

## 1.12 Eclipse Seasons

### PRE-LECTURE READING 1.12

- *Astronomy Today*, 8<sup>th</sup> Edition (Chaisson & McMillan)
- *Astronomy Today*, 7<sup>th</sup> Edition (Chaisson & McMillan)
- *Astronomy Today*, 6<sup>th</sup> Edition (Chaisson & McMillan)

### VIDEO LECTURE

- Eclipse Seasons<sup>1</sup> (13:09)

### SUPPLEMENTARY NOTES

#### Eclipse Conditions

- See Eclipse Conditions<sup>2</sup>.

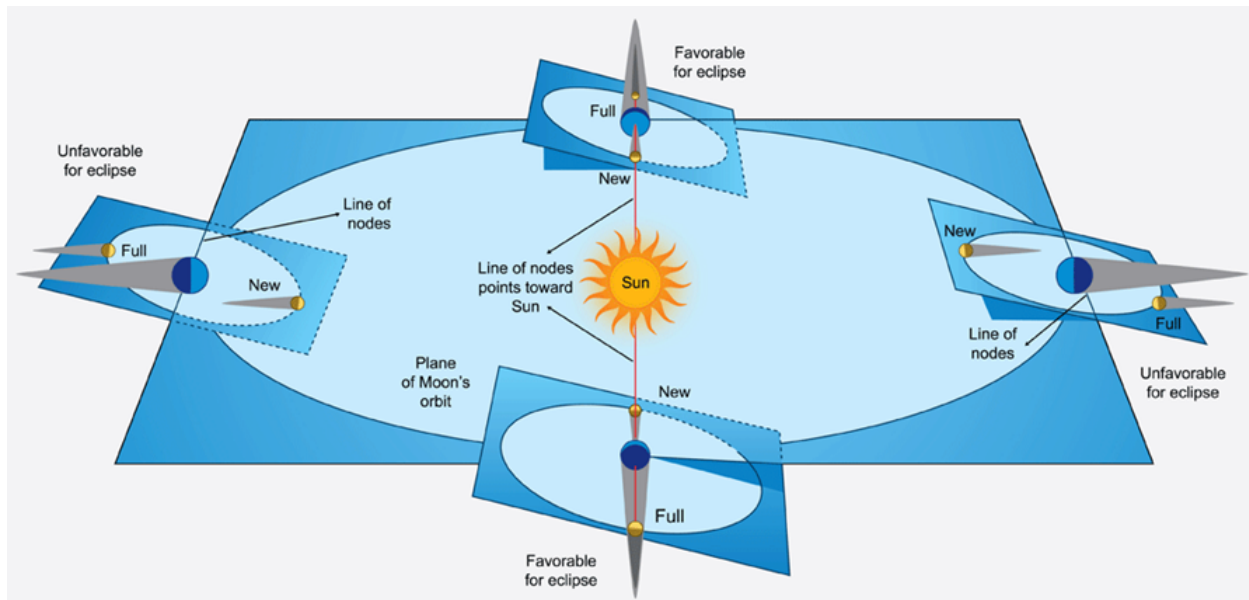


Figure 1

- The Earth-Moon plane is tilted with respect to the Sun-Earth plane by  $\approx 5^\circ$ .
  - Consequently, eclipses do not occur every new and full moon.
- The intersection of the Earth-Moon plane and the Sun-Earth plane is called the *line of nodes*.

<sup>1</sup><http://youtu.be/kh7VljWmcUM>

<sup>2</sup>[http://en.wikipedia.org/wiki/Eclipse\\_season](http://en.wikipedia.org/wiki/Eclipse_season)

- Eclipses occur when both:
  - 1. The line of nodes points toward the sun.
    - This is called an *eclipse season*. It is a 38-day period of time when you can, but do not necessarily, have eclipses.
    - 2 eclipse seasons = 1 *eclipse year*
  - 2. The moon is on the line of nodes.

### Regression of the Line of Nodes

- The Earth is nearly spherical and consequently precesses slowly compared to its rotation rate: 26,000 years vs. 1 day.
- The Earth-Moon system is not spherical and consequently precesses quickly compared to its “rotation” rate: 18.6 years vs. 1 month.
- Since the precession is in the opposite direction, we call it *regression*, or regression of the line of nodes.
- Since the line of nodes regresses, it points to the sun earlier.
  - Consequently, the eclipse year is shorter than the tropical year.
  - 1 eclipse year  $\approx$  346 days

### Eclipse Statistics

- Eclipse seasons: Between 2 and 3 per calendar year.
- Eclipses (solar + lunar): Between 4 and 7 per calendar year.
- Eclipses (solar + non-penumbral lunar): Between 2 and 7 per calendar year.
- Solar eclipses (total + partial): Between 2 and 5 per calendar year.
- Total solar eclipses: Between 0 and 2 per calendar year.
- Lunar eclipses (total + partial + penumbral): Between 2 and 5 per calendar year.
- Non-penumbral lunar eclipses (total + partial): Between 0 and 3 per calendar year.
- Total lunar eclipses: Between 0 and 3 per calendar year.

### EXERCISES

- Experiment with UNL’s Moon Inclination<sup>3</sup>.
- View UNL’s Eclipse Table<sup>4</sup>.

<sup>3</sup><http://astro.unl.edu/classaction/animations/lunarcycles/mooninc.html>

<sup>4</sup><http://astro.unl.edu/classaction/animations/lunarcycles/eclipsetable.html>

# ASSIGNMENT 1

Do Question 9.