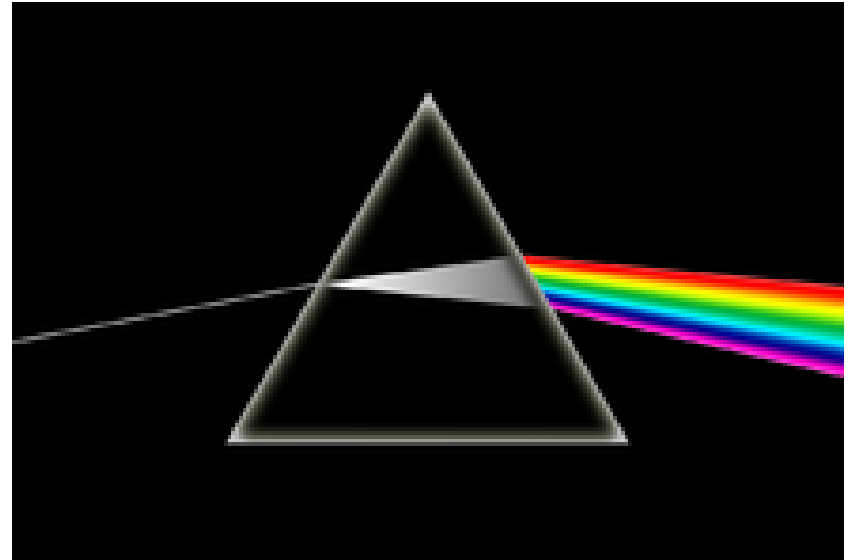
Disappearance of the sun below the horizon



Optical Phenomena

Light Dispersion

It is defined as the functional dependence of the refractive index on frequency of the light.



Color	Wavelength, nm
Red	620-760
Orange	585-620
Yellow	575-585
Green	510-575
Blue	480-510
Indigo	450-480
Violet	380-450

Halo

An optical phenomenon, a shining ring around the light source



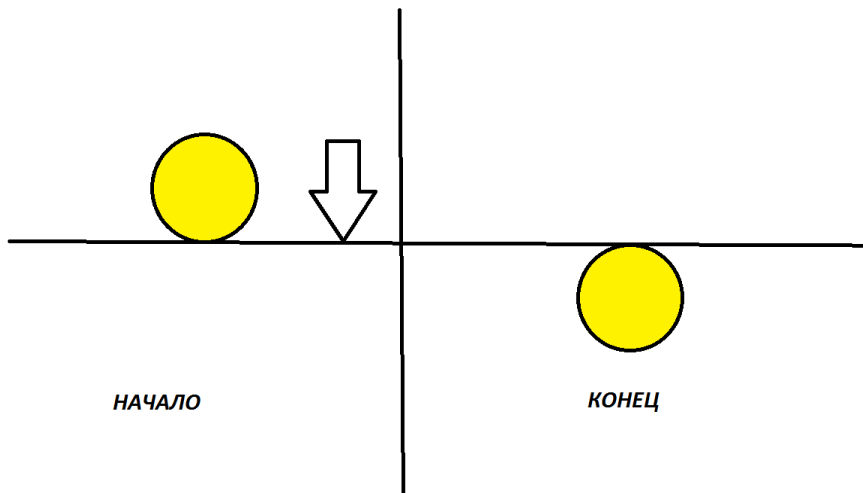
Parhelia

A kind of halo resembling a light rainbow spot at the sun level

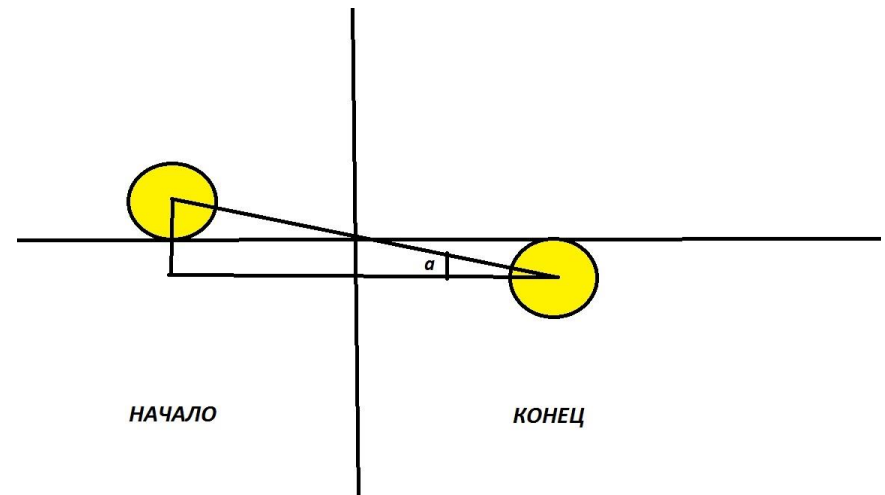


Length of Sunset

On the equator



In 55° latitude
(Novosibirsk)



On the Equator

$$57^\circ = 1 \text{ rad}$$

$$A = 0.57^\circ$$

$$360^\circ / 24 \text{ h} = 1^\circ / 4 \text{ min}$$

$$0.57^\circ / 2.28 \text{ min}$$



The sunset on the equator lasts 2 min 17 sec

Sunset for our Location

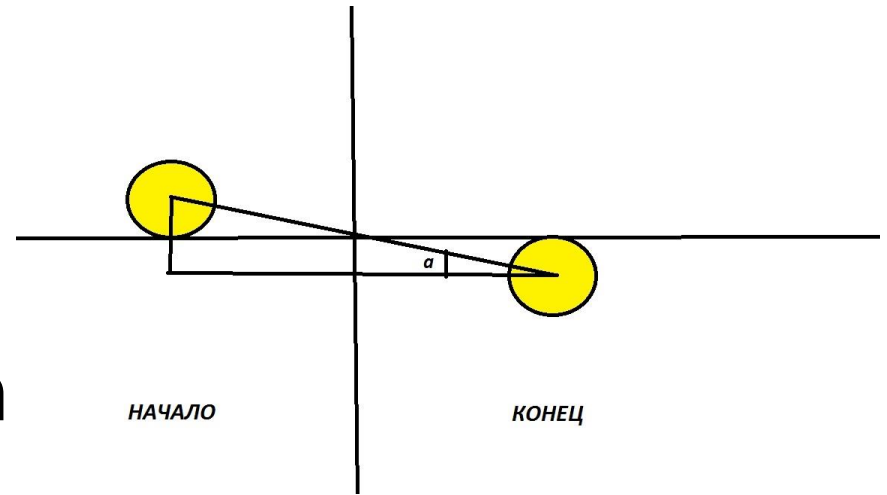
$$57^\circ = 1 \text{ rad}$$

$$A = 0.57^\circ$$

$$A = 0.8^\circ$$

$$360^\circ / 24 \text{ h} = 1^\circ / 4 \text{ min}$$

$$0.8^\circ / 3.2 \text{ min}$$



The sunset on the equator lasts 3 min 12 sec

Conclusion

- The length of the sunset is determined by the observer's geographical location
- The occurrence of optical phenomena at sunset such as halo and parhelia depends on the atmospheric properties

Information Sources

- <https://ru.wikipedia.org/wiki/%C7%E0%EA%E0%F2>
- <http://priroda-yavlenie.ru/zakat.html>
- http://www.decoder.ru/list/all/topic_83/