Tidal Heating of Moons

outreach@astronomy.nmsu.edu
http://astronomy.nmsu.edu
Tides on Earth

http://www.universetoday.com/20489/moon-compared-to-earth/
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http://www.ps.missouri.edu/rickspage/Moon/Tides.html
Jupiter’s Moon Io
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http://www.nasa.gov/multimedia/imagegallery/image_feature_758.html


http://apod.nasa.gov/apod/ap000606.html
Europa’s Cracked Icy Surface

Europa

Earth (Greenland)
Saturn’s Moon Enceladus

Enceladus’ Briny Geysers

http://apod.nasa.gov/apod/ap071013.html
Neptune’s Moon Triton

Tidal Heating Activity
Tidal Heating Activity

- Stretching elastic bands!
- Changing stretching = friction = heat
- Gravity stretches Moons = tidal force
- Changing tidal forces also cause heat
- Certain arrangements result in lots of stretching
The Rings of Saturn

http://apod.nasa.gov/apod/ap061016.html
The Rings of Saturn

The Rings of Saturn

Enceladus & the E ring!

http://photojournal.jpl.nasa.gov/catalog/PIA03550

http://apod.nasa.gov/apod/ap070327.html
Summary

• Some moons are far from the Sun but are heated somehow

• Gravity stretches moons = tidal force

• Changing tidal forces provides heat by friction

• Heated moons can have volcanoes, geysers, and oceans!
  – Tidal heating means water can be a liquid even in places far from the Sun. Where there’s water, there might be life! Follow the water!