

Topic 3: The Solar System – Part 1

<https://geowiki.ucsd.edu/sio15>

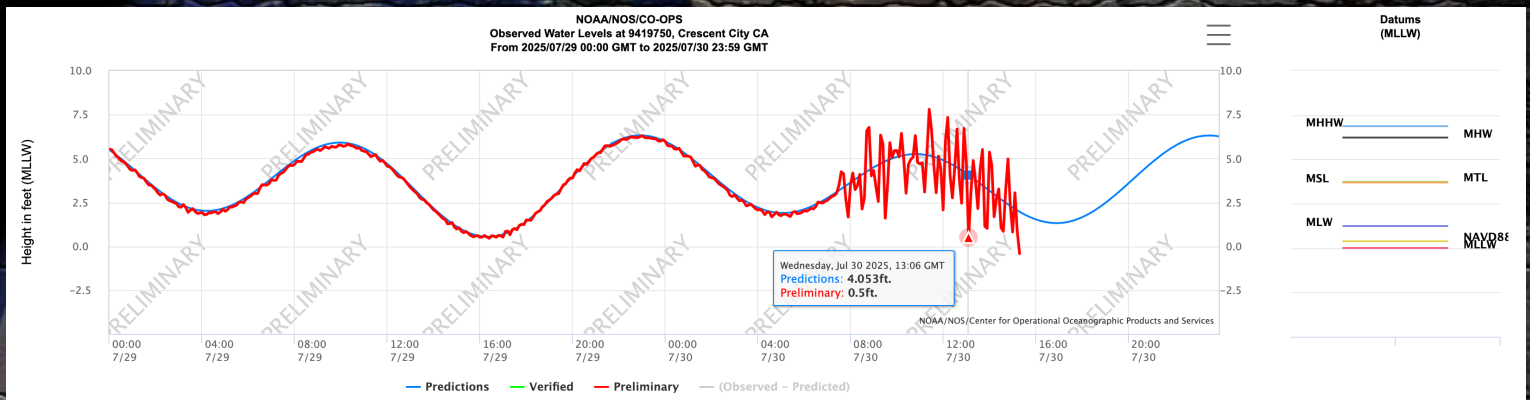
The Earth-Moon System



Earth-Moon System: Why is this important?

Earth Tides vs other things

2025 Kamchatka Tsunami at Crescent City, CA

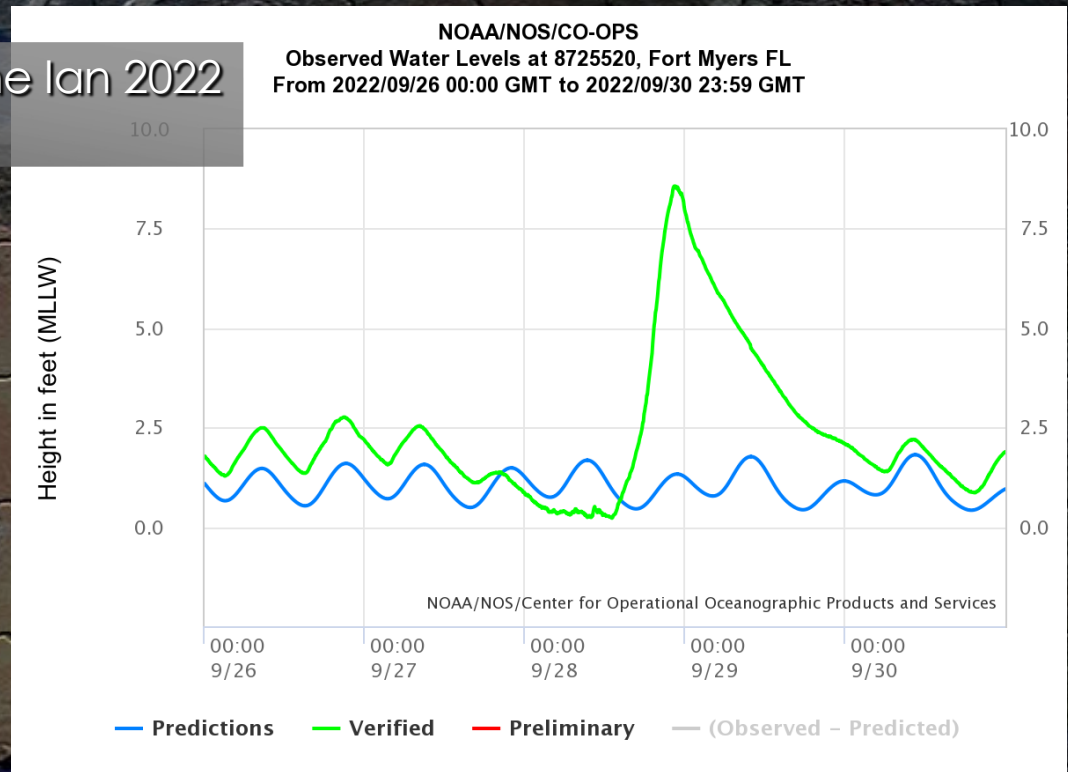


Earth-Moon System: Why is this important?

Earth Tides vs other things

source: NOAA

Storm Surge, Hurricane Ian 2022
at Fort Myers, FL



seawalls must accommodate
such events

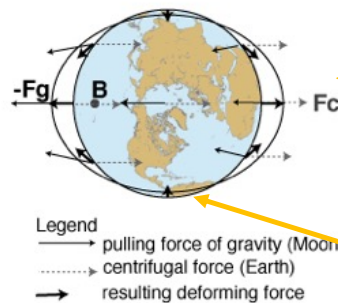
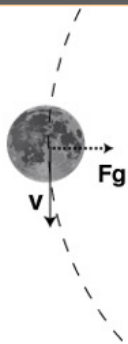
Earth Tides (Sun-Earth-Moon System)

high tide
wherever Moon
is 'overhead'

Gravitation and Tides

* Earth's surface feels the pull of the Moon on the near side more than on the far side.

Moon
orbits Earth



... but also on
the 'other side'

low tide at 90°

Fig. 2.15

Watch short Video on tides (3a,b)

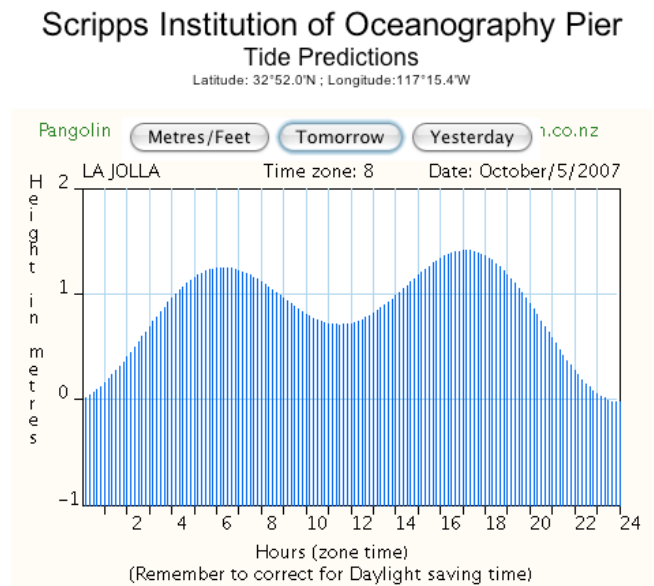
SIO15: Chapter 2: Tides

Change of Tides at a Specific Location

Most places on Earth experience two high tides and two low tides per day (*semi-diurnal tides*).

For example, the tides on October 5, 2007 at the SIO pier looked like the diagram to the right:

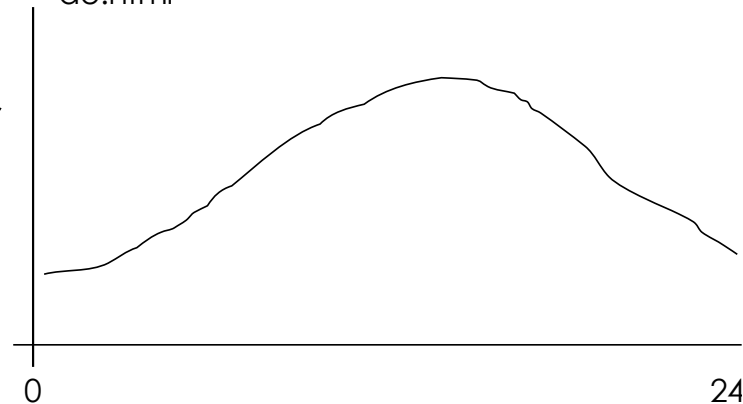
Fig. 2.17



<http://ocean.peterbrueggeman.com/piertide.html>

A few places experience only one high and one low tide per day (*diurnal tides*).

The tides throughout the day look like this:

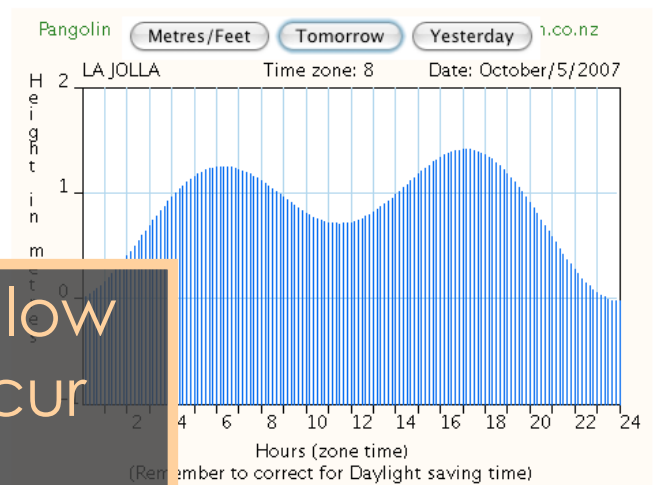


Change of Tides at a Specific Location

Most places on Earth experience two high tides and two low tides per day (*semi-diurnal tides*).

For example, the tides on October 5, 2007 at the Scripps Institution of Oceanography Pier looked like the diagram to the right:

Scripps Institution of Oceanography Pier
Tide Predictions
Latitude: 32°52.0'N ; Longitude: 117°15.4'W

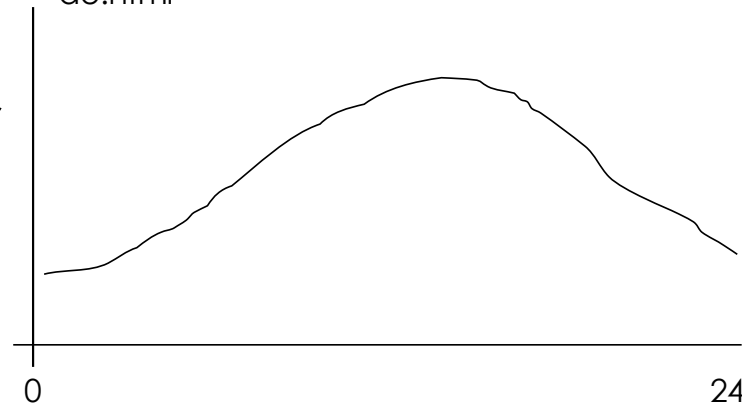


high and low
tides occur
daily

<http://ocean.peterbrueggeman.com/piertide.html>

A few places experience only one high and one low tide per day (*diurnal tides*).

The tides throughout the day look like this:

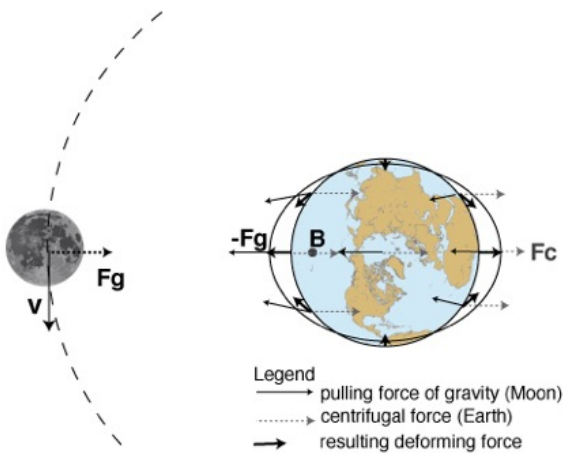


Earth Tides (Sun-Earth-Moon System)

tides also influenced by Sun

Gravitation and Tides

* Earth's surface feels the pull of the Moon on the near side more than on the far side.



tides “greatest” when Sun, Moon are aligned

tides “smallest” when Sun, Moon are 90°

F_{gs}

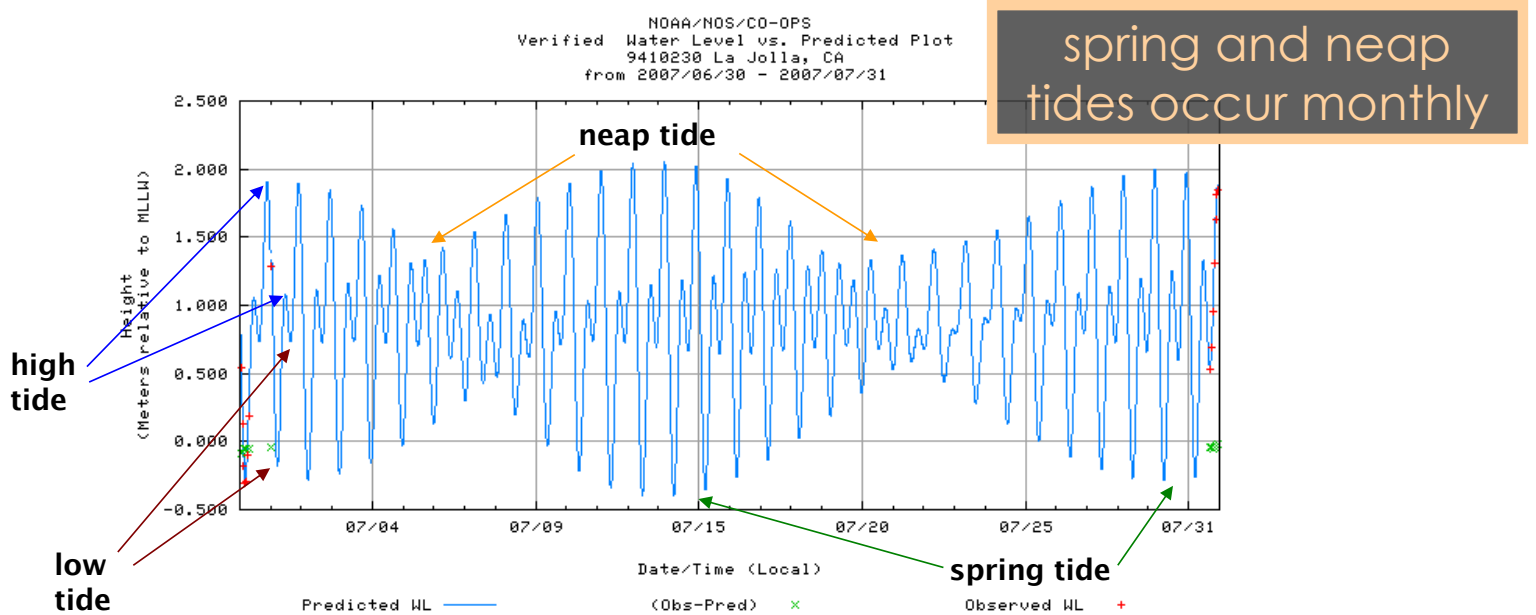
Sun

Fig. 2.15

Watch short Video on tides (3a,b)

SIO15: Chapter 2: Tides

The Moon, Sun and Tides at a Specific Location



<http://tidesandcurrents.noaa.gov>

during a synodic month, La Jolla experiences two spring tides and two neap tides.

The period between Full Moons is about 29.5 days (synodic month).

Tidal range:
High-low tide

Earth Tides (Sun-Earth-Moon System)

The Moon, Sun and Tides

the Sun also pulls on Earth though the lunar (Moon) tides are stronger

Spring tide: when Sun, Earth and Moon are aligned (syzygy), then Sun and Moon pull together. The difference between high and low tide is then largest. This happens during Full Moon - when the Moon is on the other side of Earth - and during New Moon - when the Moon is on the same side of Earth as the Sun is.

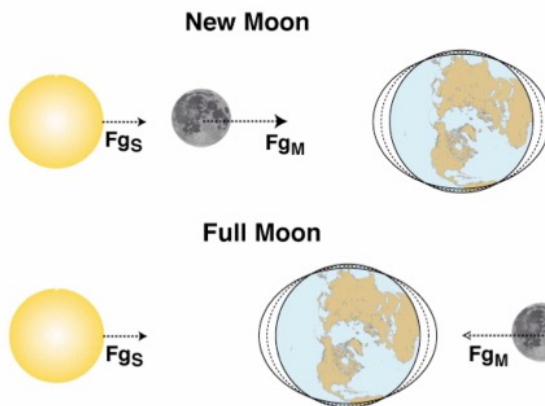


Fig. 2.20

The period between Full Moons is about 29.5 days (synodic month).

Idealized!

Watch short Video on tides (3a,b)

Solar and Lunar Eclipses

Why do we not have eclipses every month?

because Moon's orbit around Earth does not lie in the ecliptic

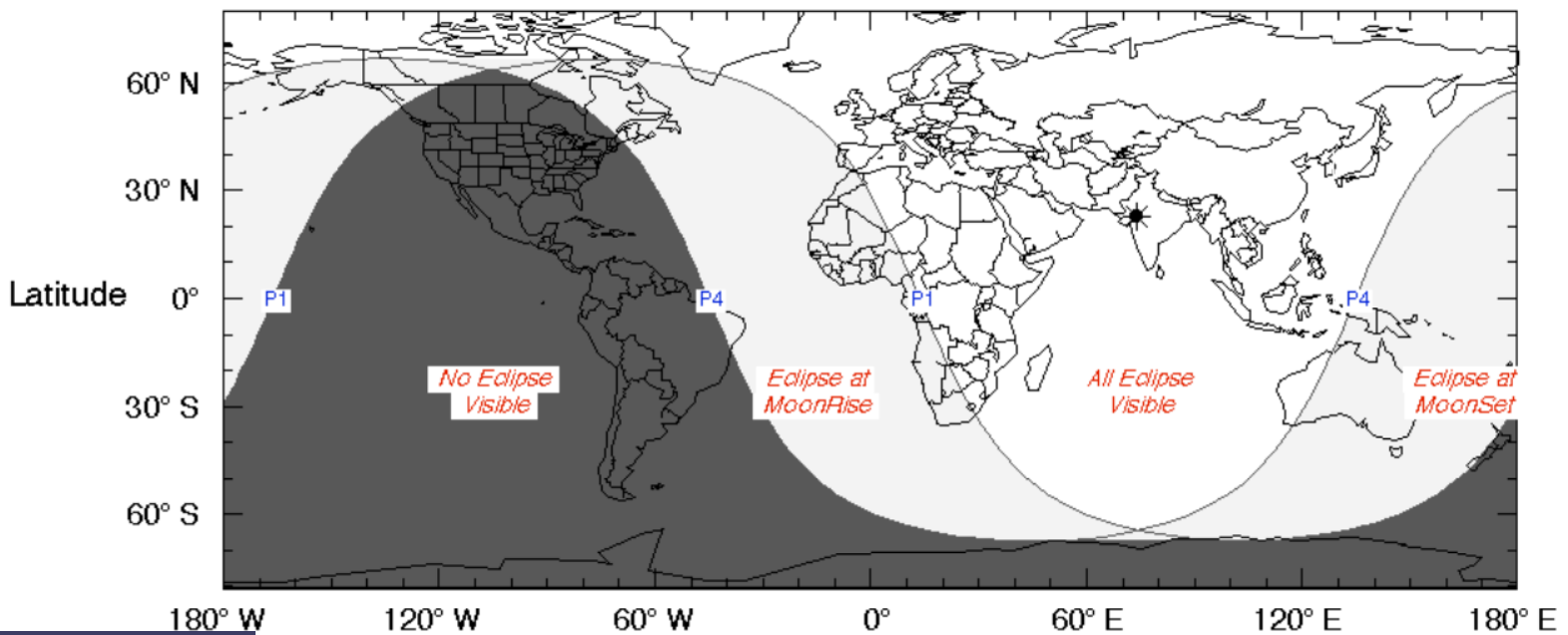
Earth's orbit around Sun



Sideways view

Moon's orbit around Earth

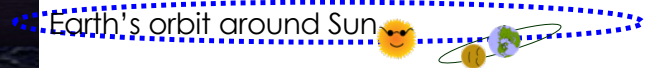
Jan 2020 Lunar Eclipse



source:
wikipedia

Why do we not have eclipses every month?

because Moon's orbit around Earth does not lie in the ecliptic



Sideways view

Moon's orbit around Earth

SIO15 (10/1/25): Topic 03 - The Solar System – Part 1

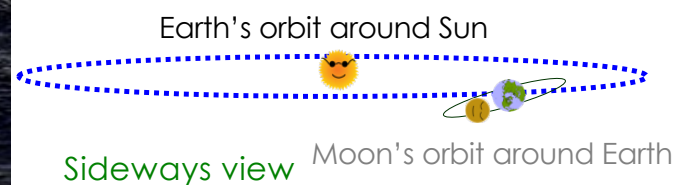
8/21/17 Total Solar Eclipse

source:
greatamericaneclipse.com



Why do we not have eclipses every month?

because Moon's orbit around Earth does not lie in the ecliptic



Next Solar Eclipses

Source: wikipedia/NASA

Total and Annular Solar Eclipse Paths: 2021 – 2040

