

Reminder: no food or
drinks in the planetarium!

Astronomy 4 - *Solar System Astronomy*

Reminders

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-Feel free to email me about course questions or astronomy in general.

Class website:

-<https://amcody.github.io/astro4>

Your one-stop shop for anything course related, including homework readings and exam practice material.

Lost and found:

-At the end of class, check to make sure you aren't leaving anything behind. Any items will be added to the Lost and Found box in back.

MS. FRIZZLE, HOW
DO THE TIDES WORK?

TIDES COME IN
TIDES GO OUT
YOU CAN'T EXPLAIN THAT

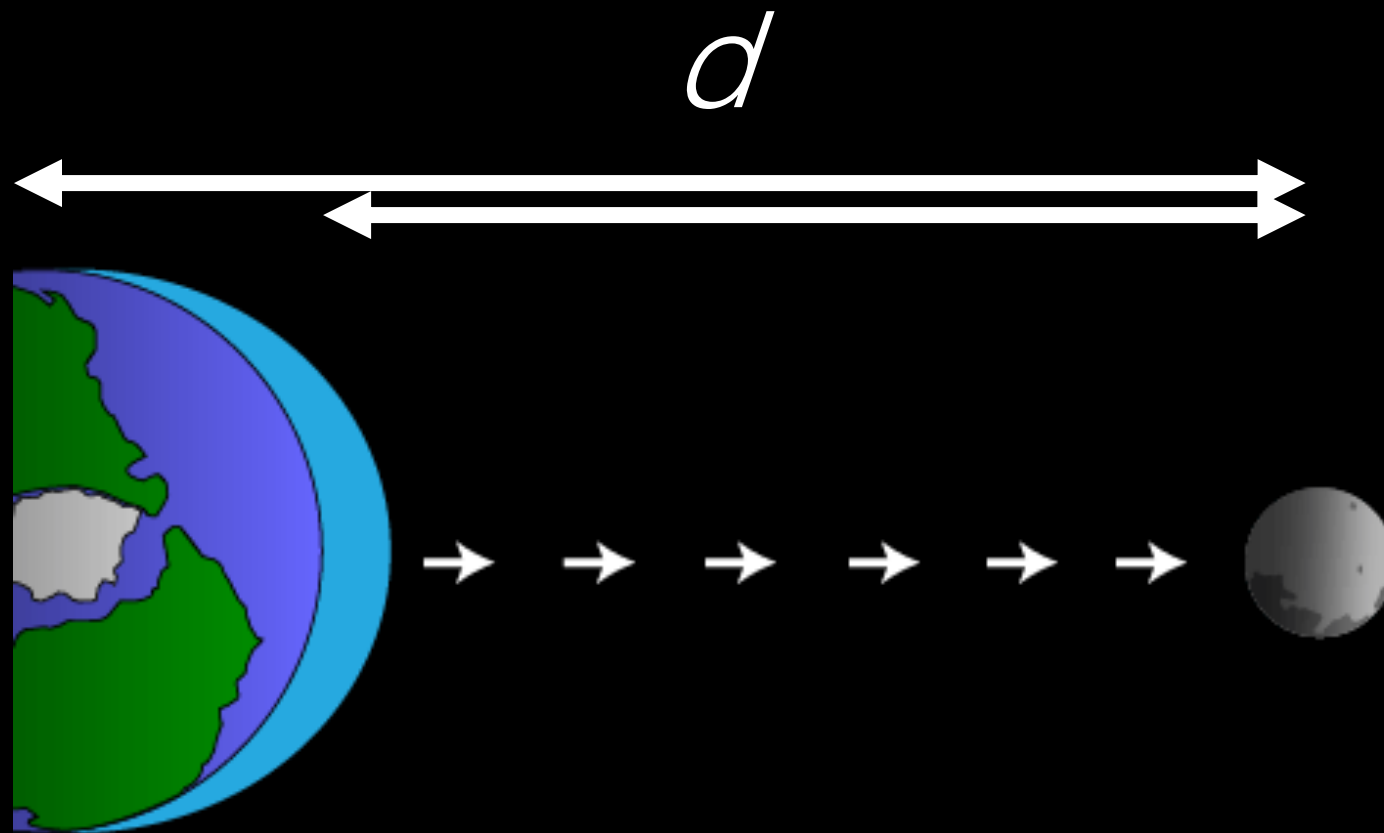




High tide vs. low tide

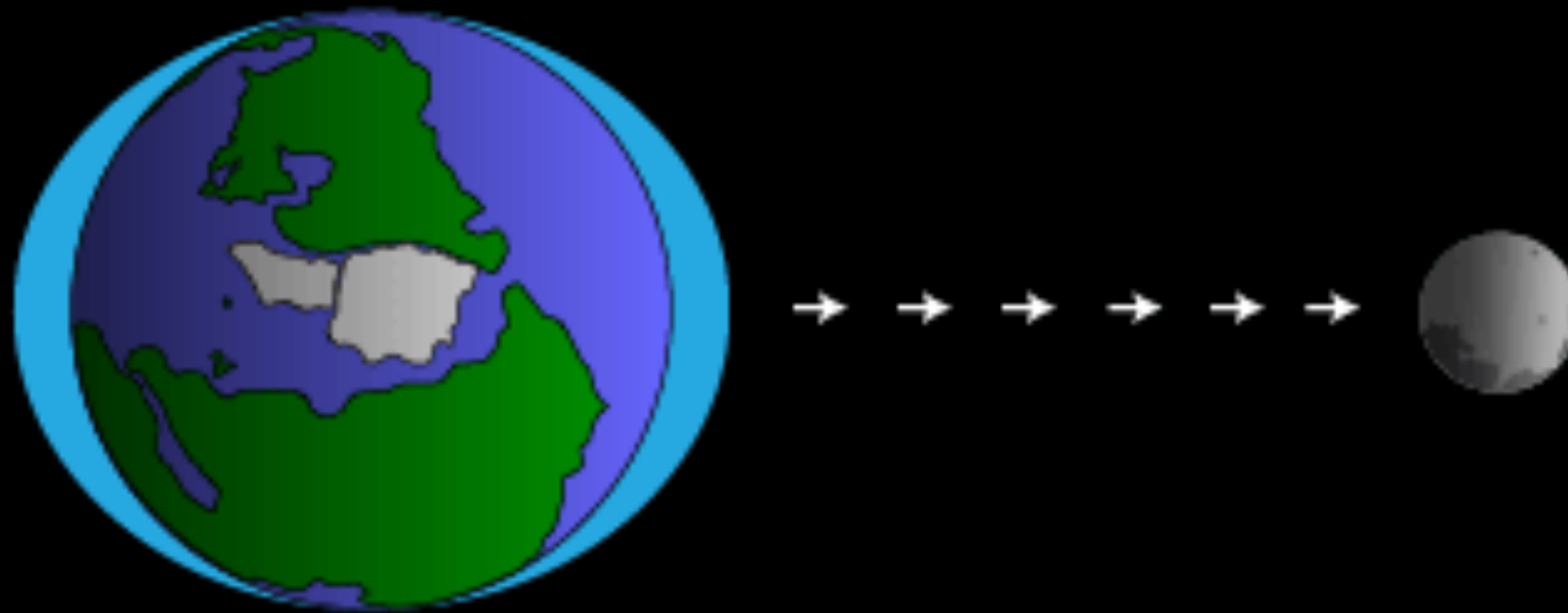
We go through *two* cycles per day.

Tides are caused by small differences in the force of gravitational attraction between the Earth and moon



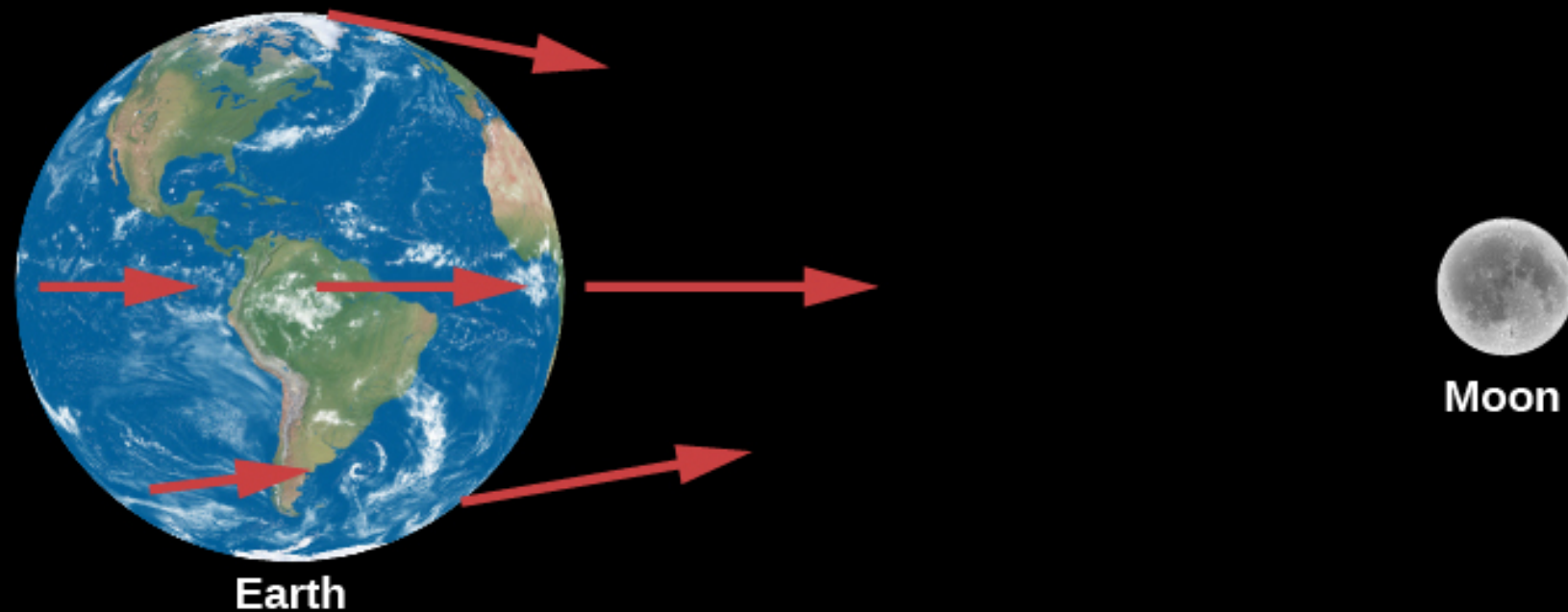
Recall: the force of gravity drops off as $1/d^2$.
So, the side of Earth facing the moon feels a stronger force than the side facing away.

...But wait- There is another tidal bulge on the *opposite* side of Earth!

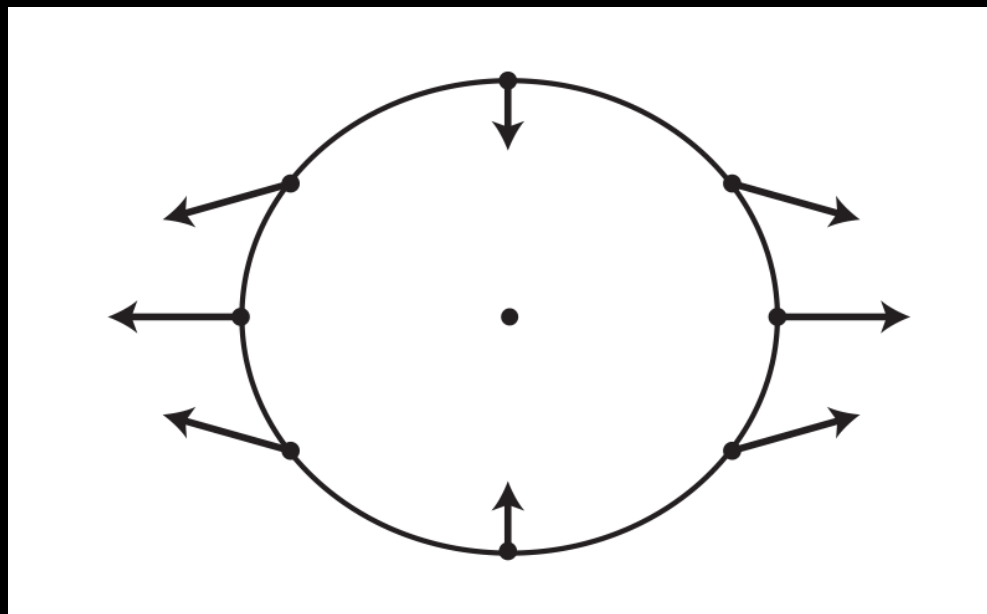


Why is this??

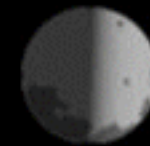
Tides are a *differential* effect.
Total gravitational force from moon:



vs. difference between that
and the average force (i.e., at Earth's center)

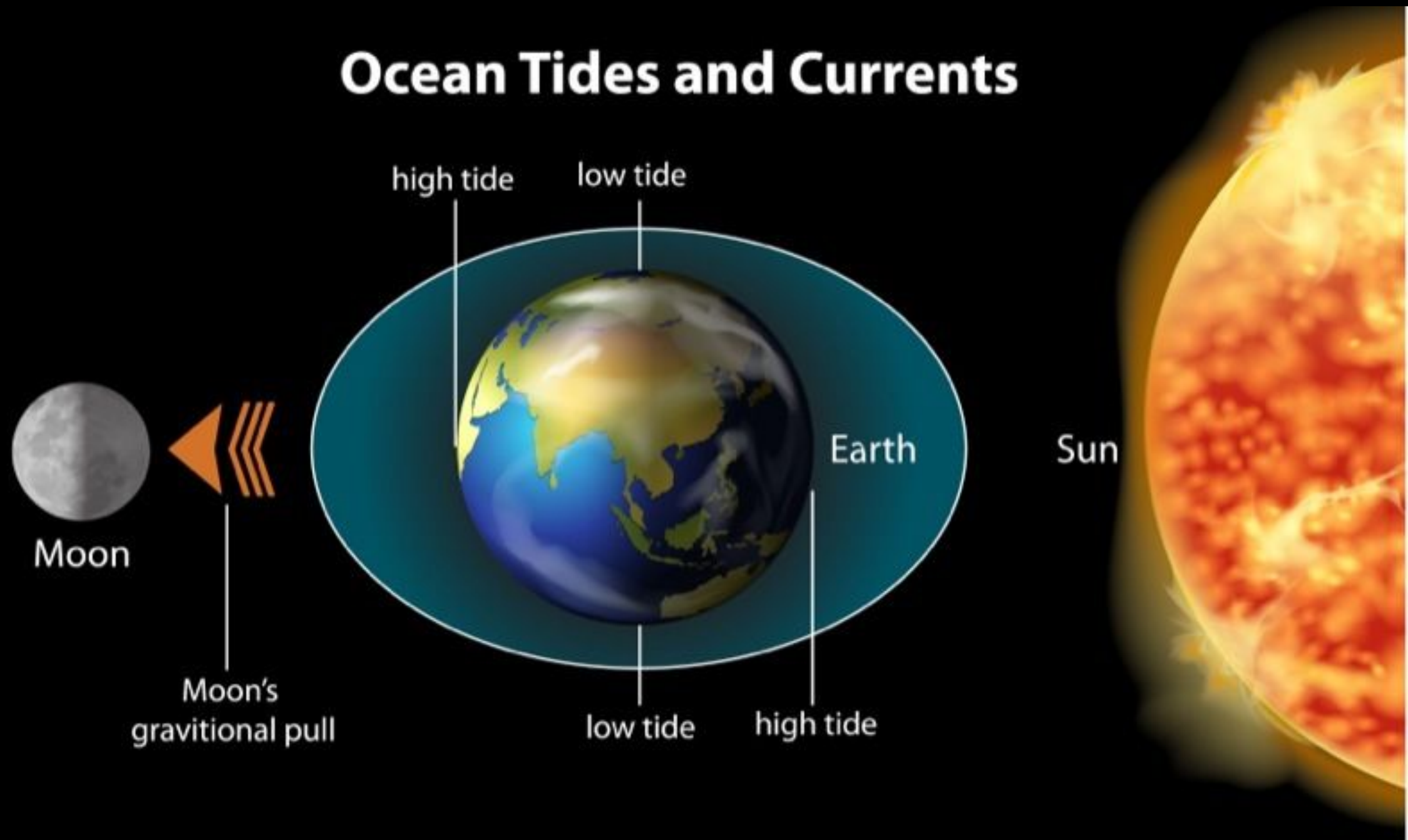


Tides happen as Earth spins through these gravitational bulges.

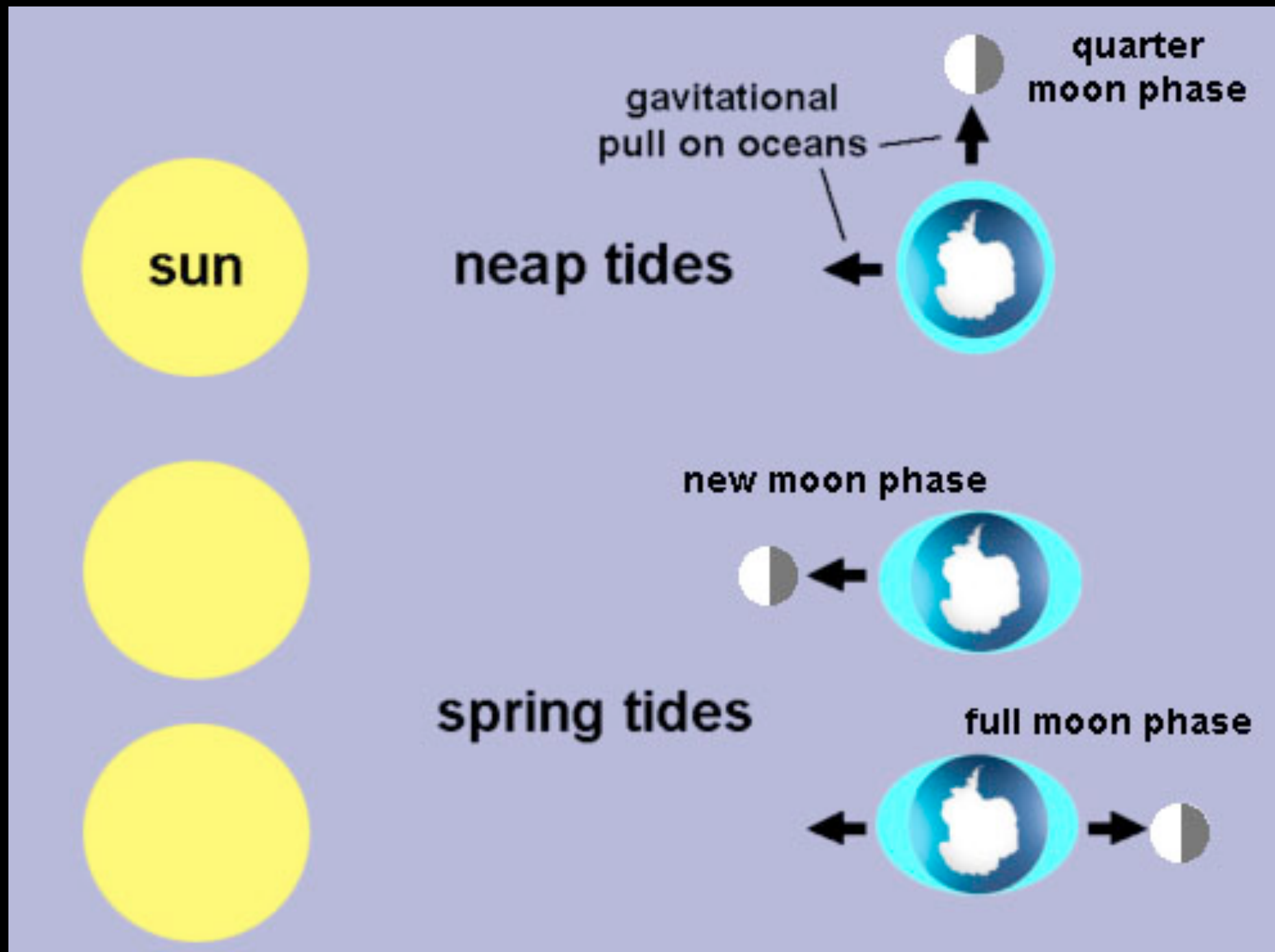


Two bulges → two tides per day

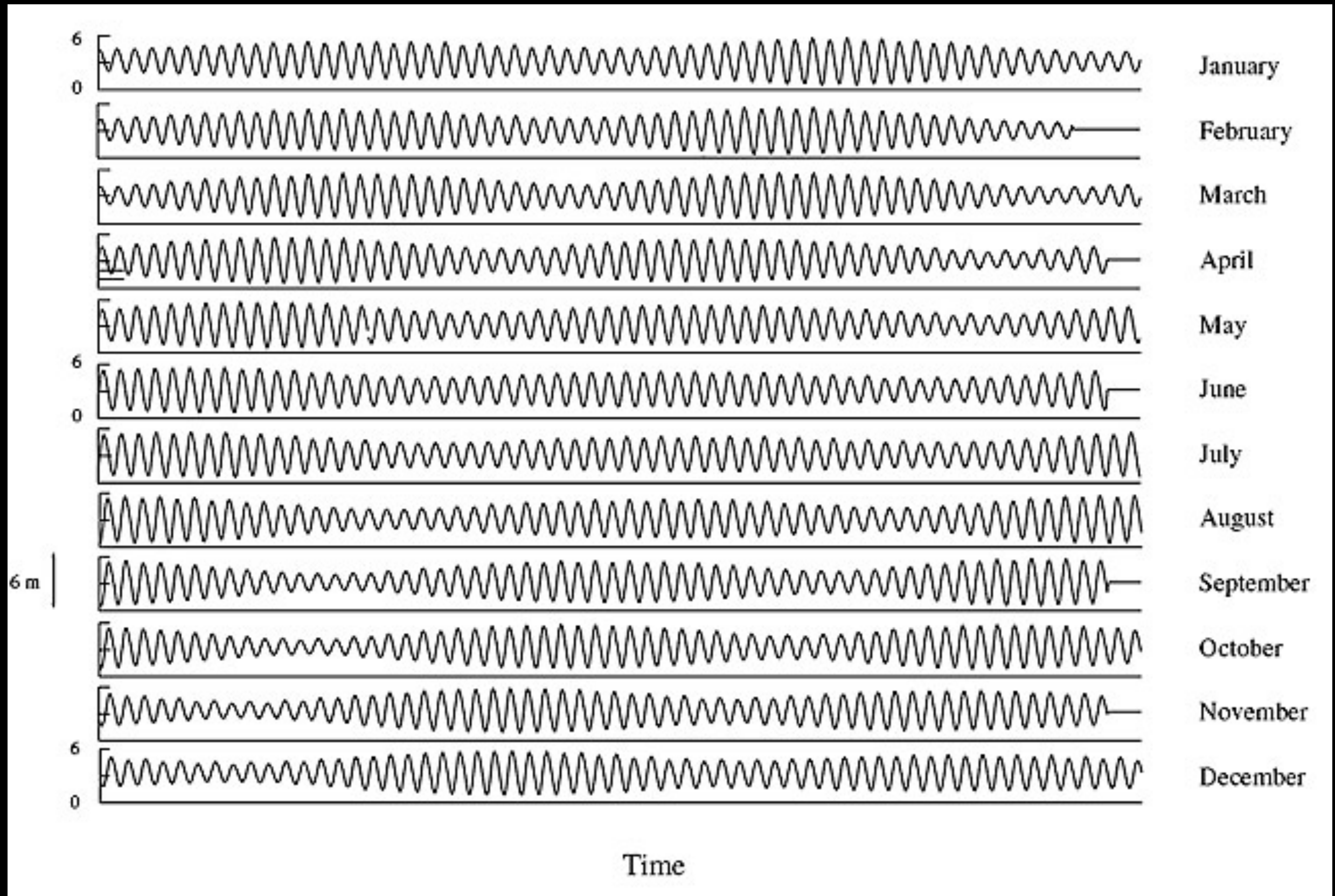
Tides are caused by small differences in the force of gravitational attraction between the Earth, moon *and* Sun



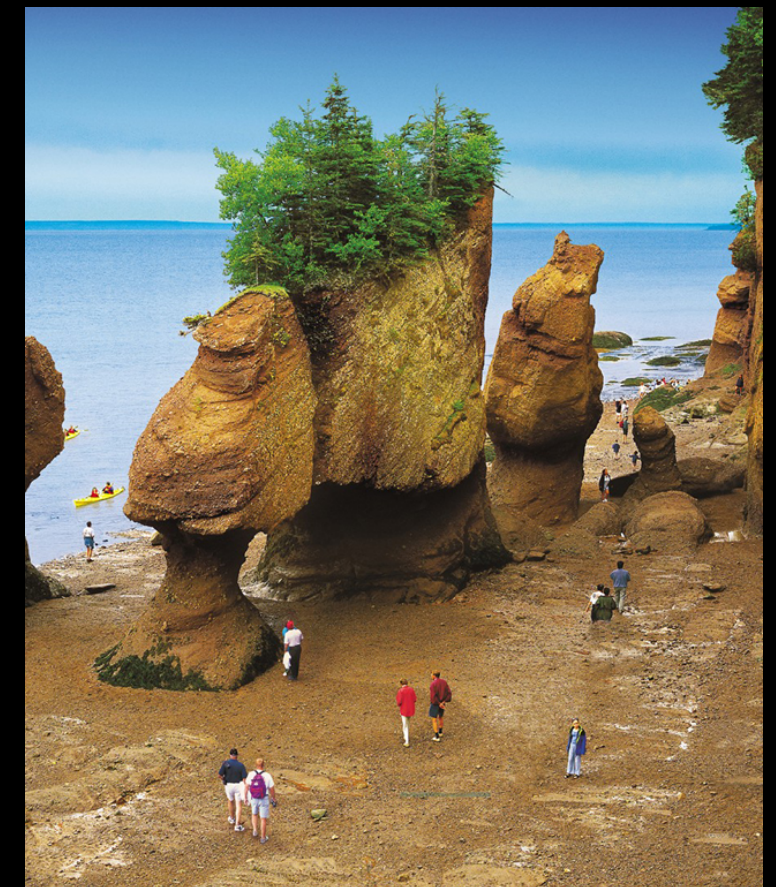
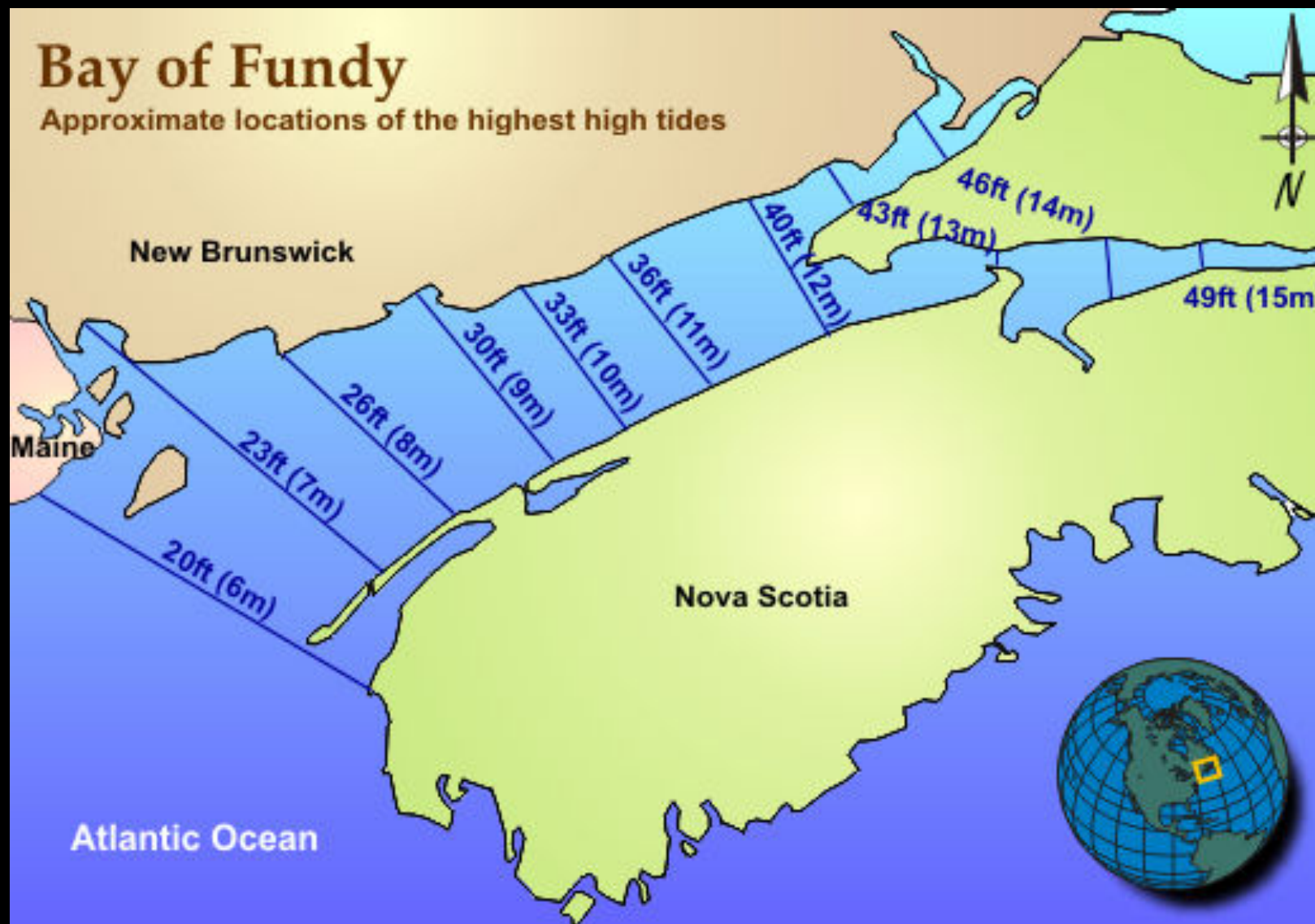
Neap tides occur at the quarter moons
Spring tides occur at the new and full moons



Calendar of the range of tides off the coast of the UK

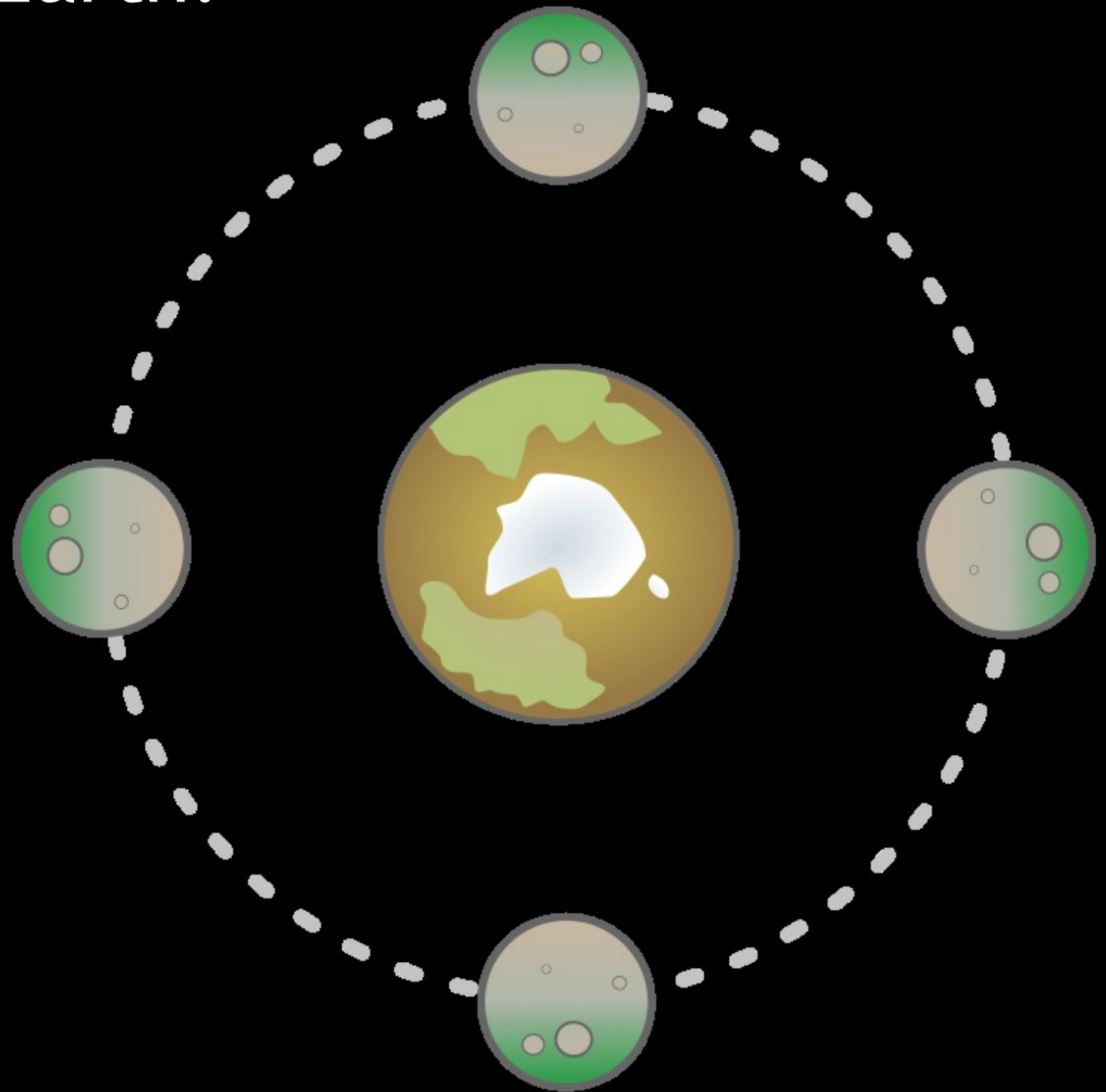


Earth has an uneven distribution of land and water--
The height of tides in different areas depends on
geography as well as weather patterns.

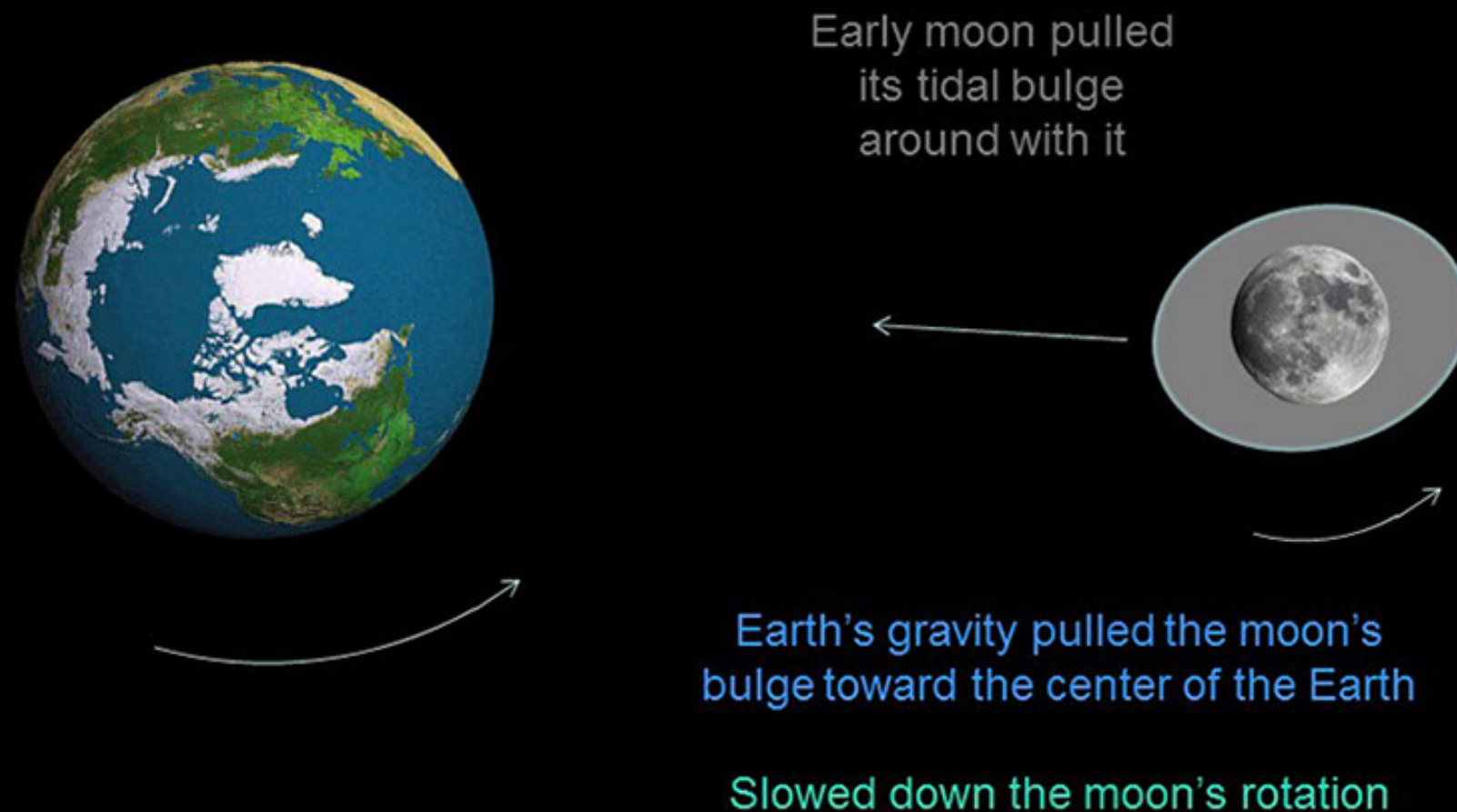


Another consequence of tides between the Earth and Moon is the fact that the SAME side of the Moon faces the Earth.

A “year” on the moon and a “day” on the moon are the same length of time ~28 days



This is due to a phenomenon called
tidal locking.



The moon has its own tidal bulges that
rotate along with it.

Cause of tidal locking



If the moon's bulges didn't point straight at Earth, gravitational forces ("torques") would tend to pull them back toward center.