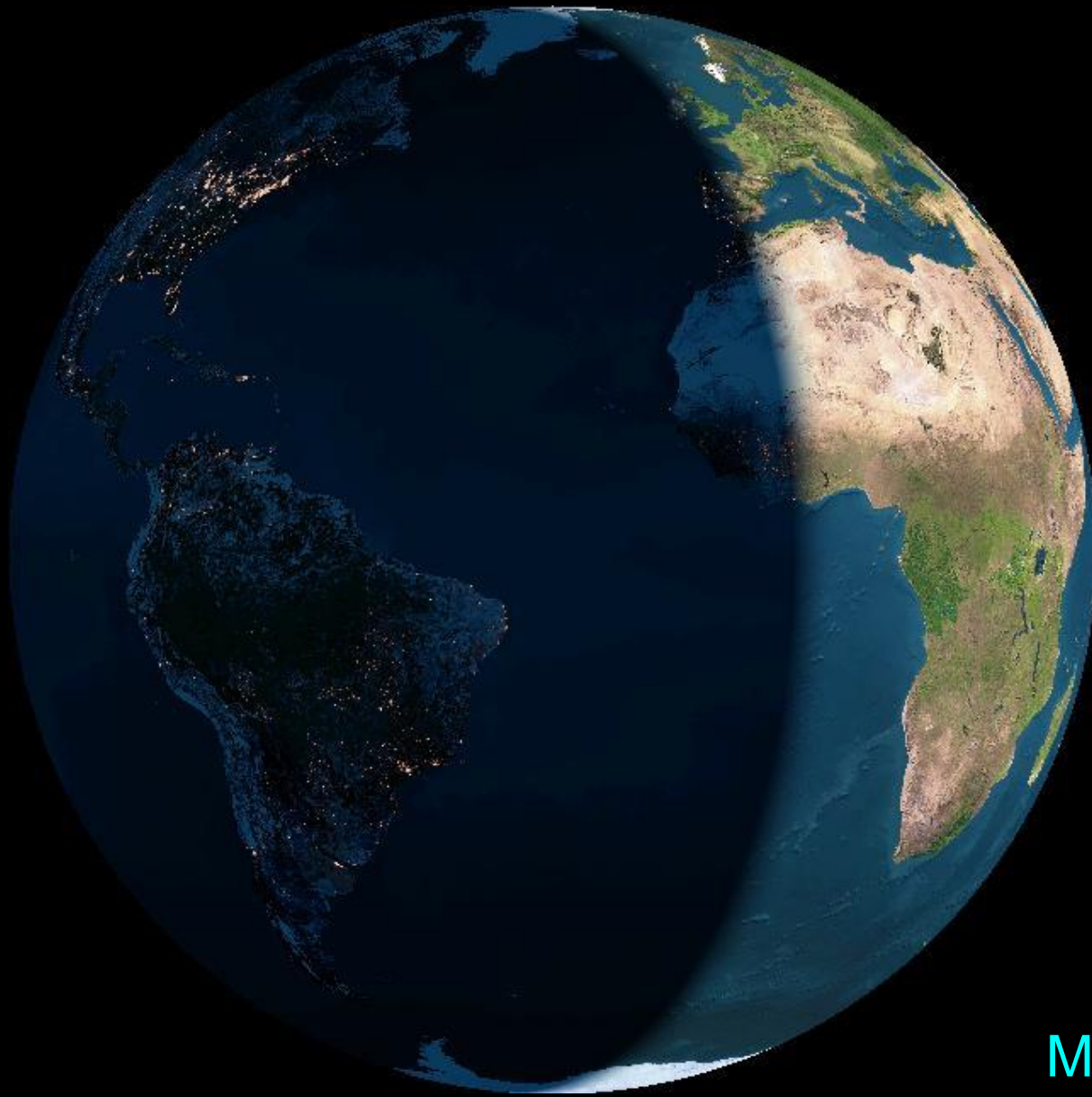


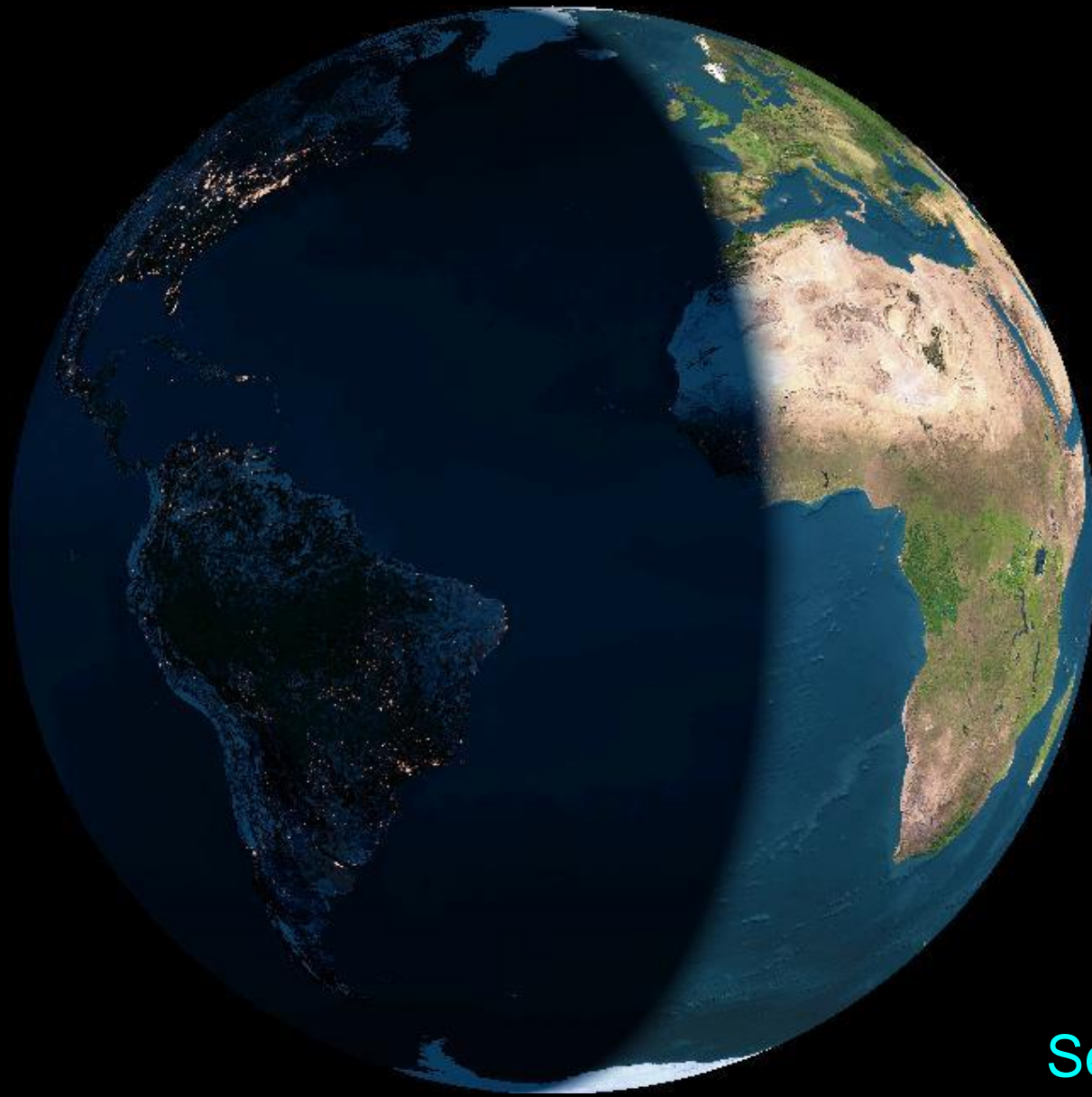
Dec 21



Mar 21

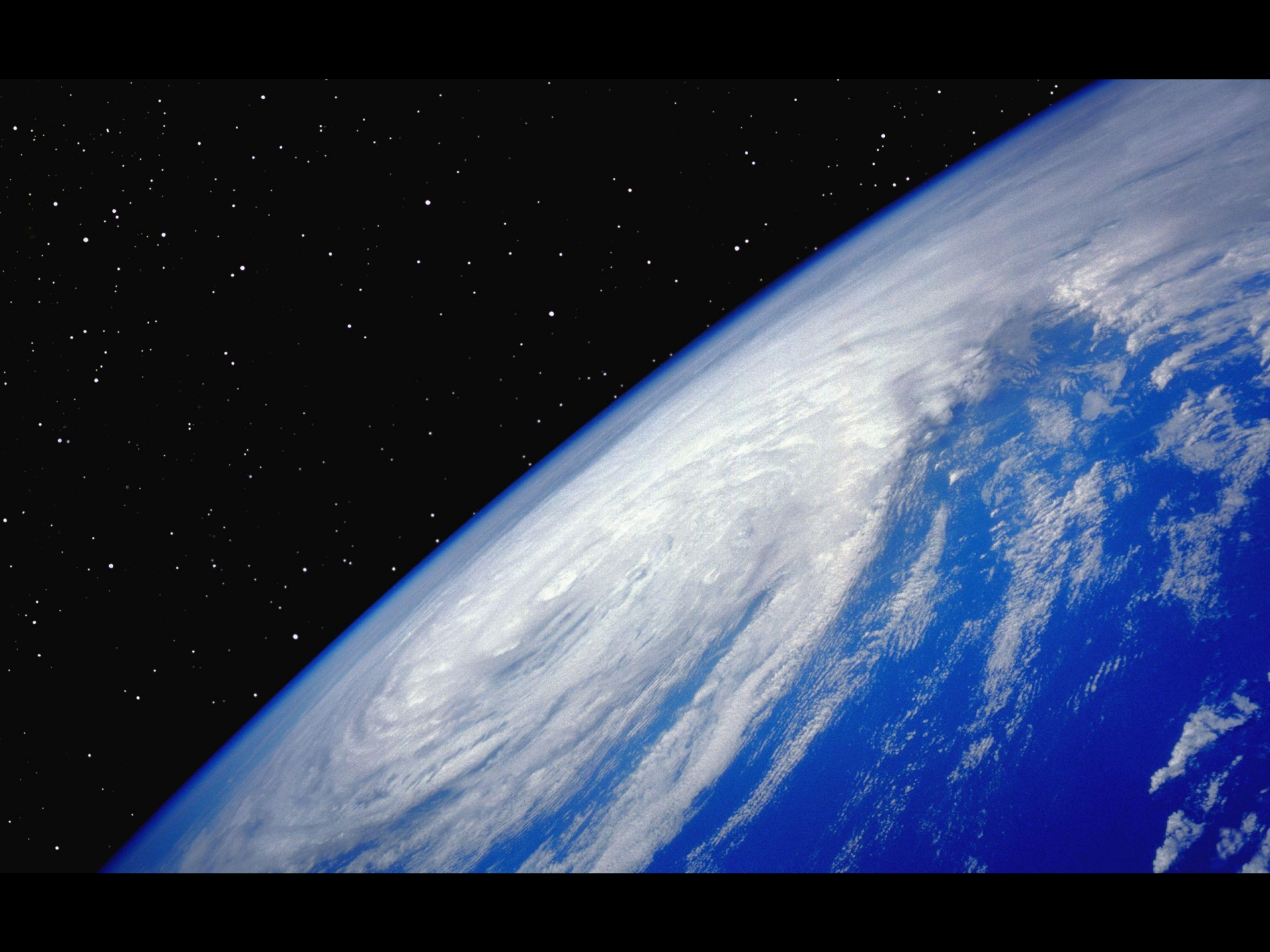


Jun 21



Sep 21

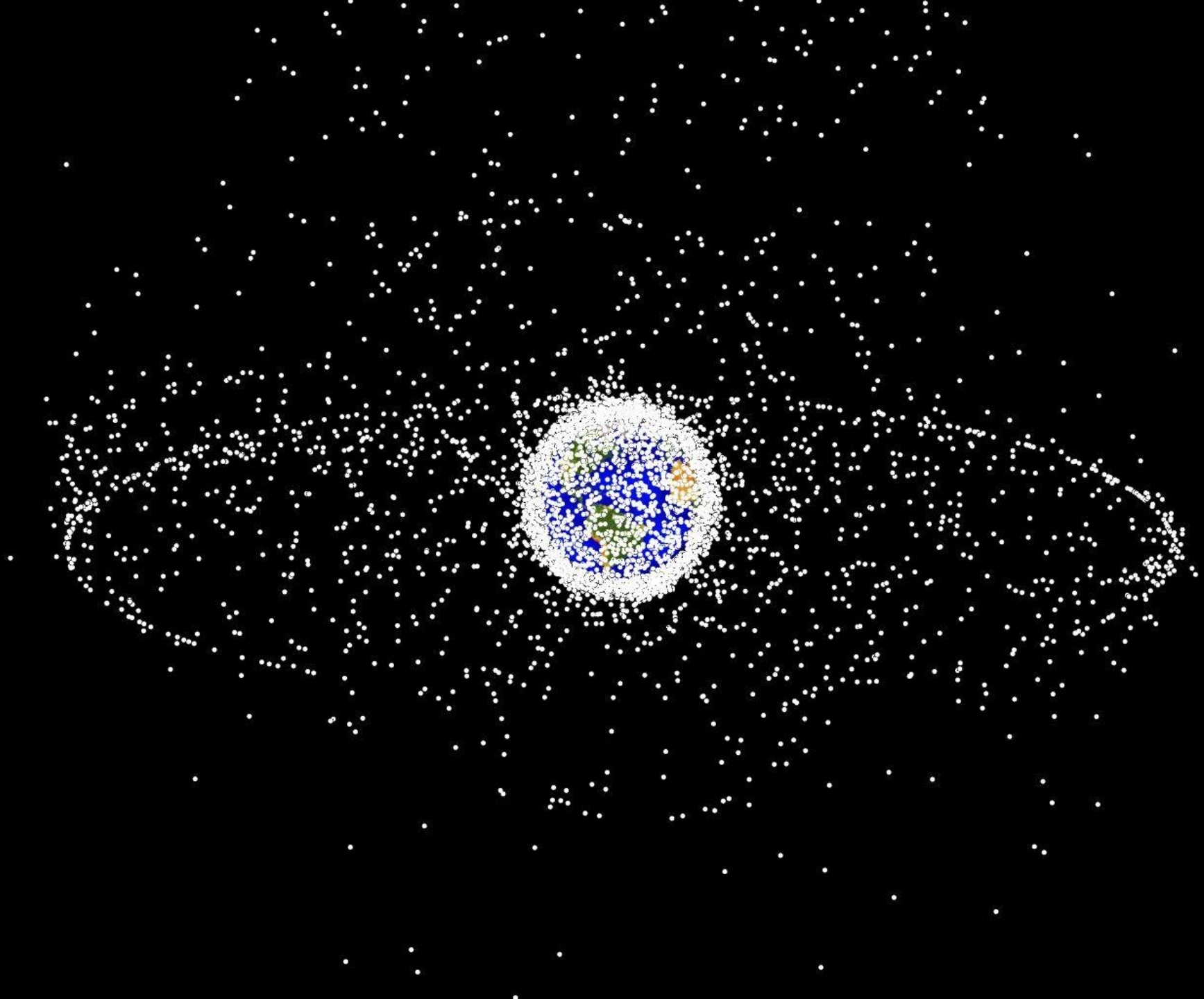


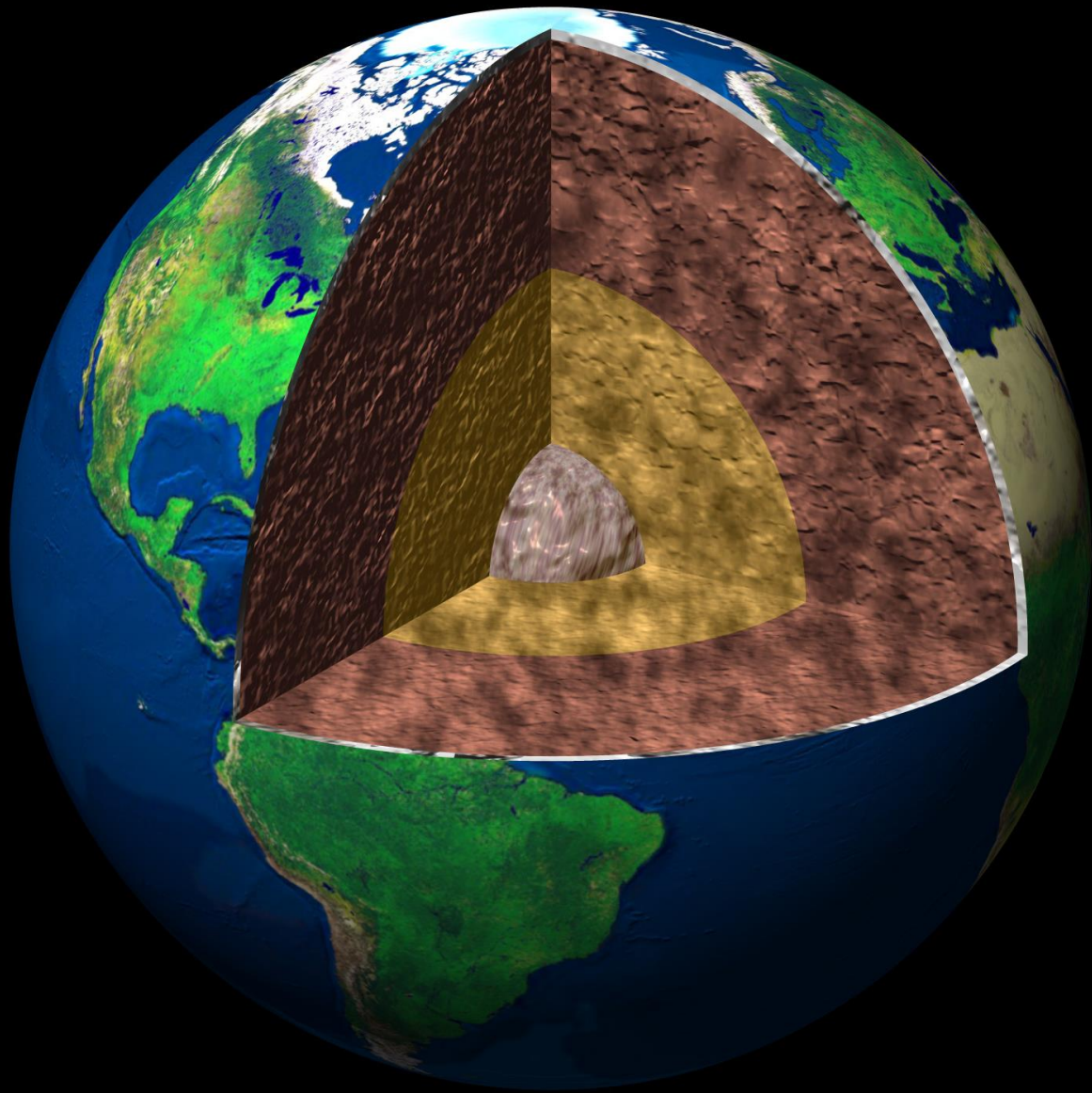


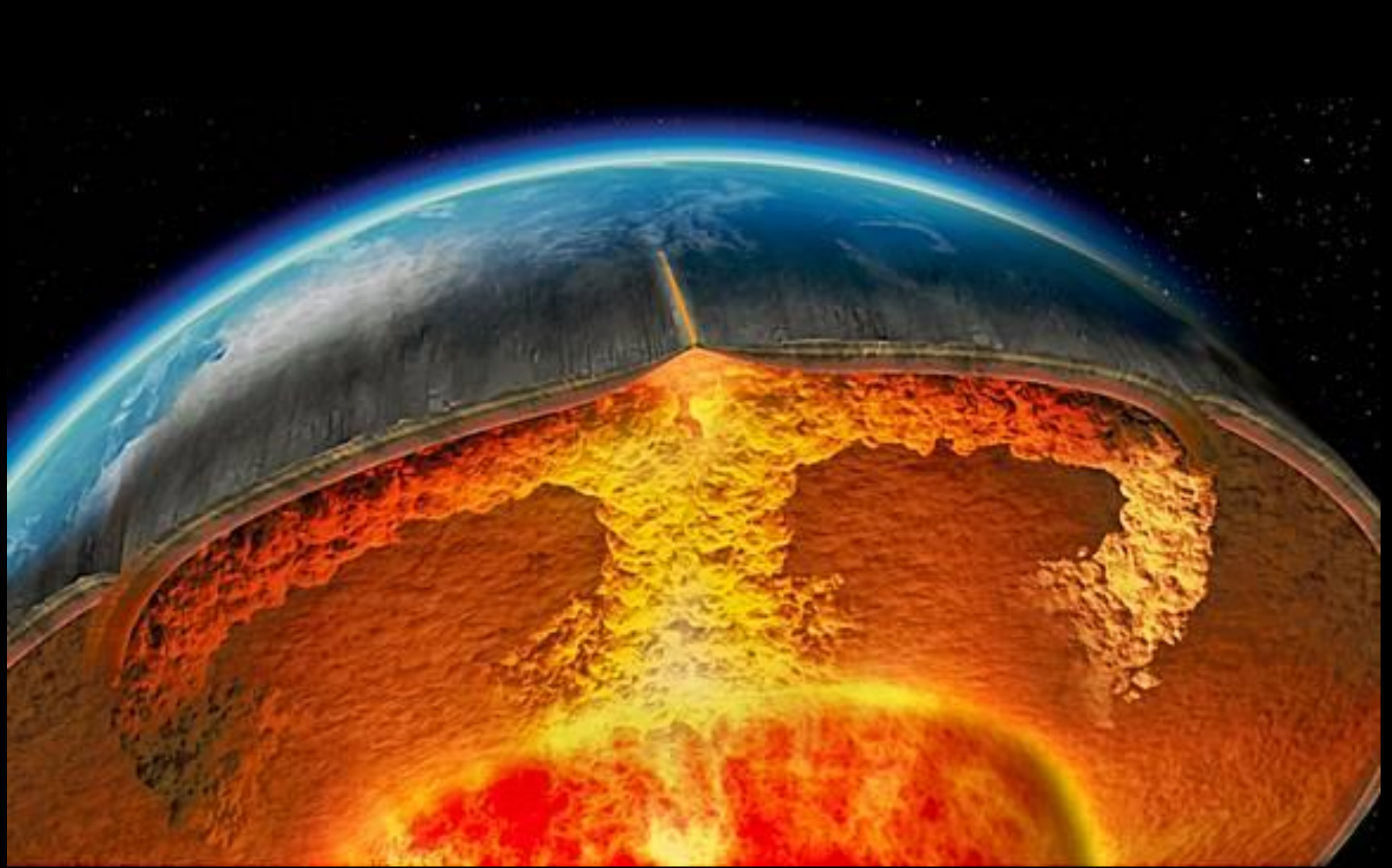


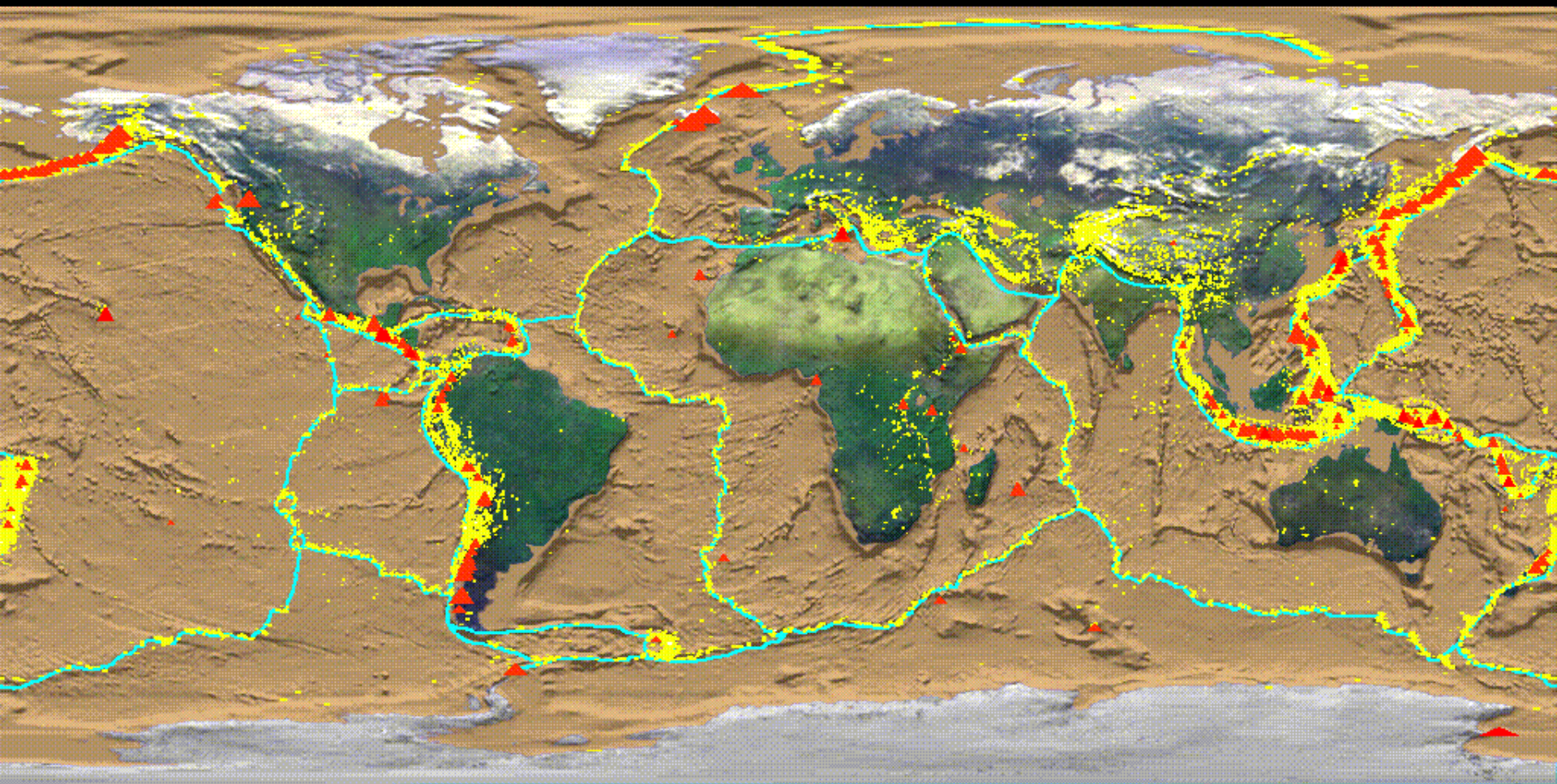
Note: Artist's impression; size of debris exaggerated as compared to the Earth



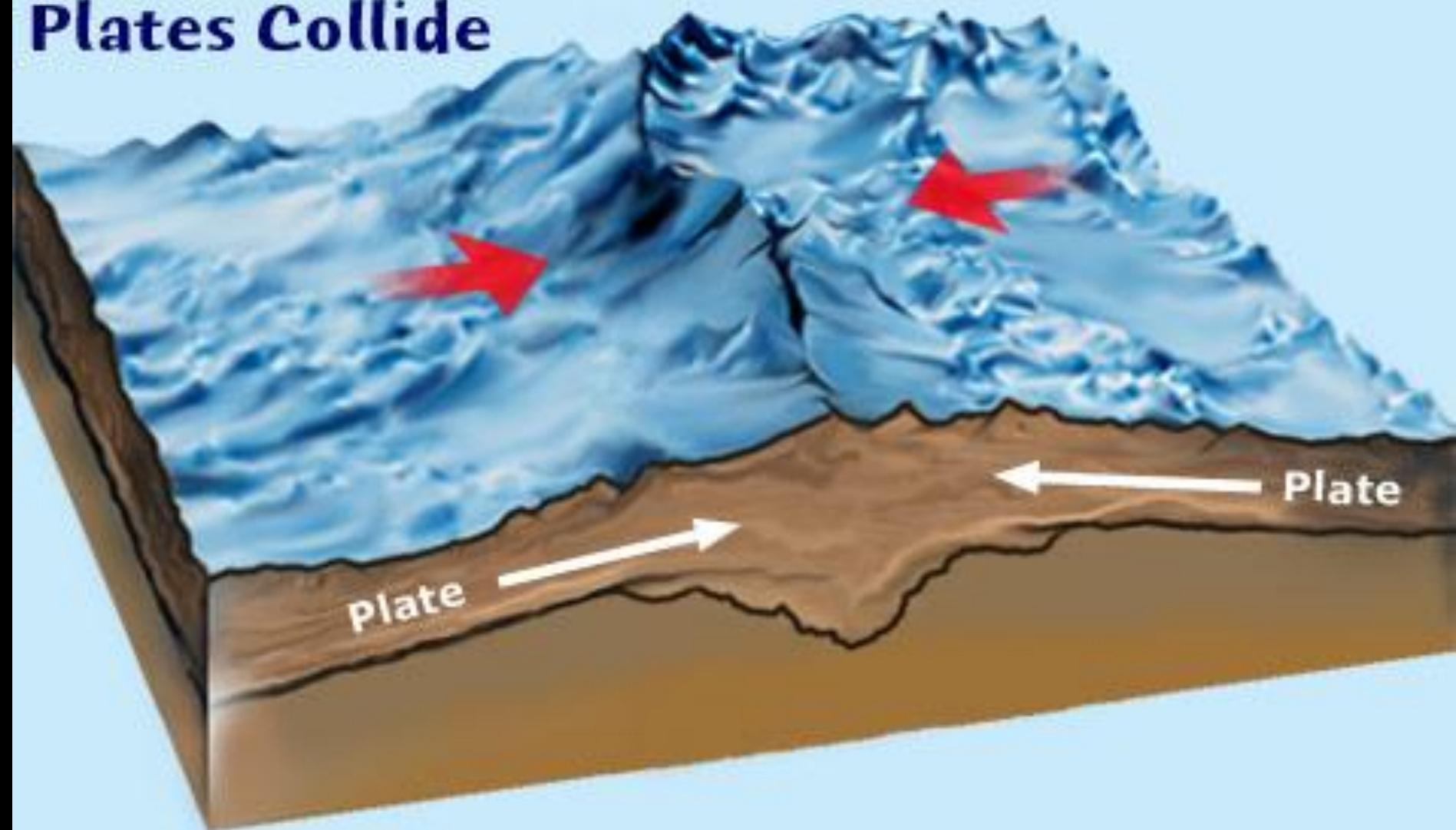




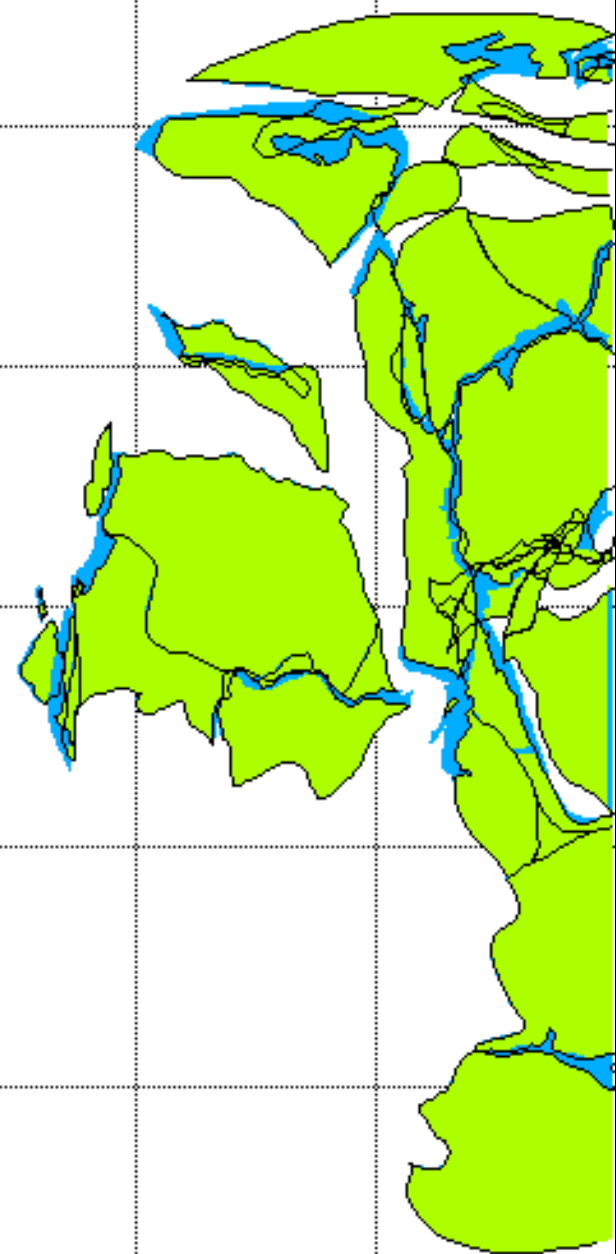
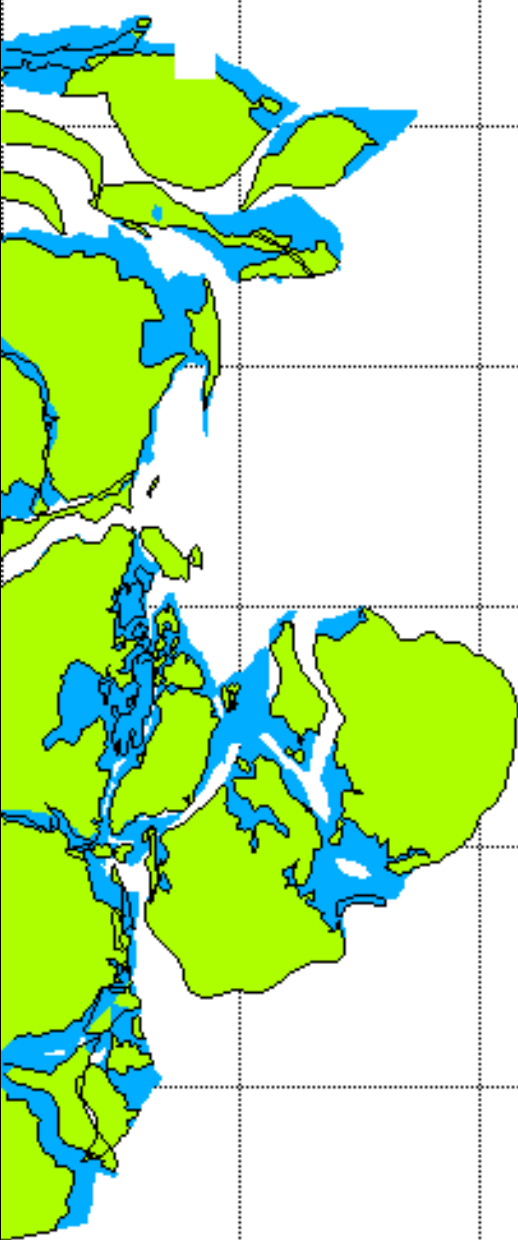




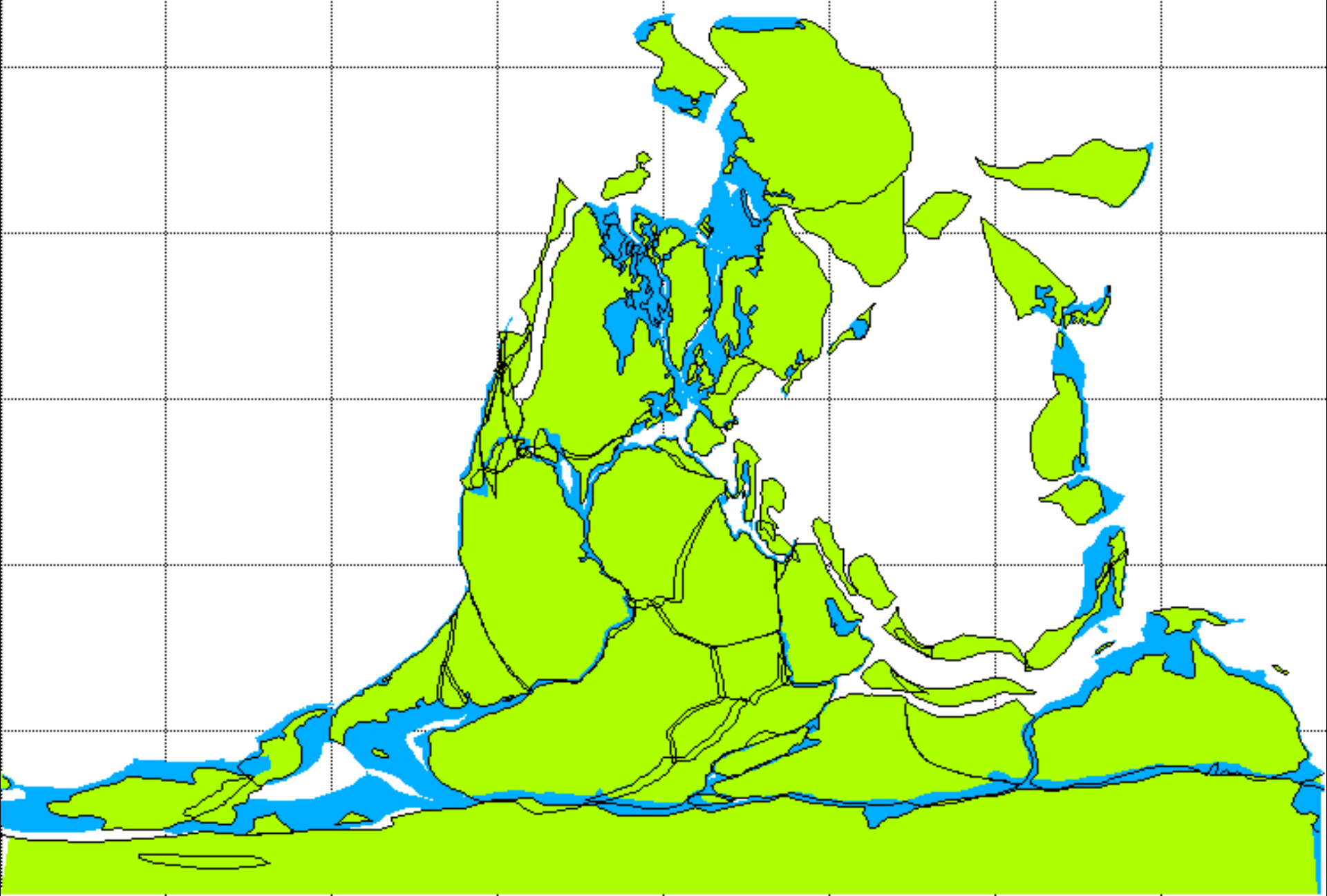
# Plates Collide



Precambrian [750.00 Ma]



11. Bashkirian & Moscovian [300.00 Ma]

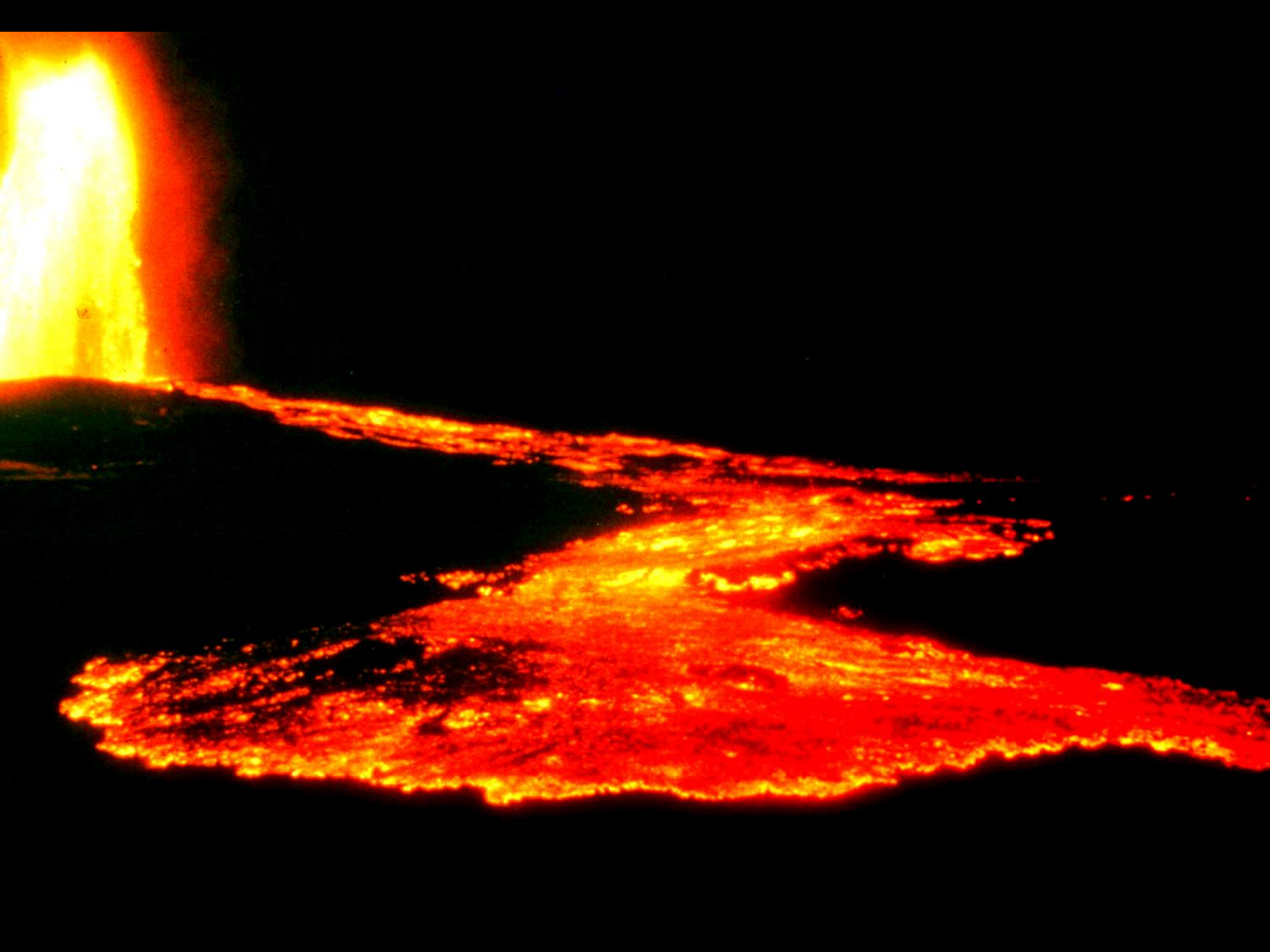




Mt Etna explodes

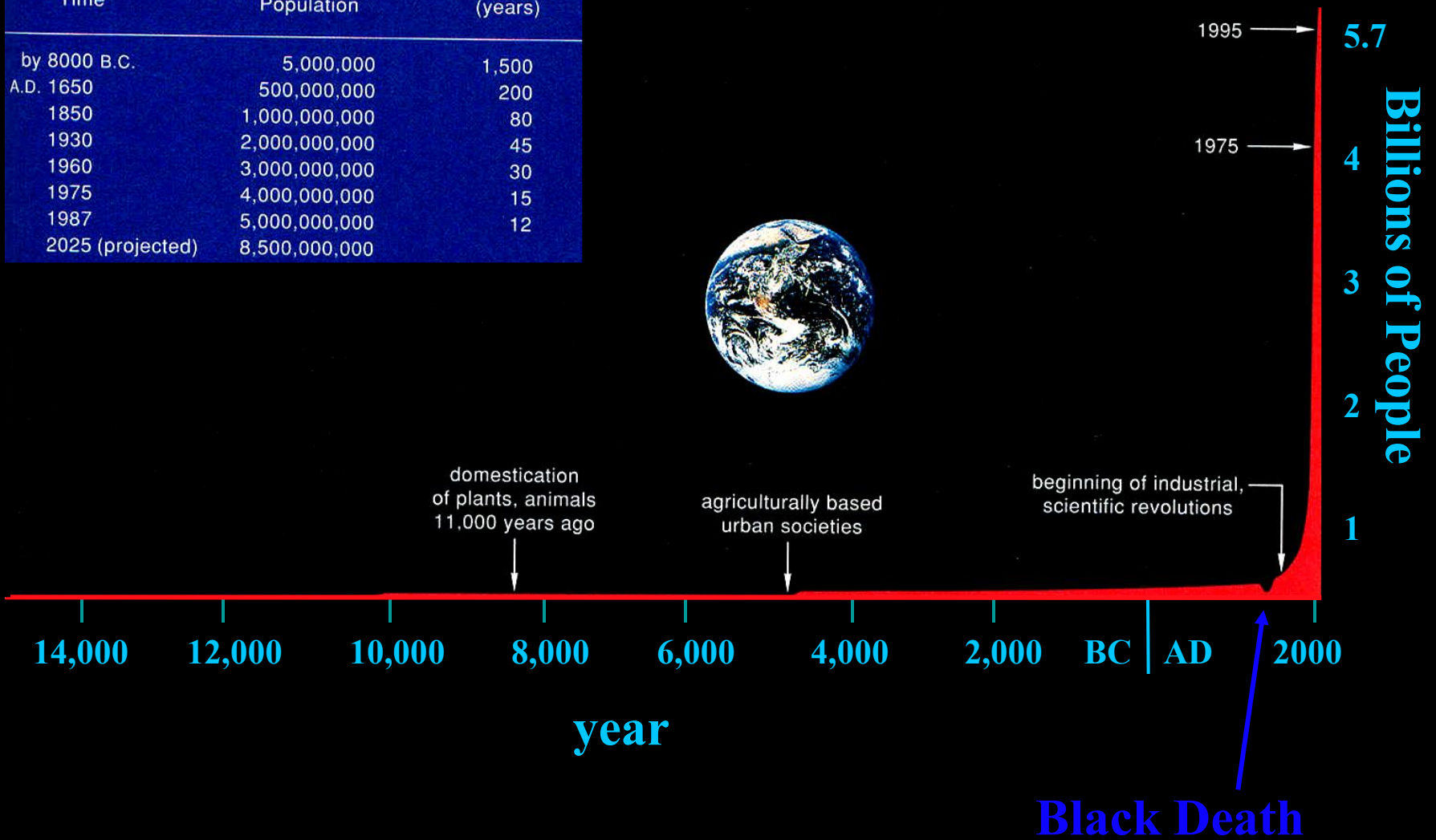








Time	Estimated World Population	Doubling Time (years)
by 8000 B.C.	5,000,000	1,500
A.D. 1650	500,000,000	200
1850	1,000,000,000	80
1930	2,000,000,000	45
1960	3,000,000,000	30
1975	4,000,000,000	15
1987	5,000,000,000	12
2025 (projected)	8,500,000,000	





INPUT  
Solar radiation to  
Earth

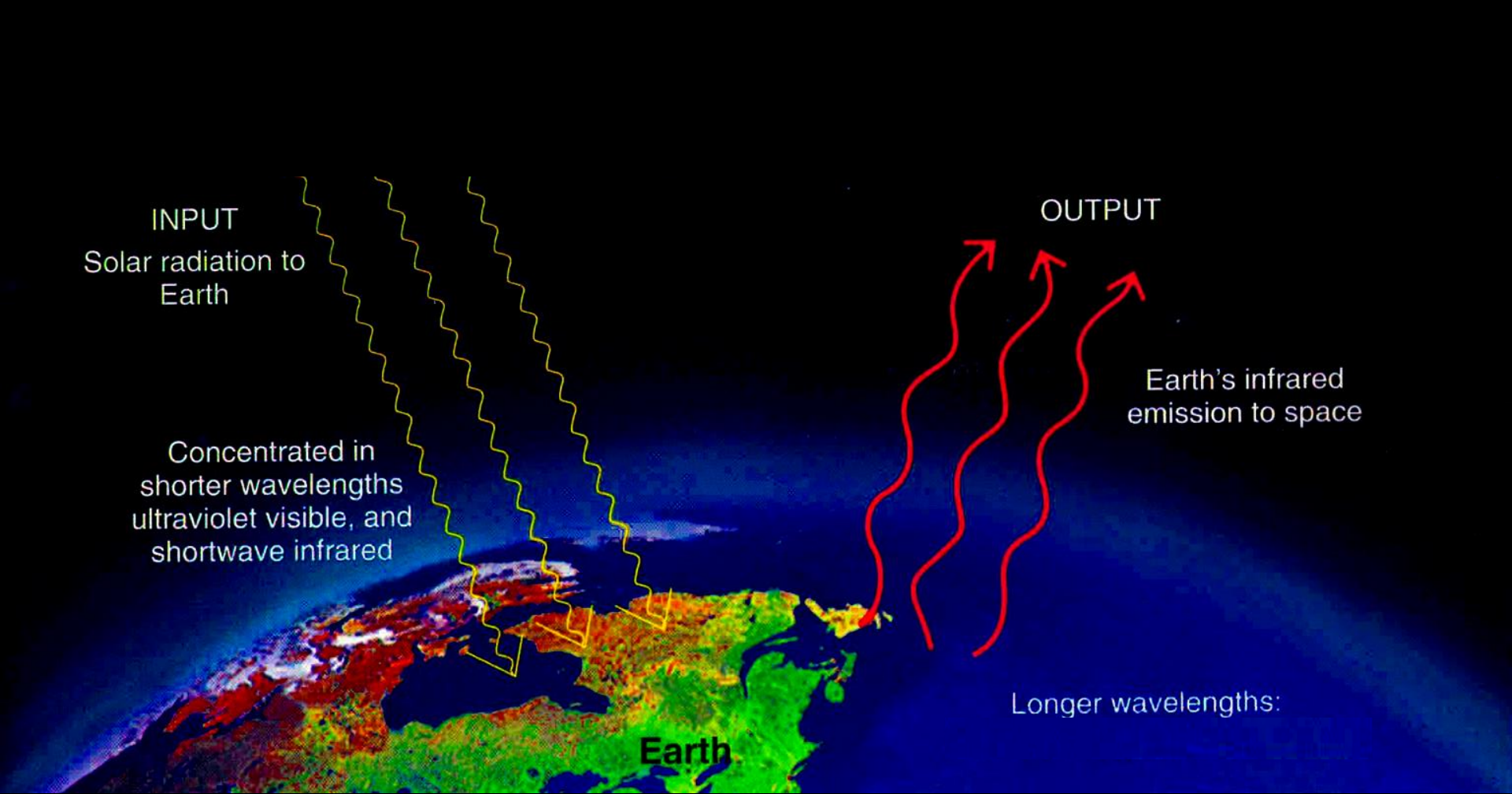
Concentrated in  
shorter wavelengths  
ultraviolet visible, and  
shortwave infrared

OUTPUT

Earth's infrared  
emission to space

Longer wavelengths:

Earth



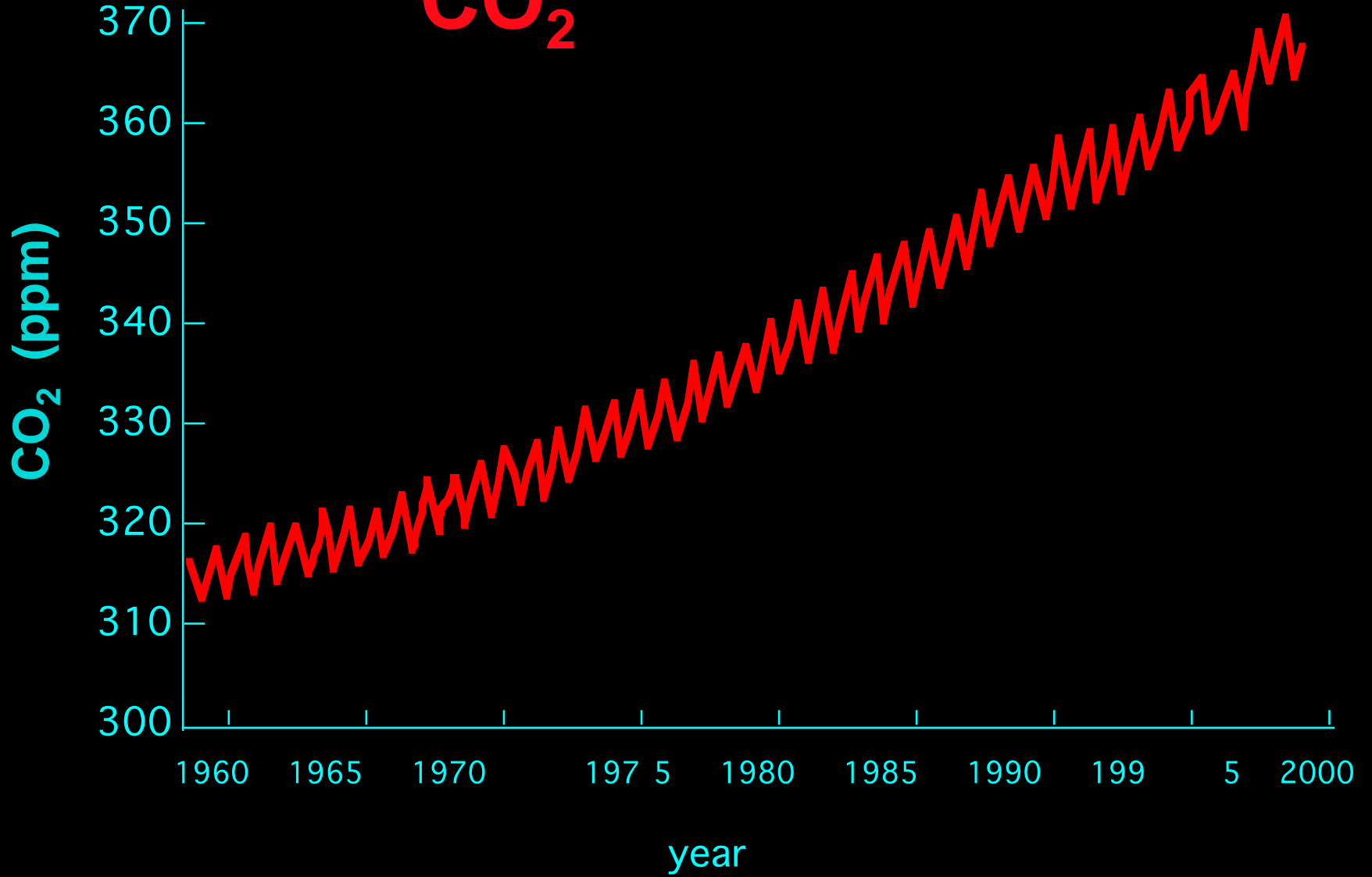


Visible light passes through atmosphere.

Greenhouse gases trap infrared radiation in troposphere, heating lower atmosphere.

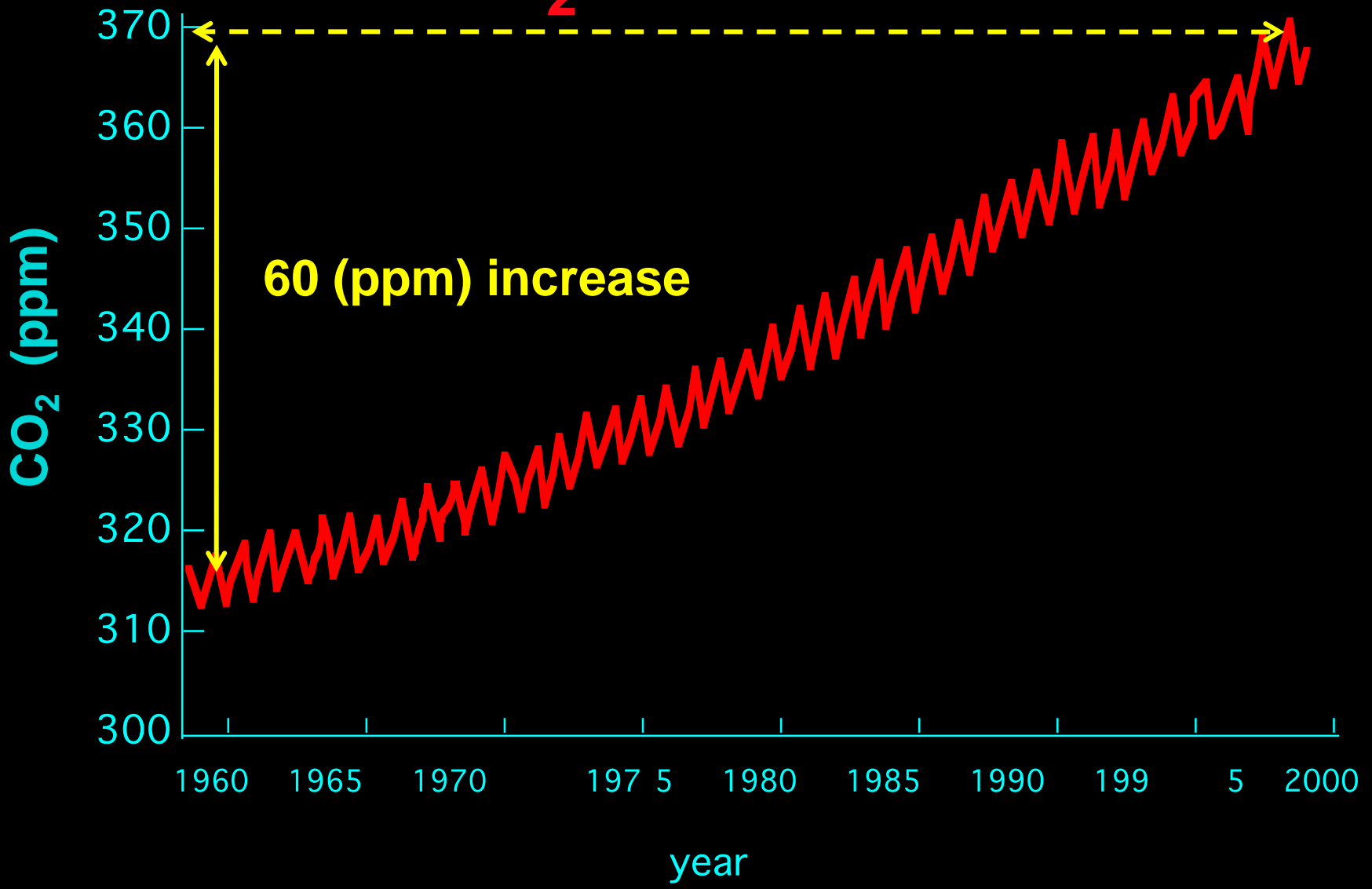
Surface absorbs visible light and emits infrared light.

**CO<sub>2</sub>**

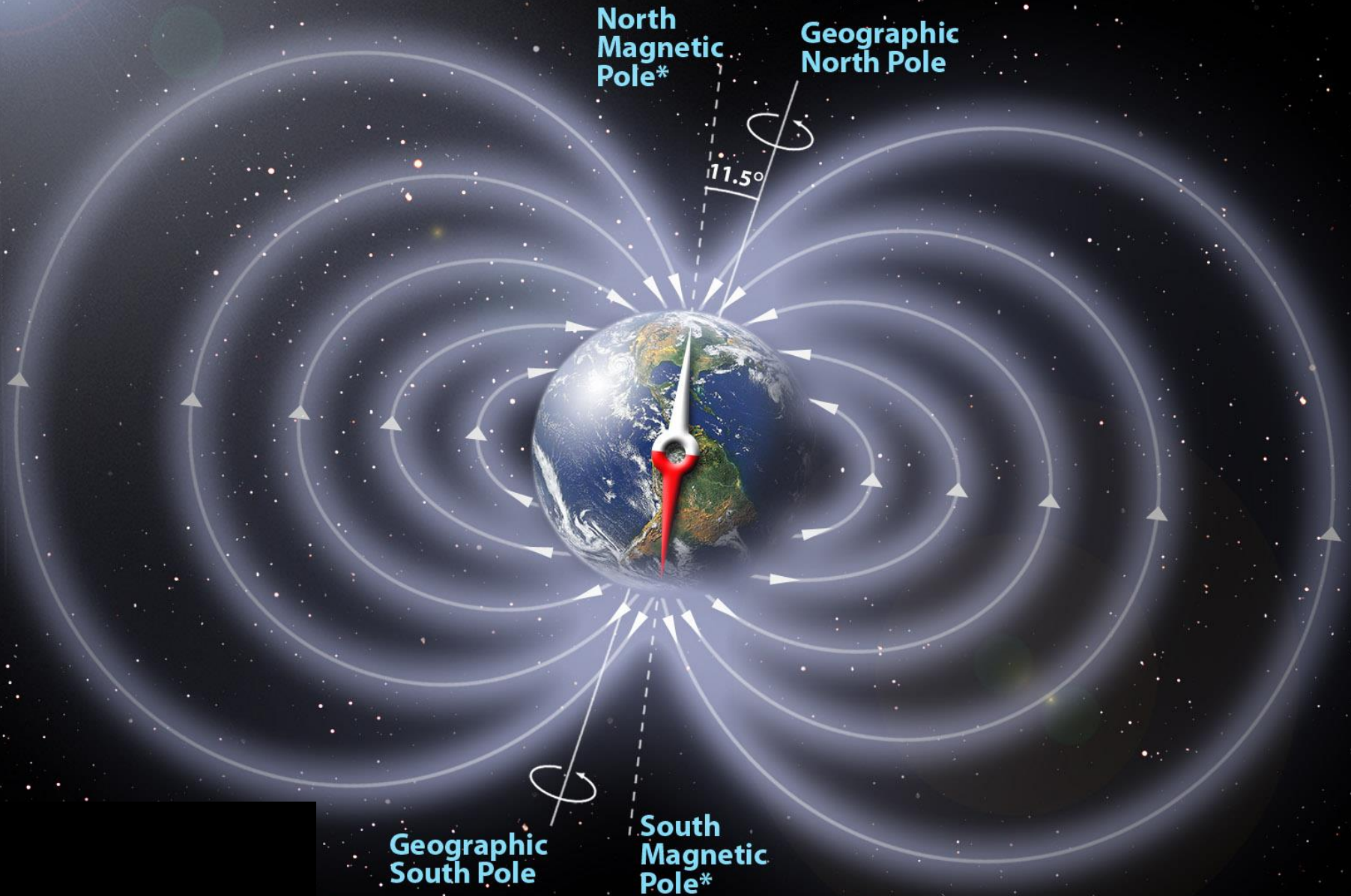


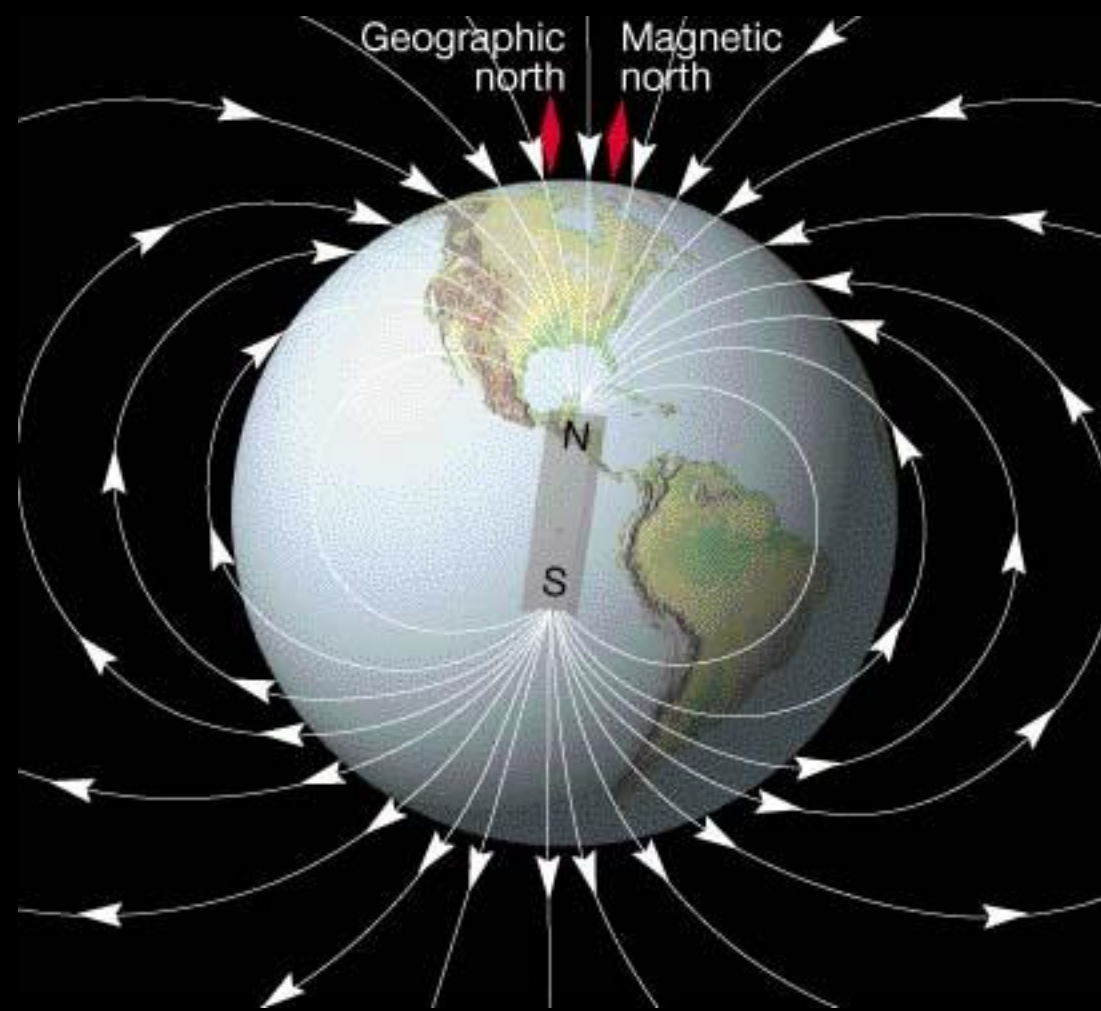


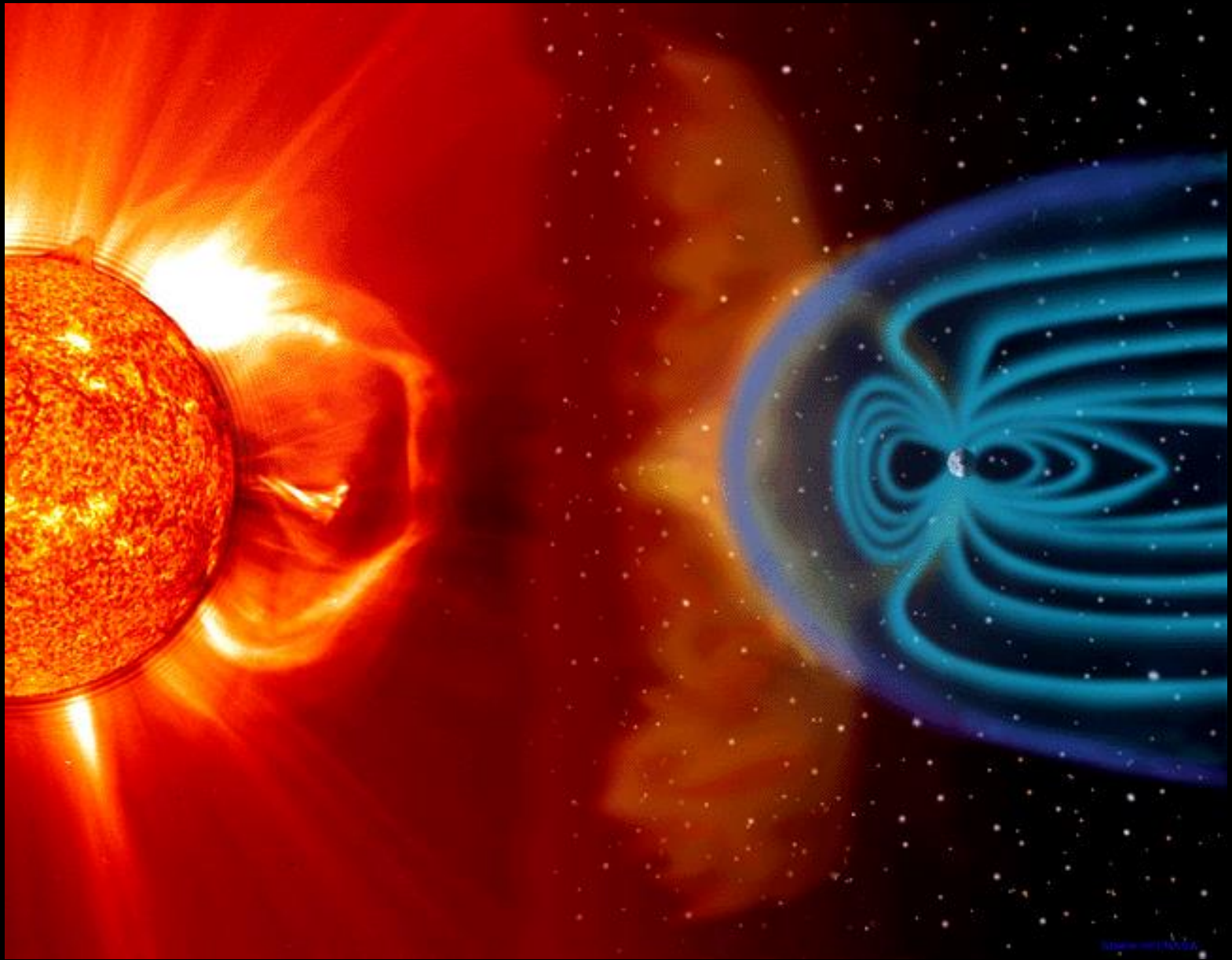
**CO<sub>2</sub>**

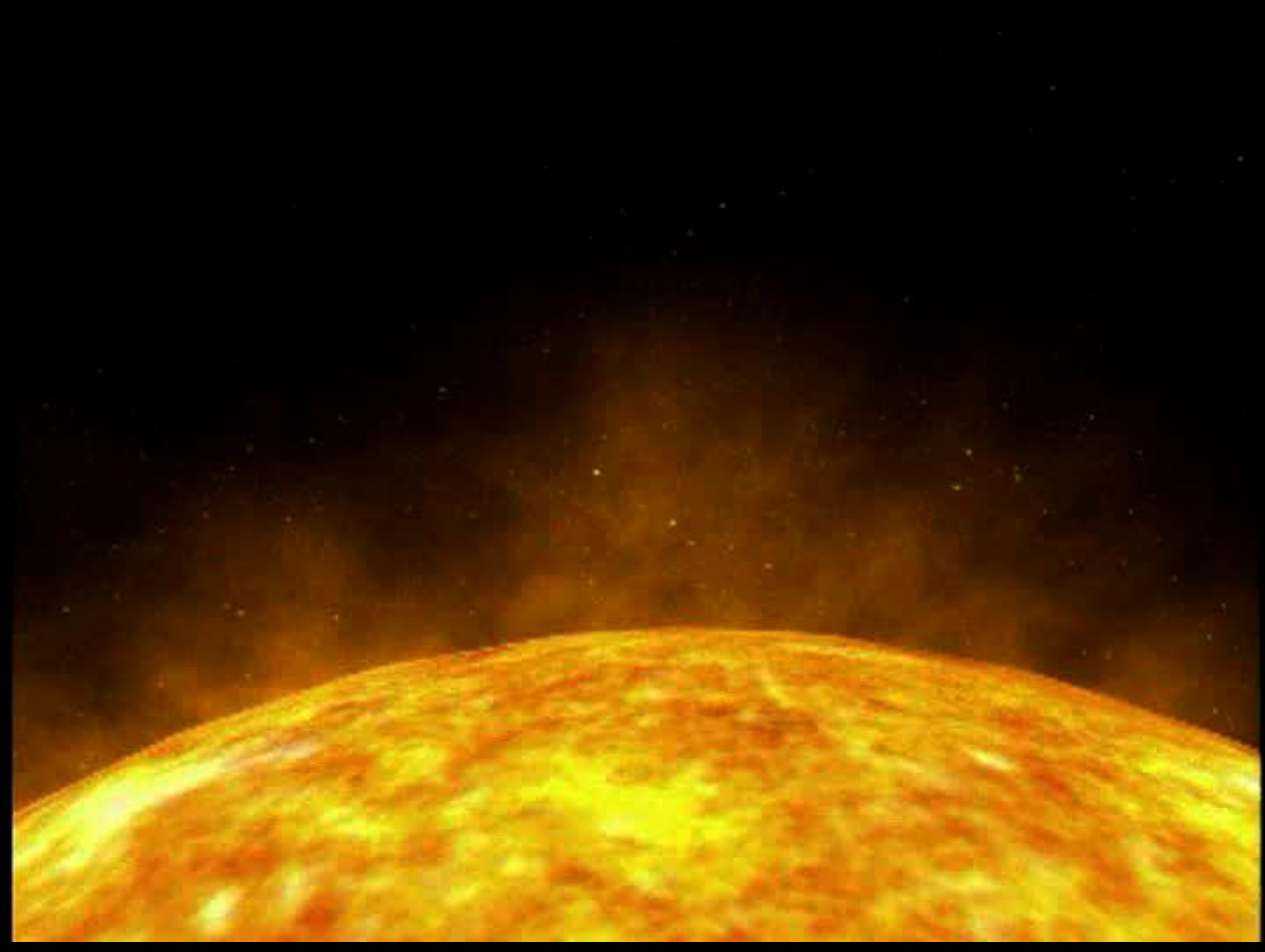


# The Earth's Magnetic Field



















# Aurora Substrom - Real time motion

Yellowknife, Canada, 2013.

KWON O CHUL ASTROPHOTOGRAPHY

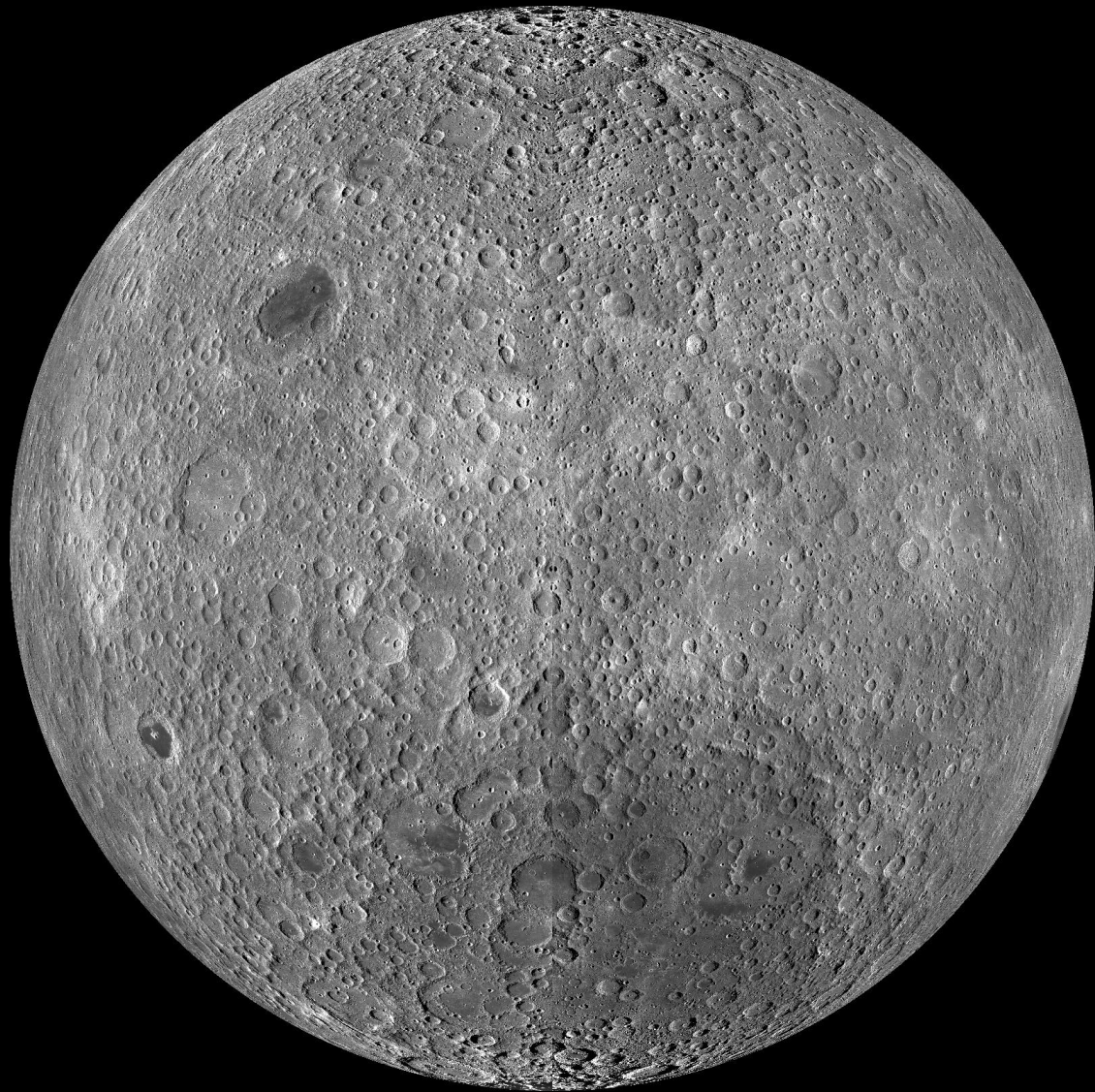
00:00

HD

A video player interface with a blue thumbs-up icon on the left, a white progress bar in the center, and the text 'HD' and a full-screen icon on the right.



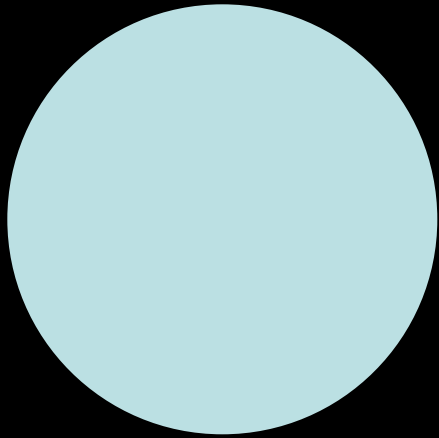
Earth's view of the  
Moon — only one side



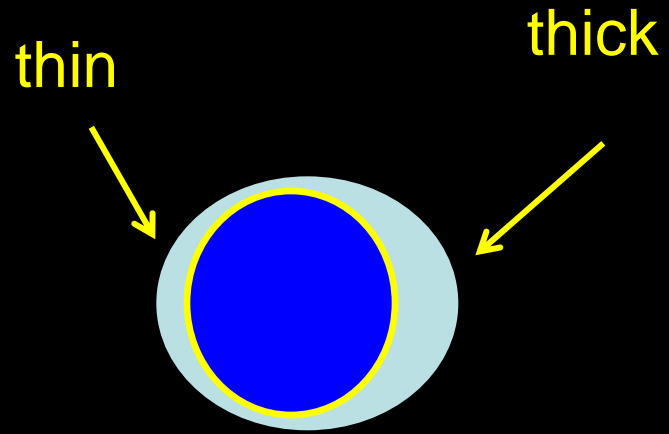
Farside of the Moon —  
not seen from Earth



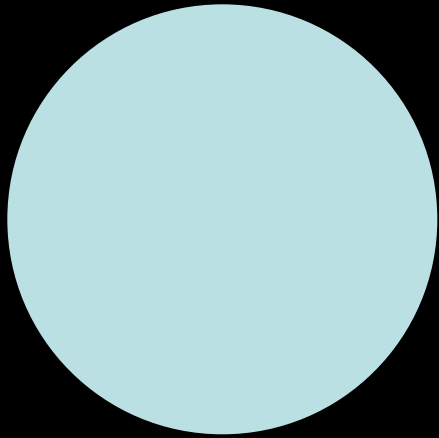
Moon



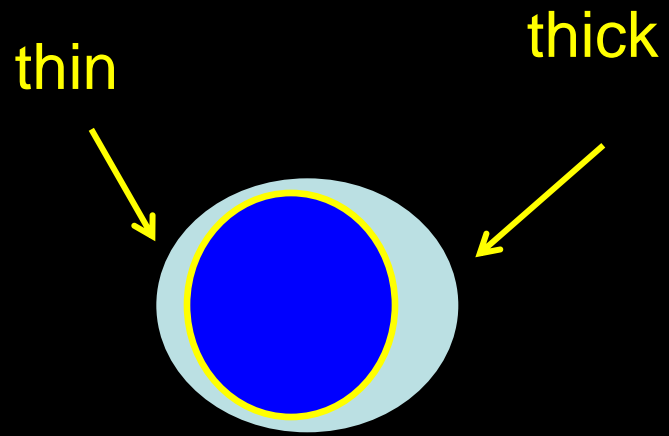
Earth



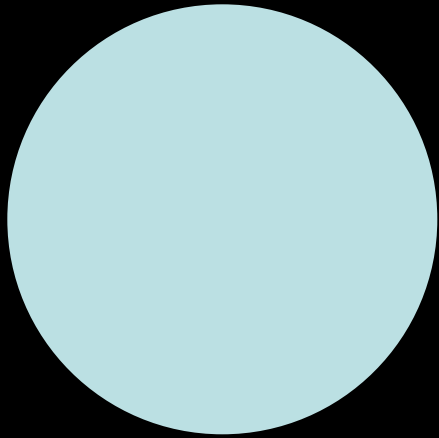
Moon in tidal lock



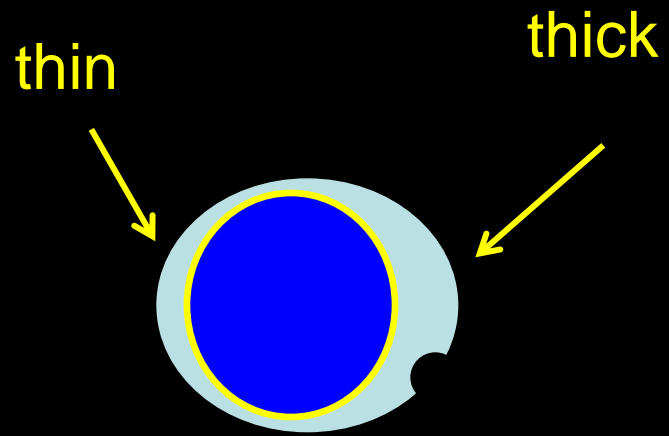
Earth



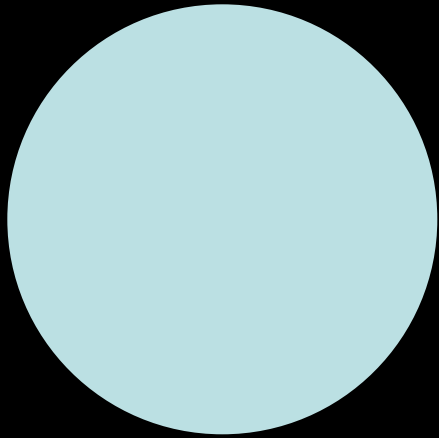
Moon in tidal lock



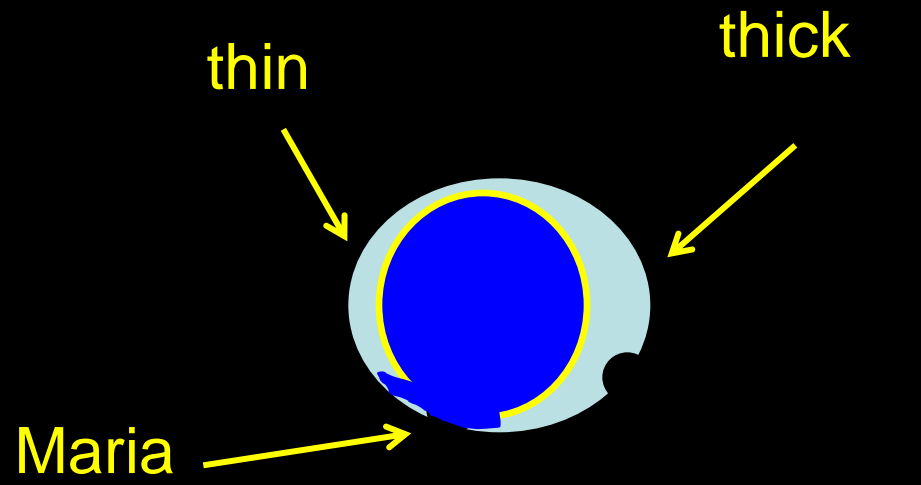
Earth



Moon in tidal lock

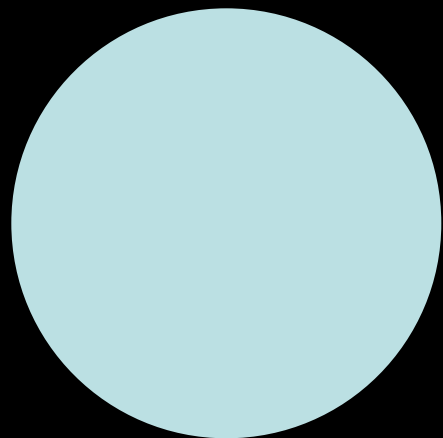


Earth



Moon in tidal lock

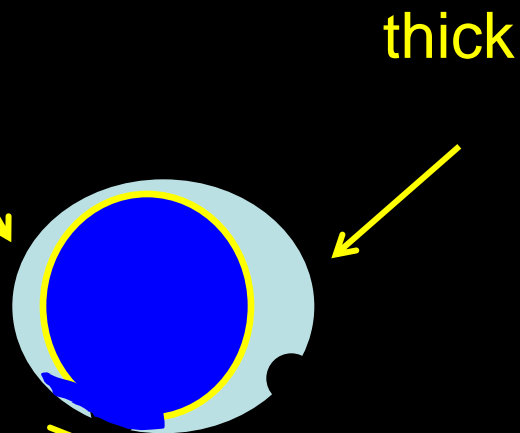




Earth



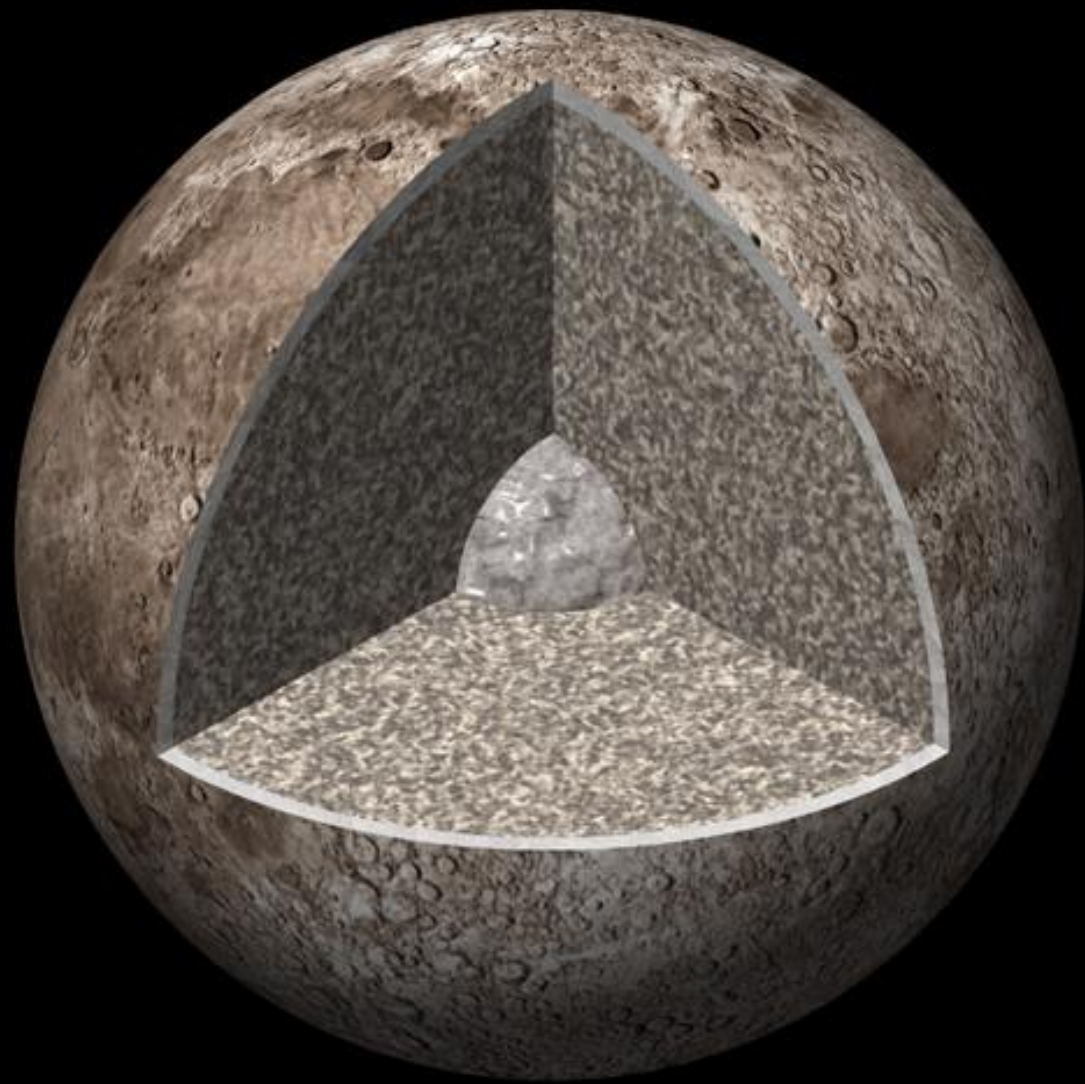
view from Earth



thin

thick

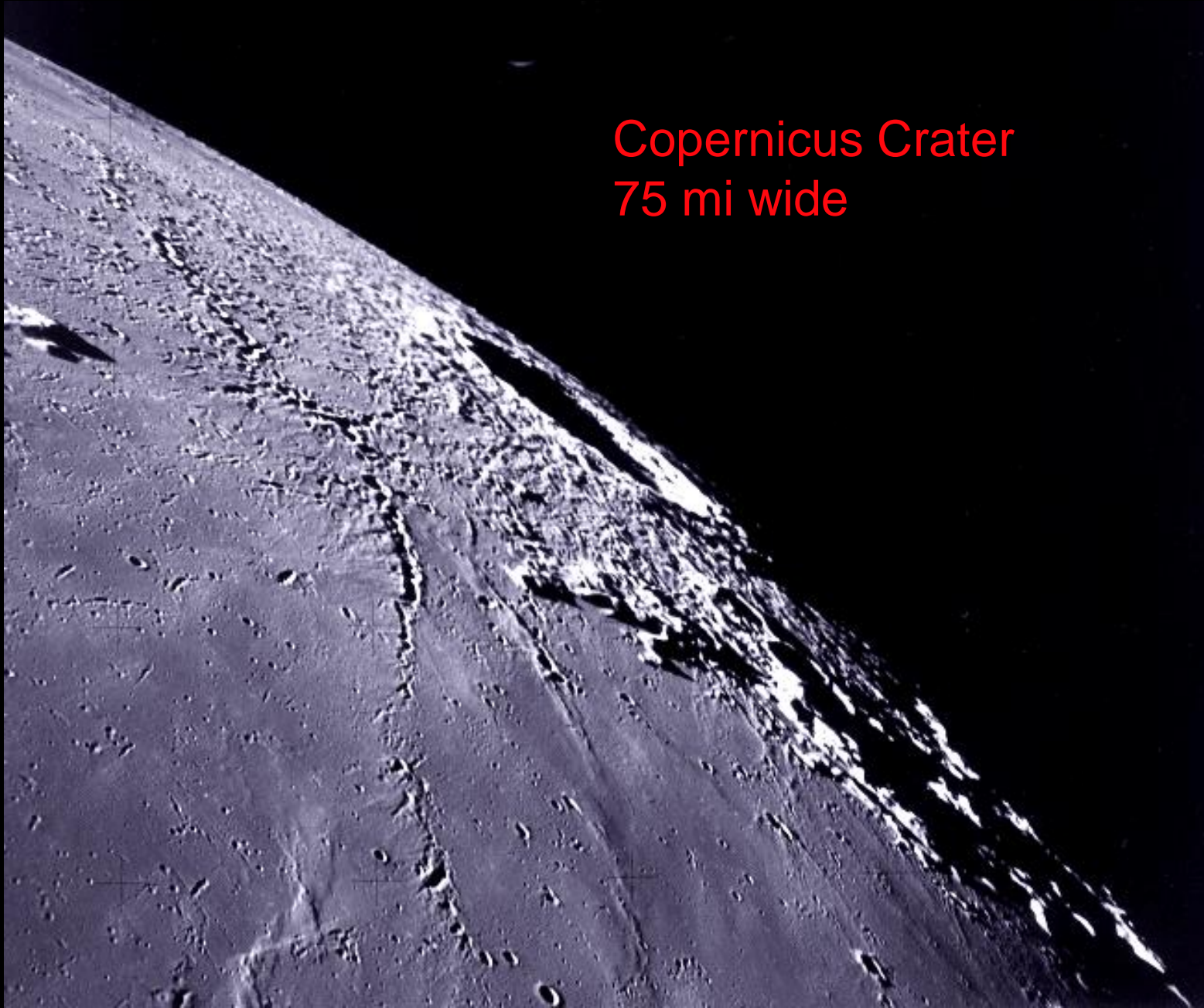
Maria



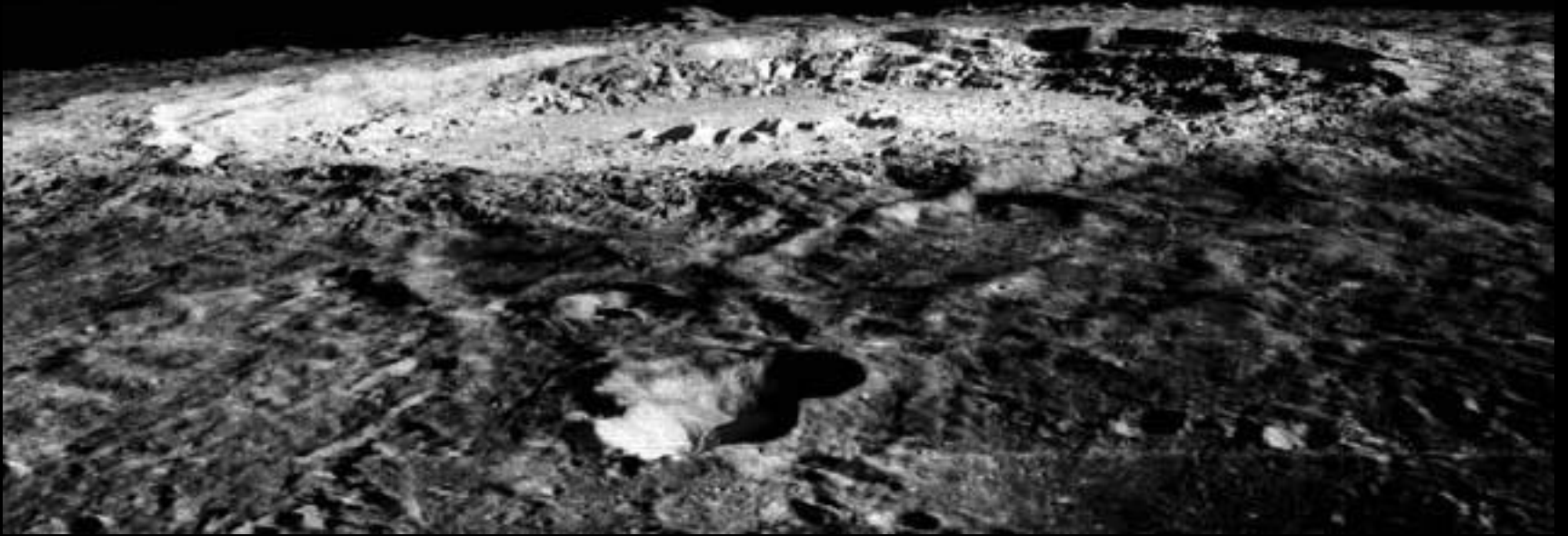


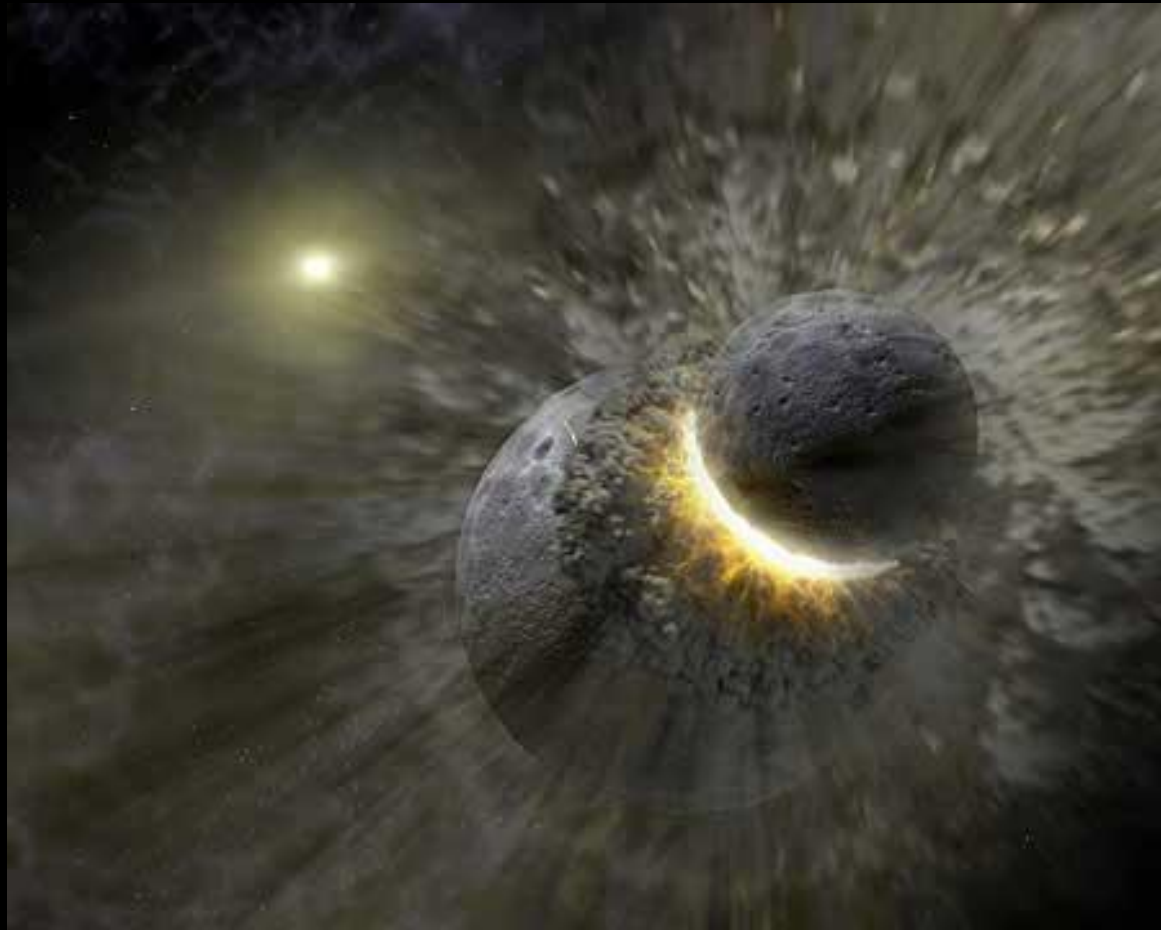


Copernicus Crater  
75 mi wide

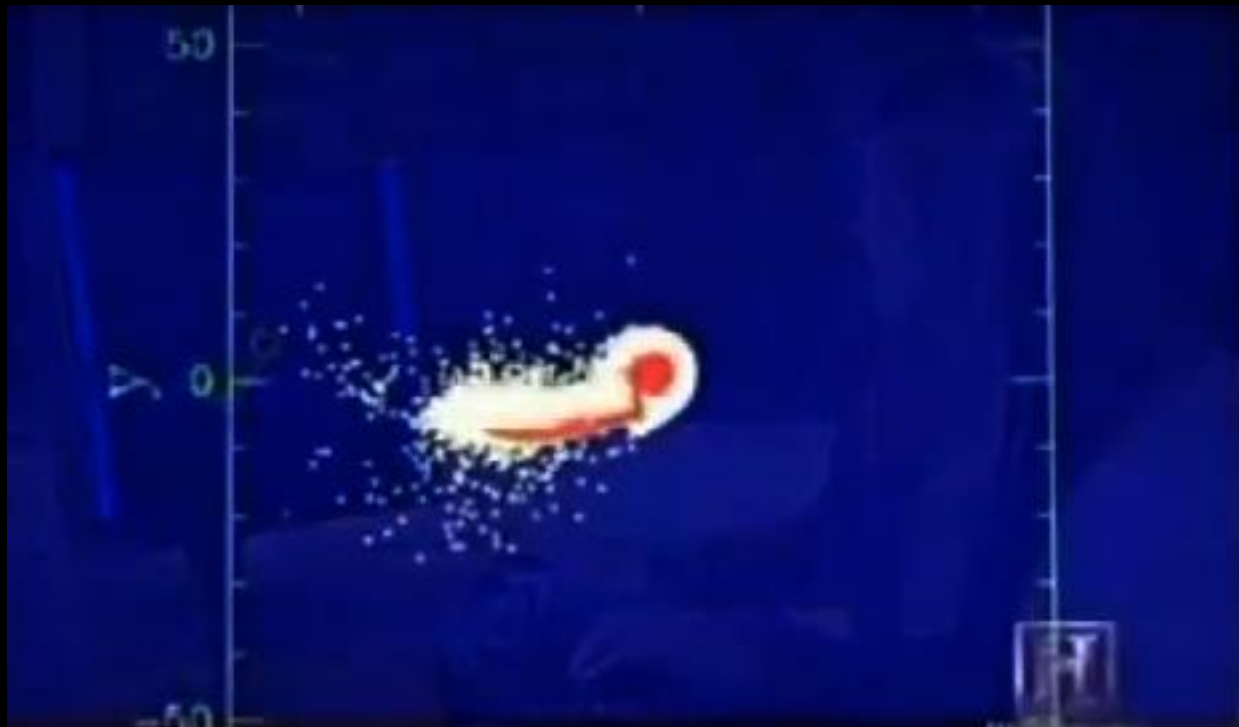


# Copernicus Crater





About 1 billion years after the solar system started to form

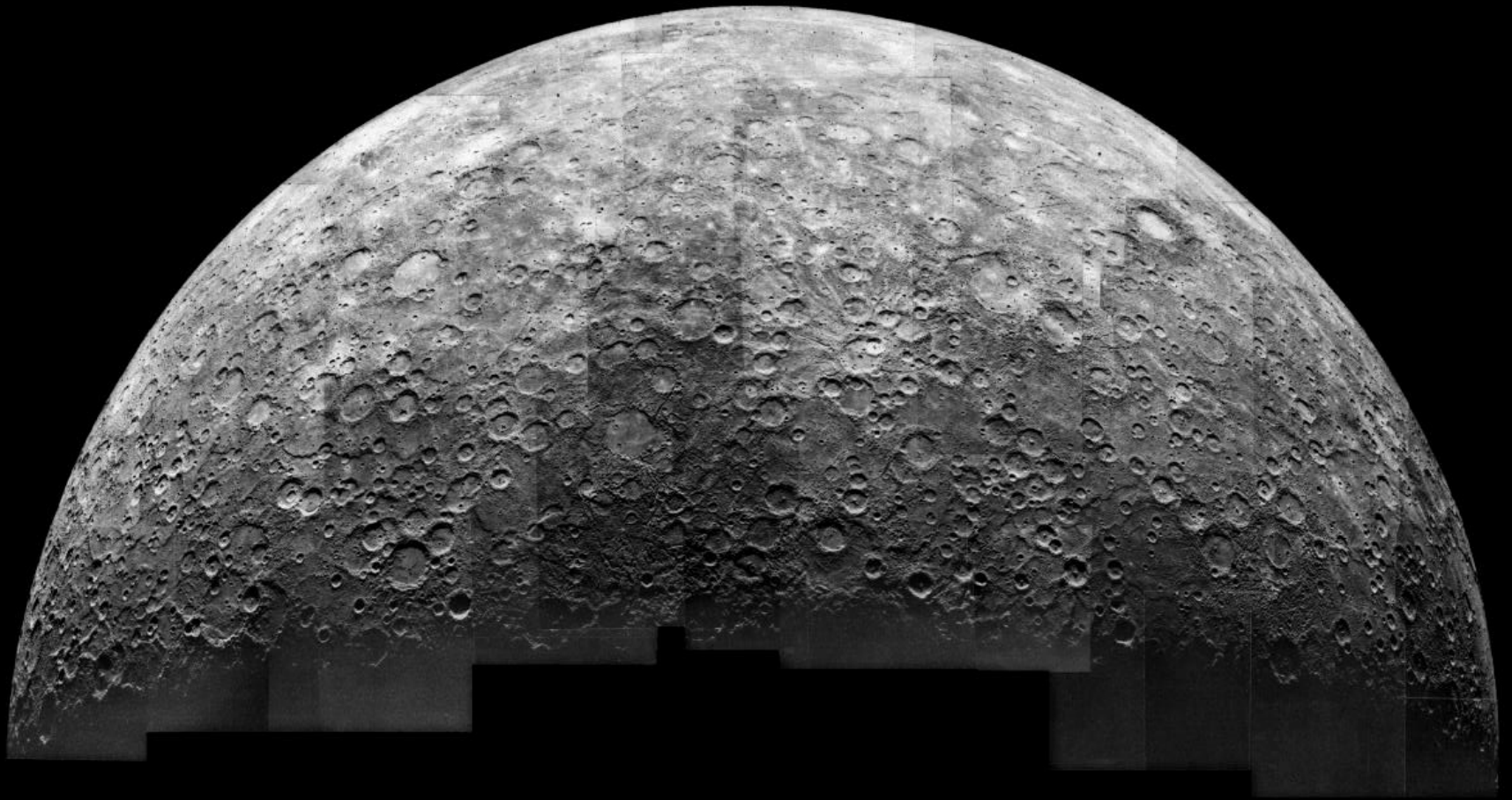


Earth's surface melted from the collision and Moon formed

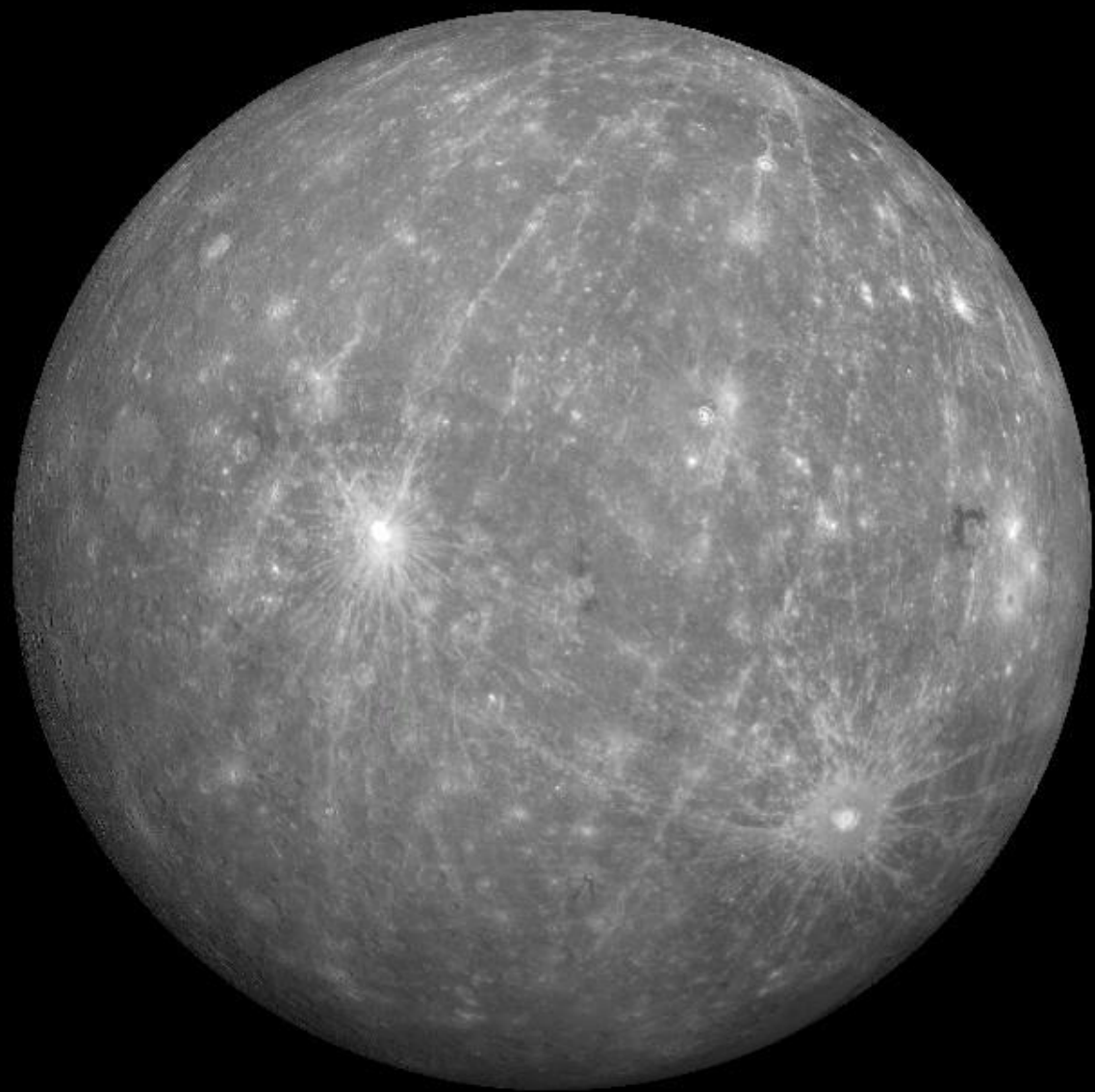


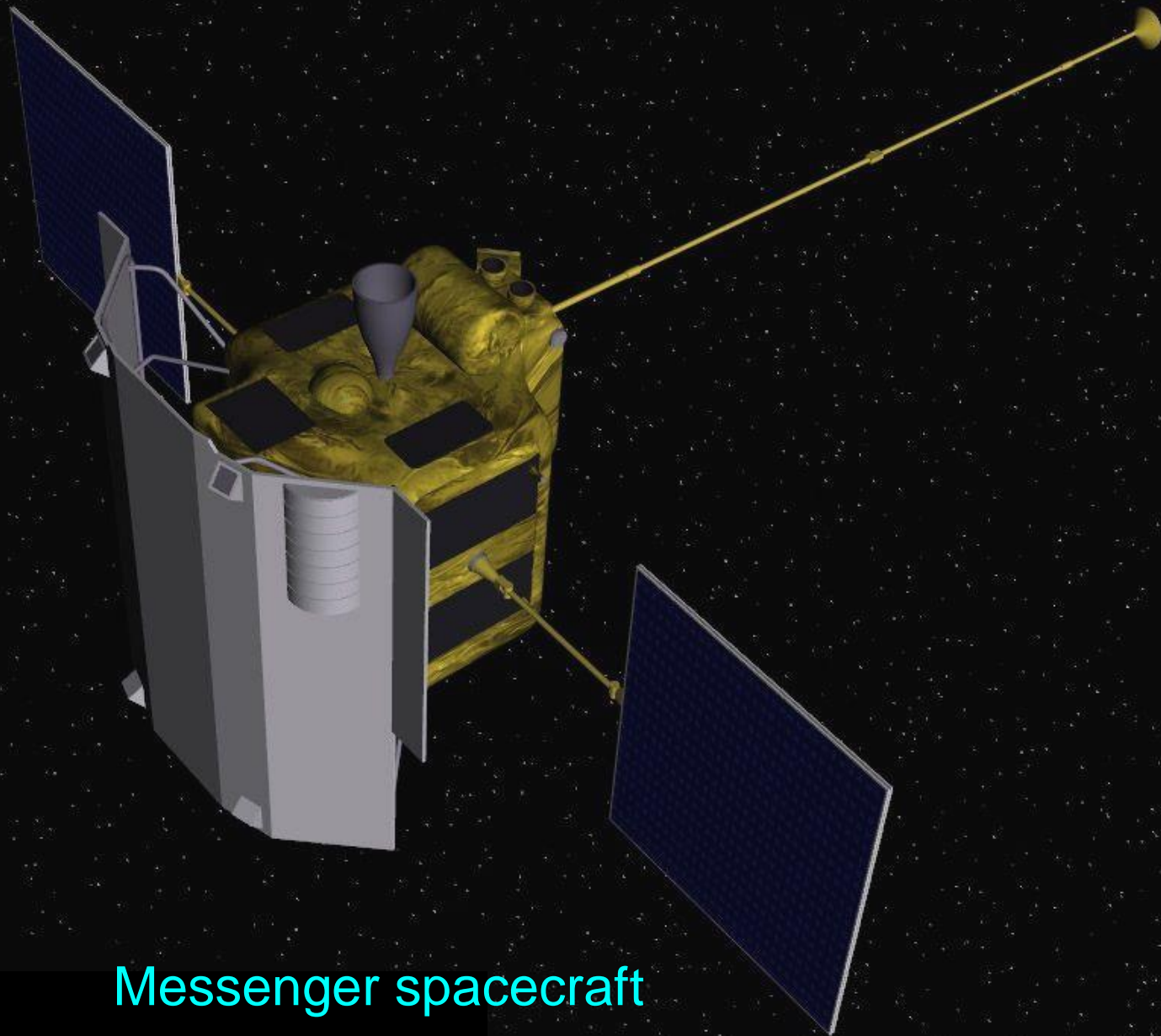
## Moon's formation:

- caused strong tides on Earth
- stabilized Earth's rotational tilt



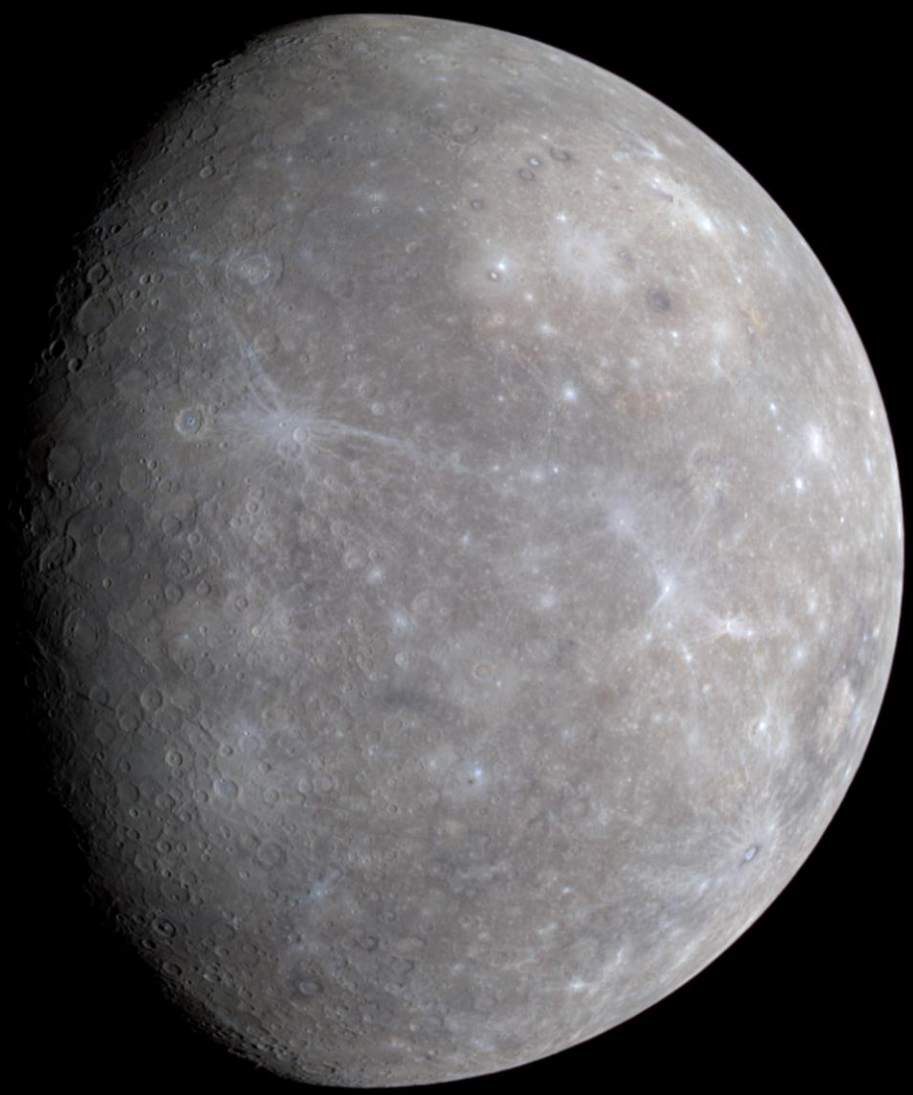
Mercury

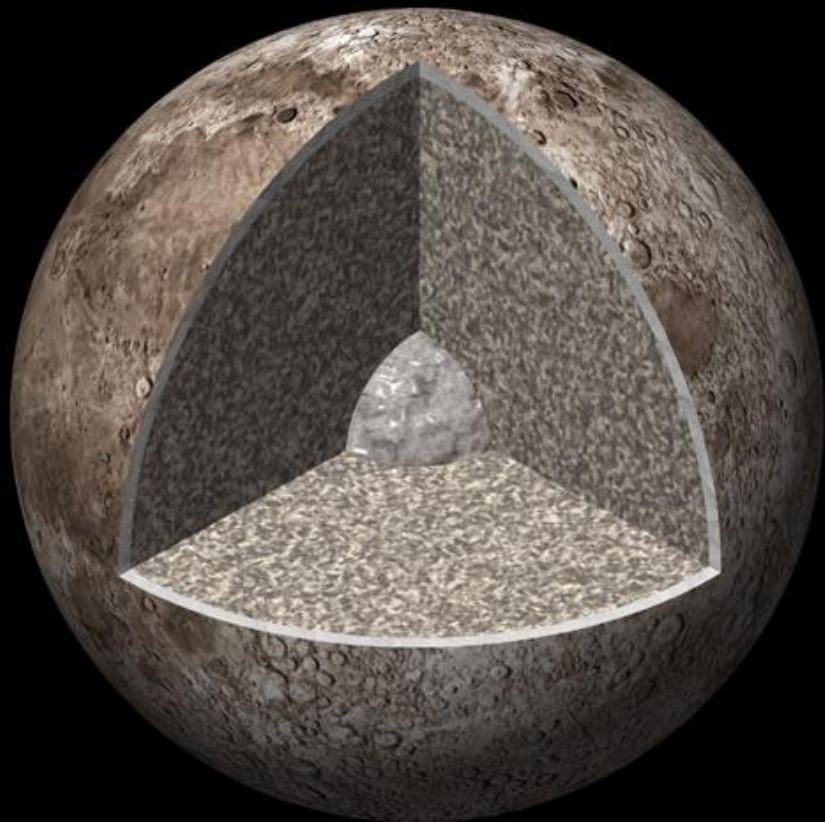




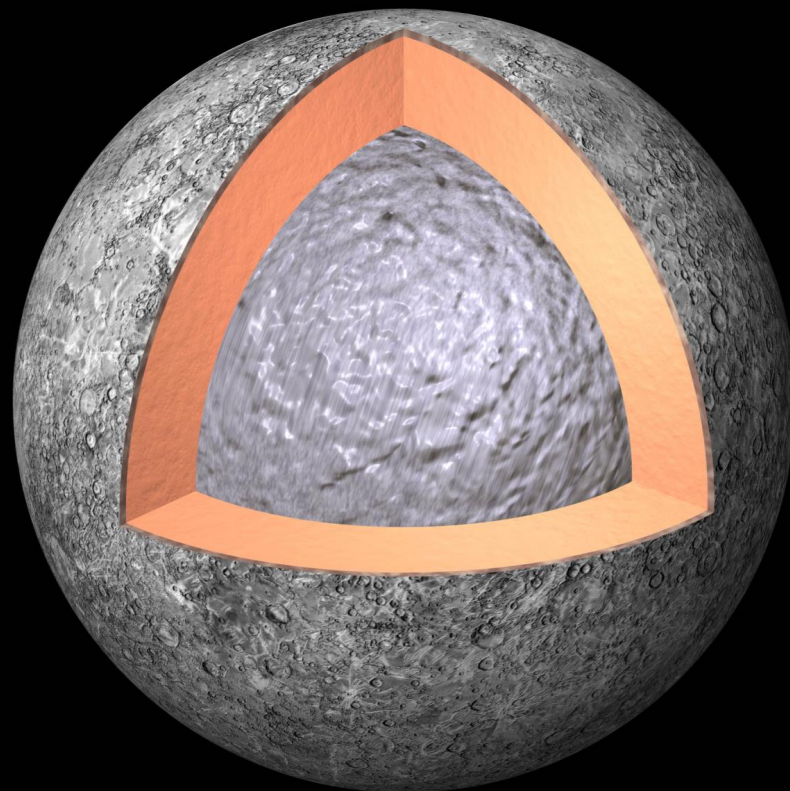
Messenger spacecraft







Earth's Moon



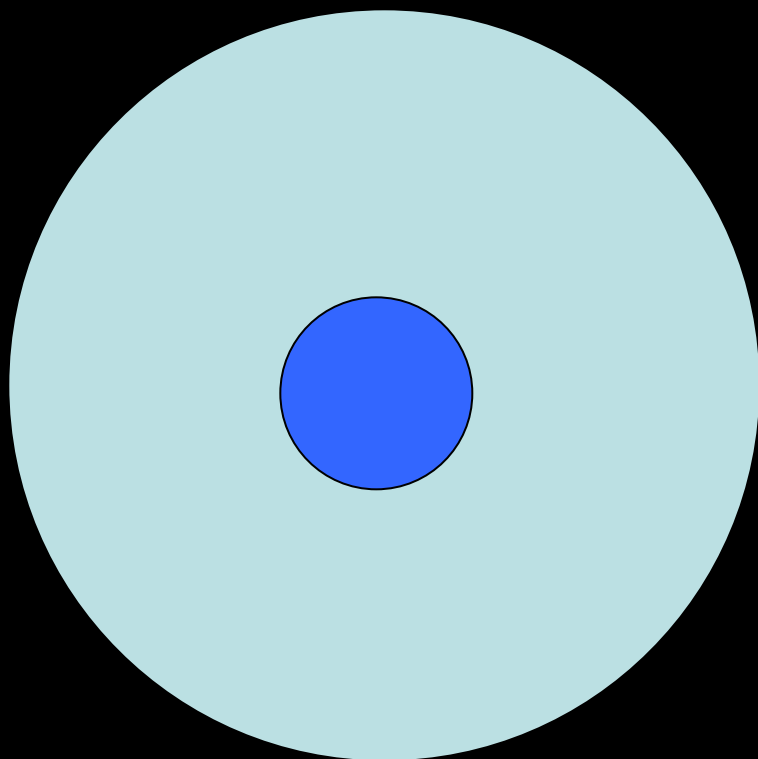
Mercury

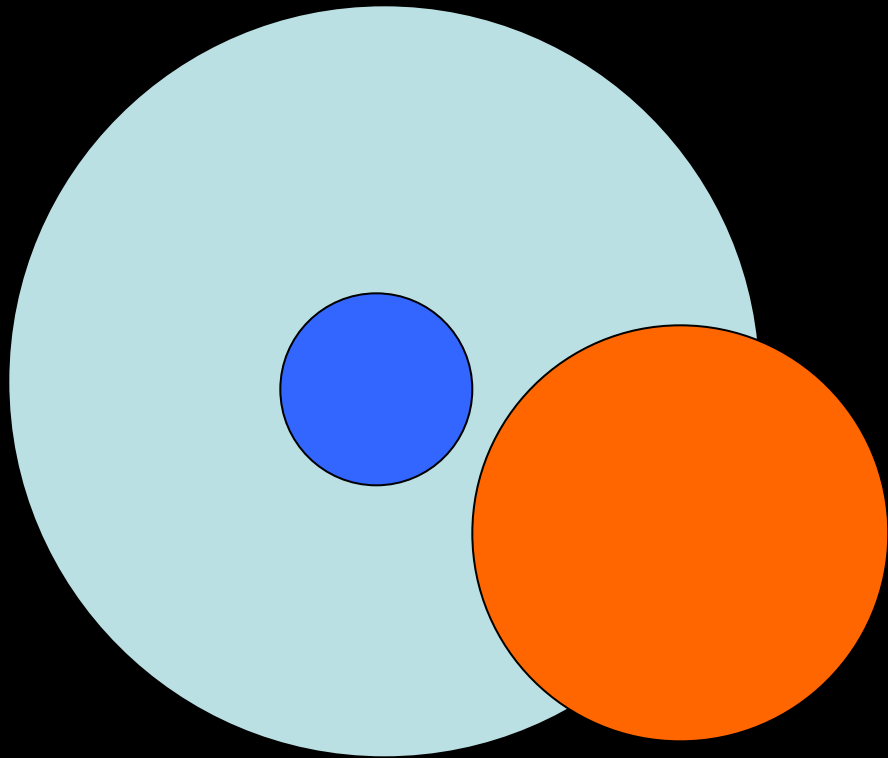


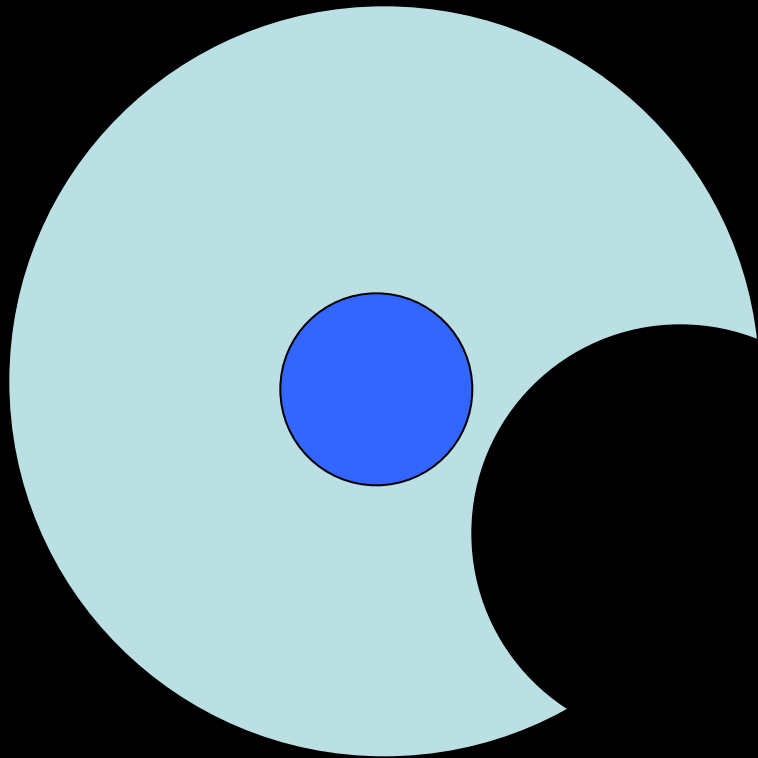
glancing blow

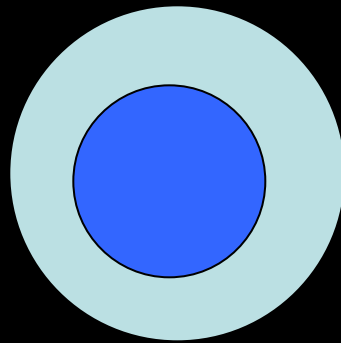




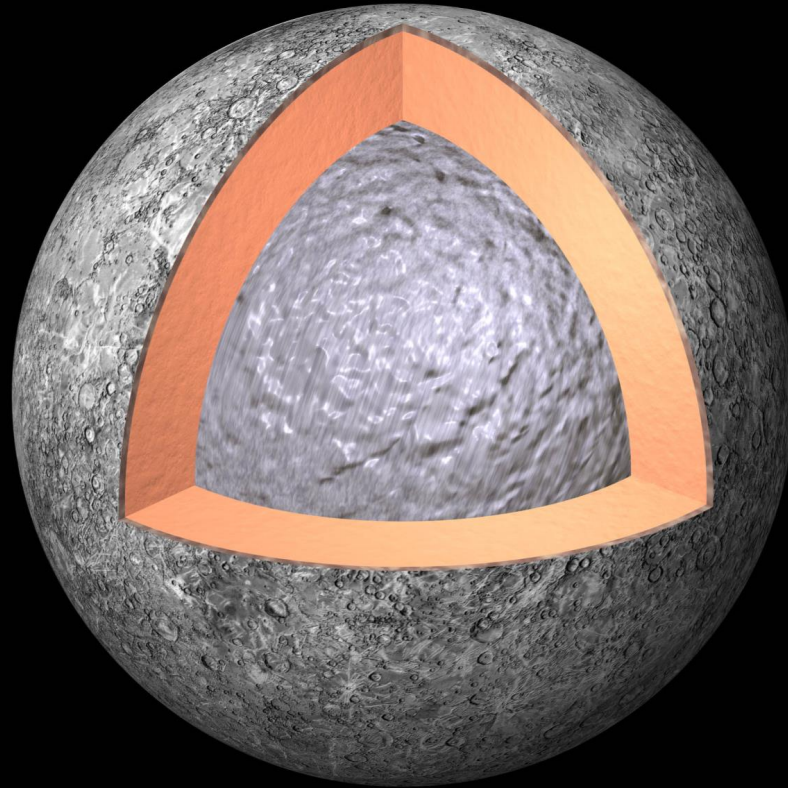








Mercury's huge core

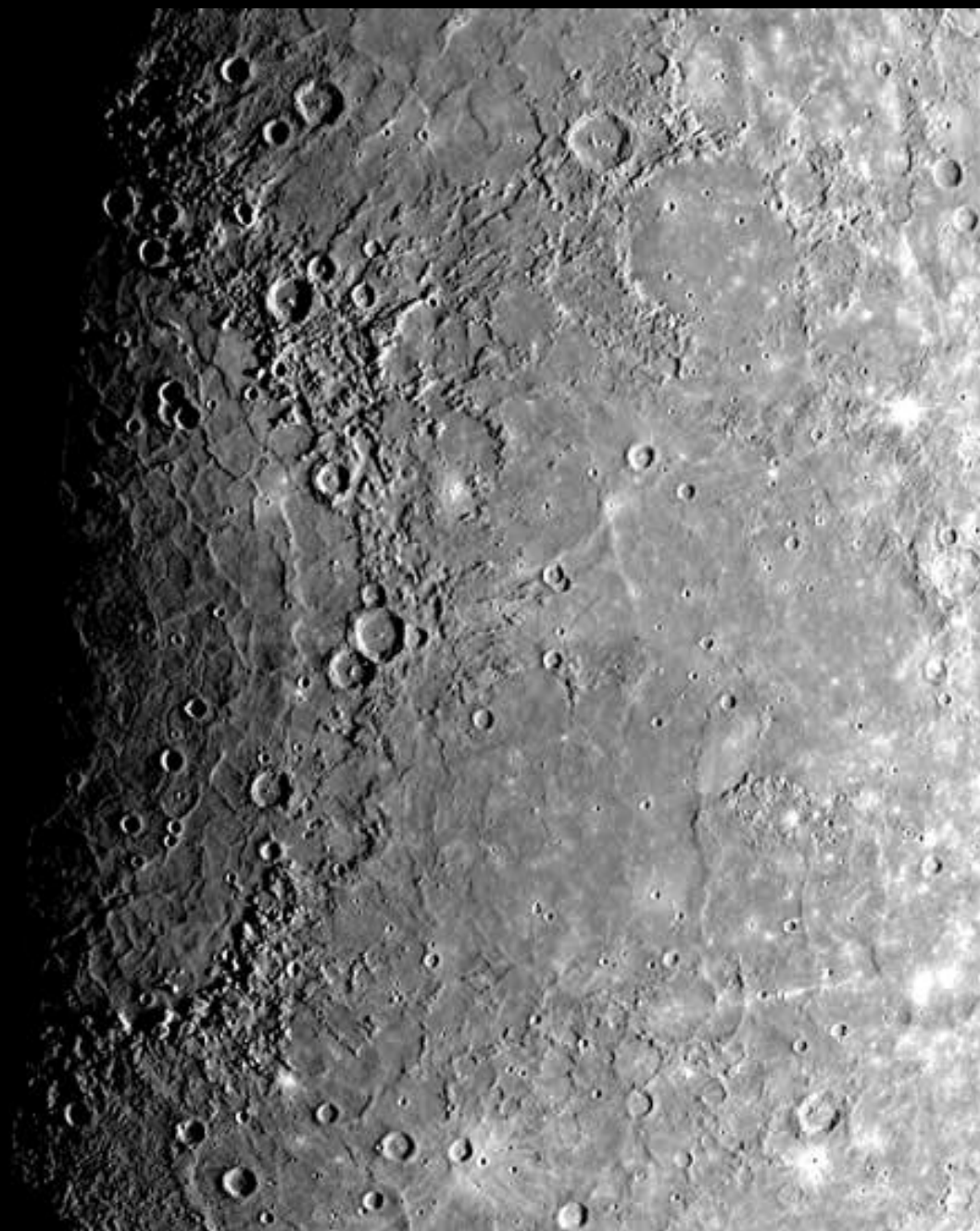


Mercury's huge core

Caloris  
Basin

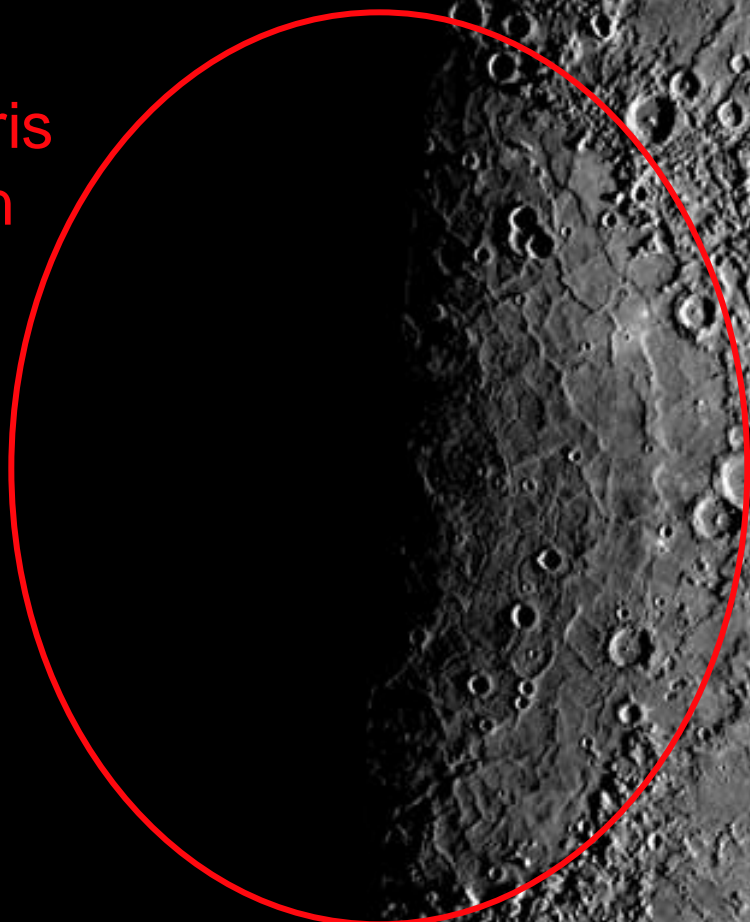


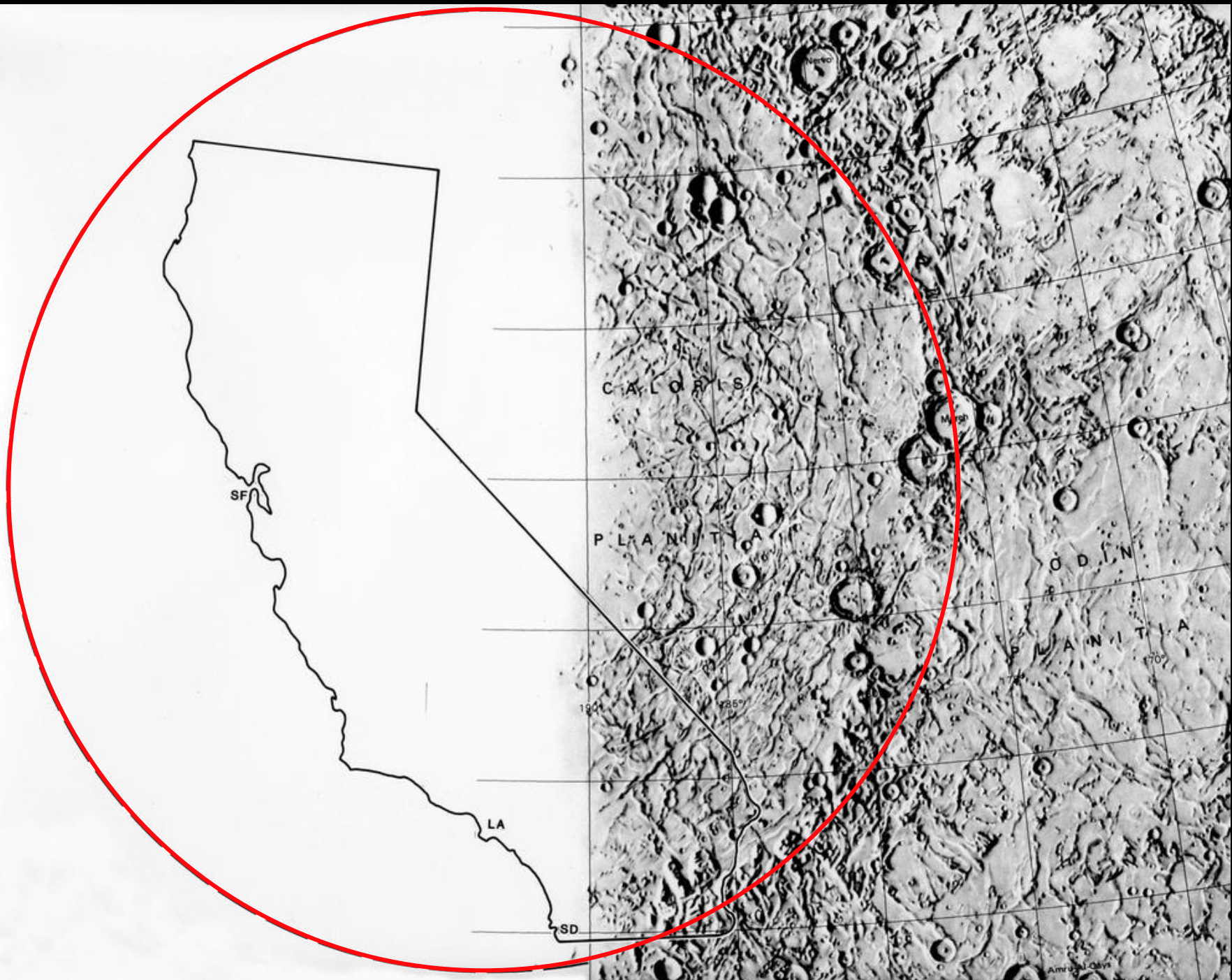
Caloris  
Basin



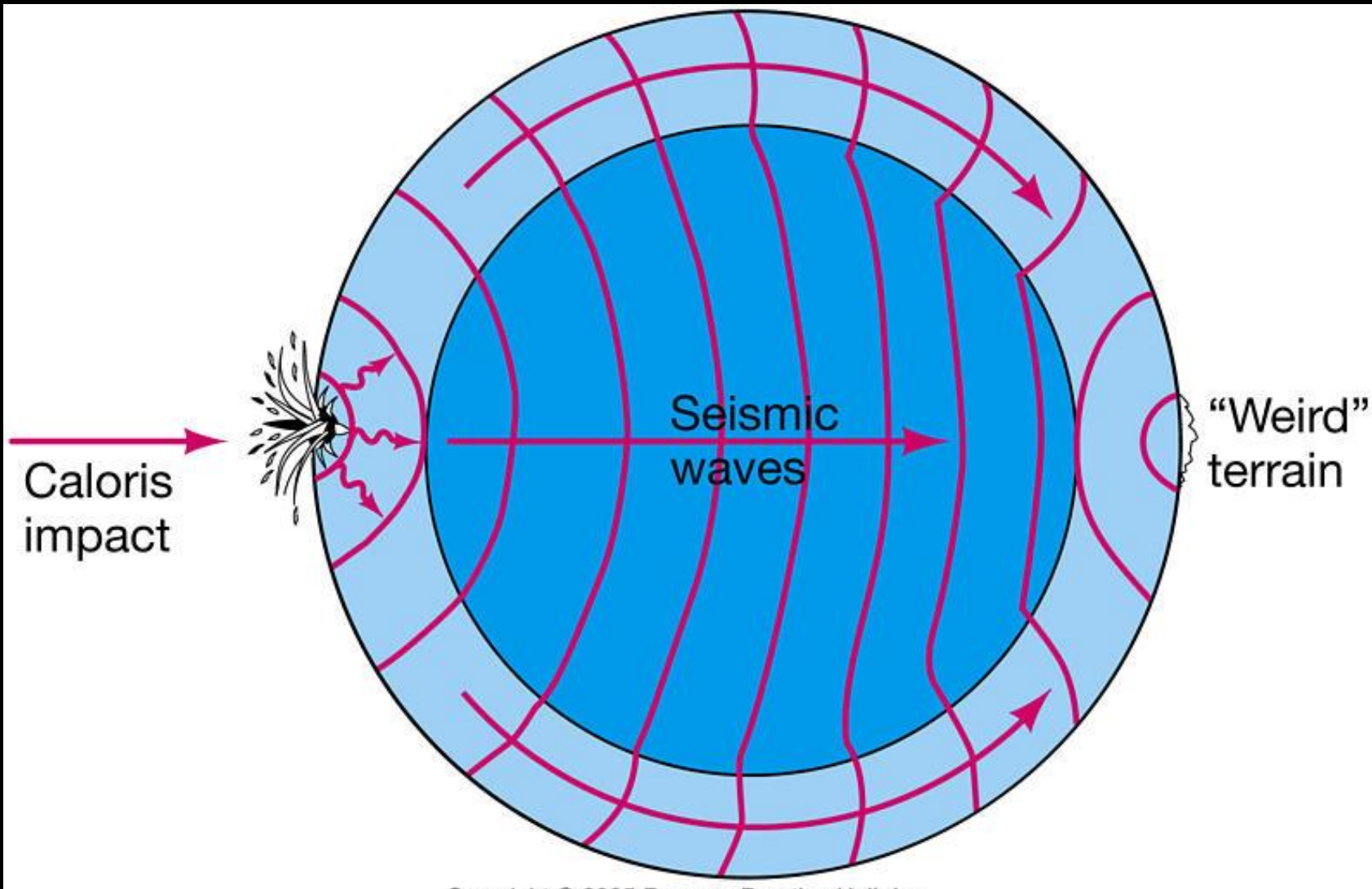


Caloris  
Basin

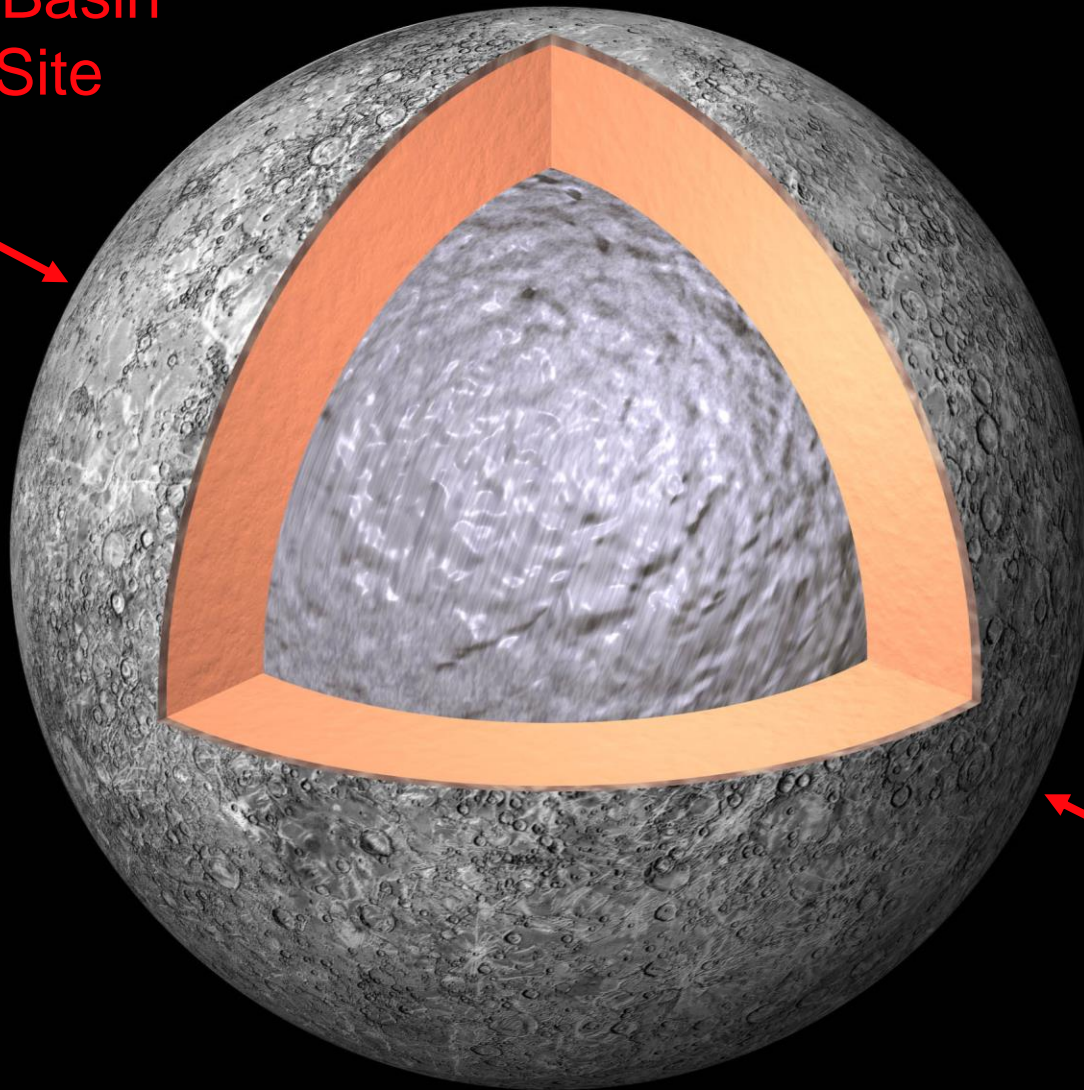








Caloris Basin  
Impact Site



Weird  
Terrain





Weird  
Terrain