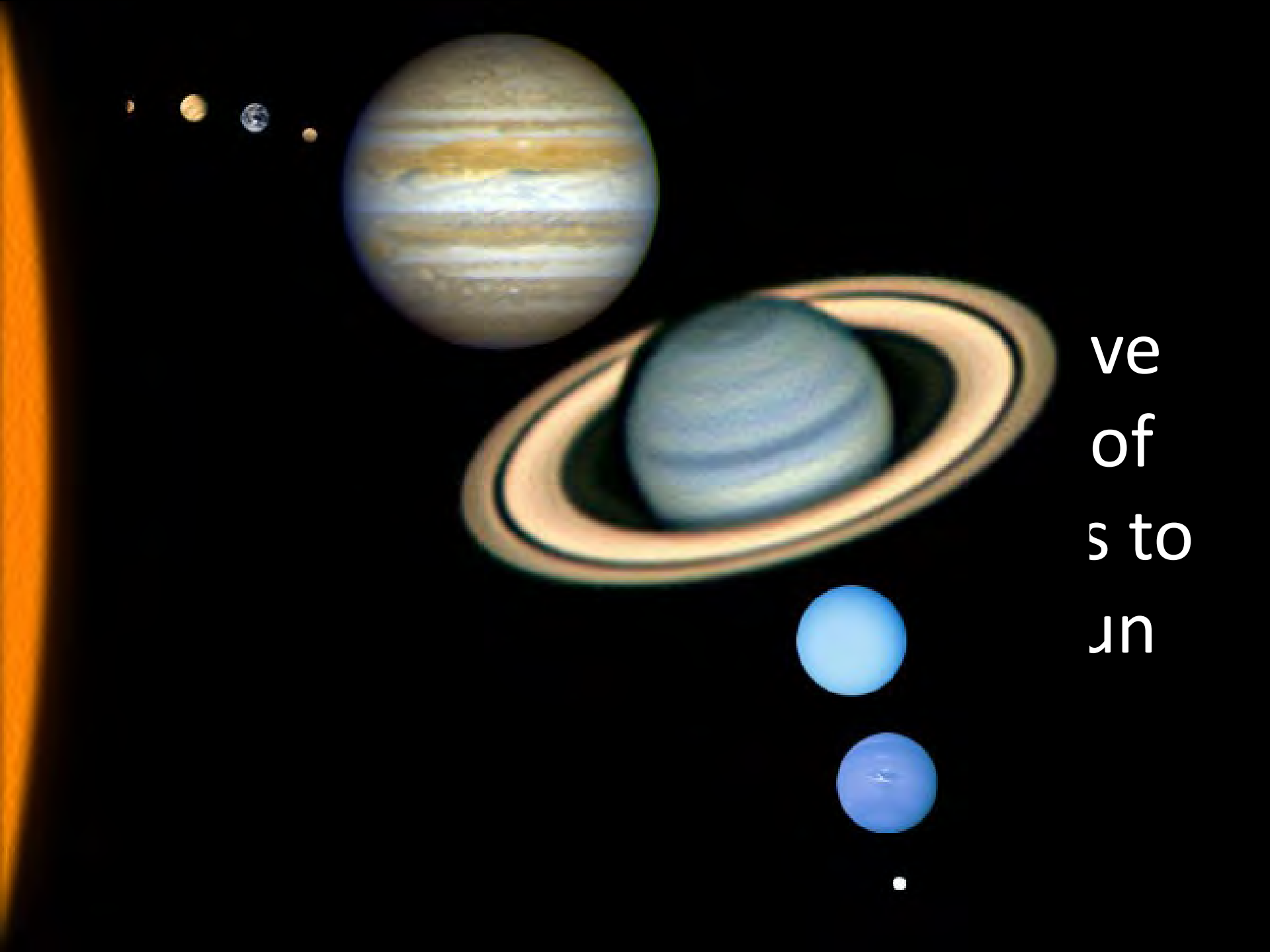
Psalm 3:19 - The Lord by wisdom founded the earth;
by understanding he established the heavens;

For since the creation
of the world God's invisible
qualities—his eternal power
and divine nature—have
been clearly seen, being
understood from what has
been made, so that people
are without excuse.

Romans 1:20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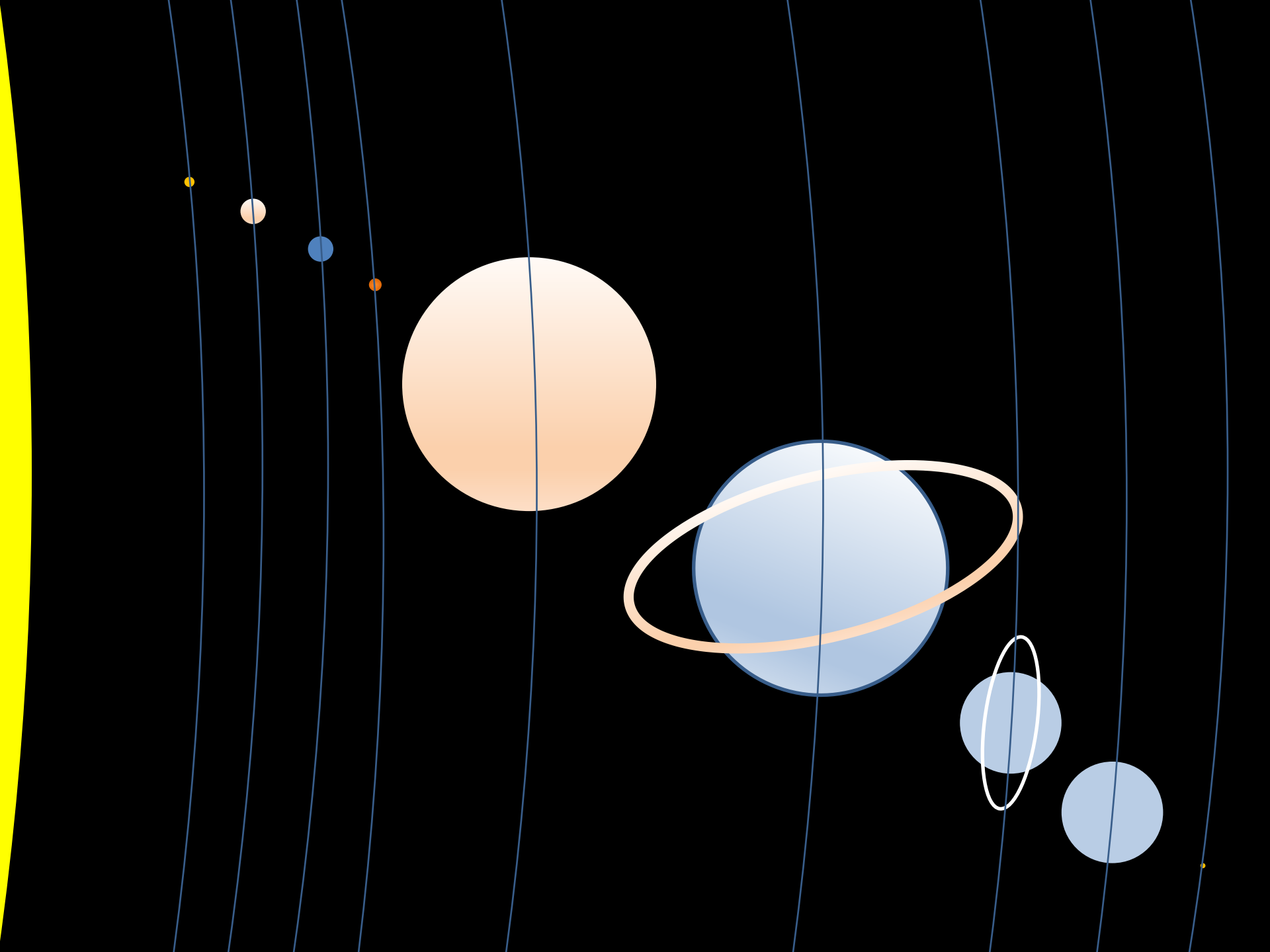
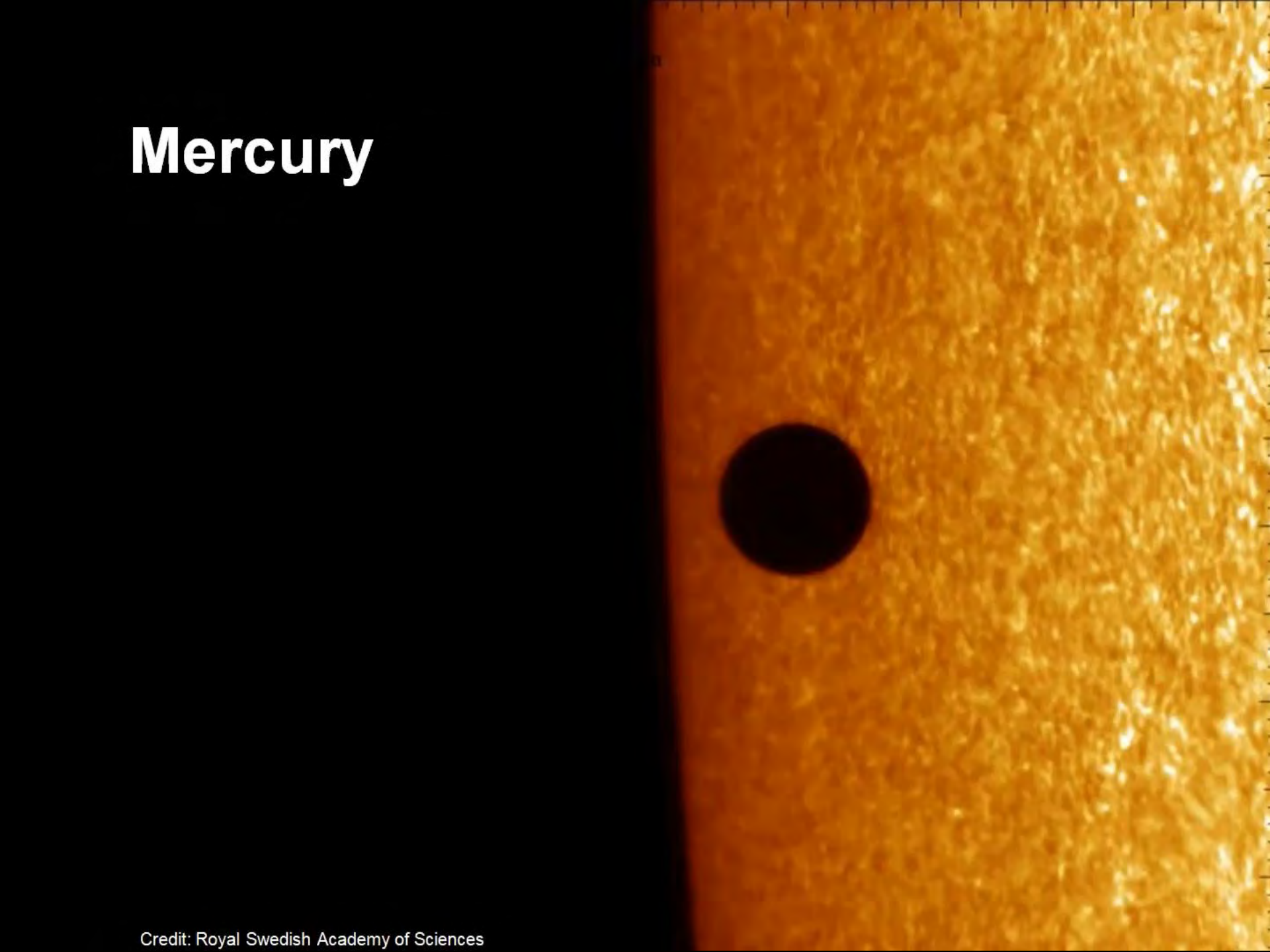


Mercury



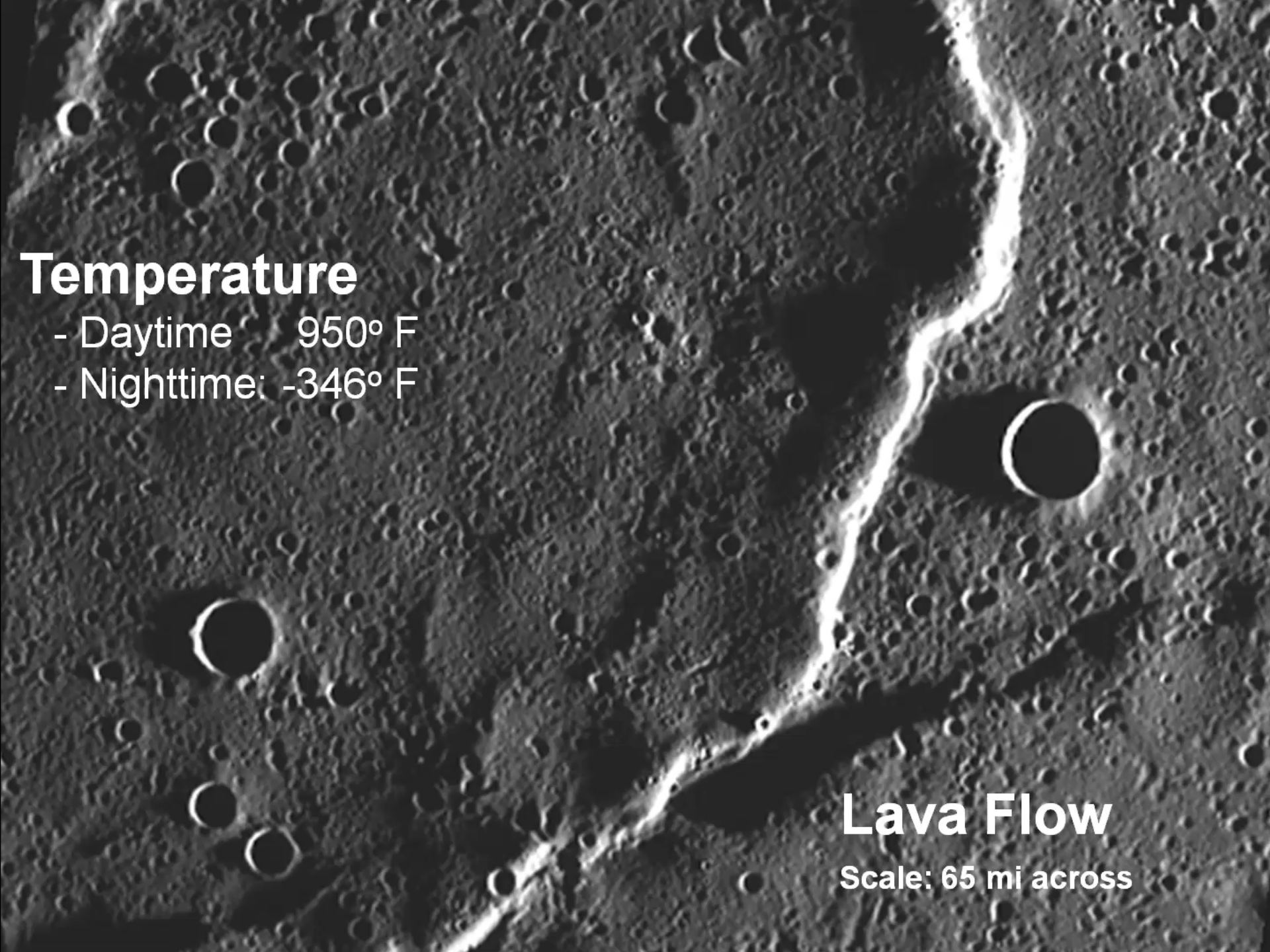
Credit: Royal Swedish Academy of Sciences

Mercury

Mercury

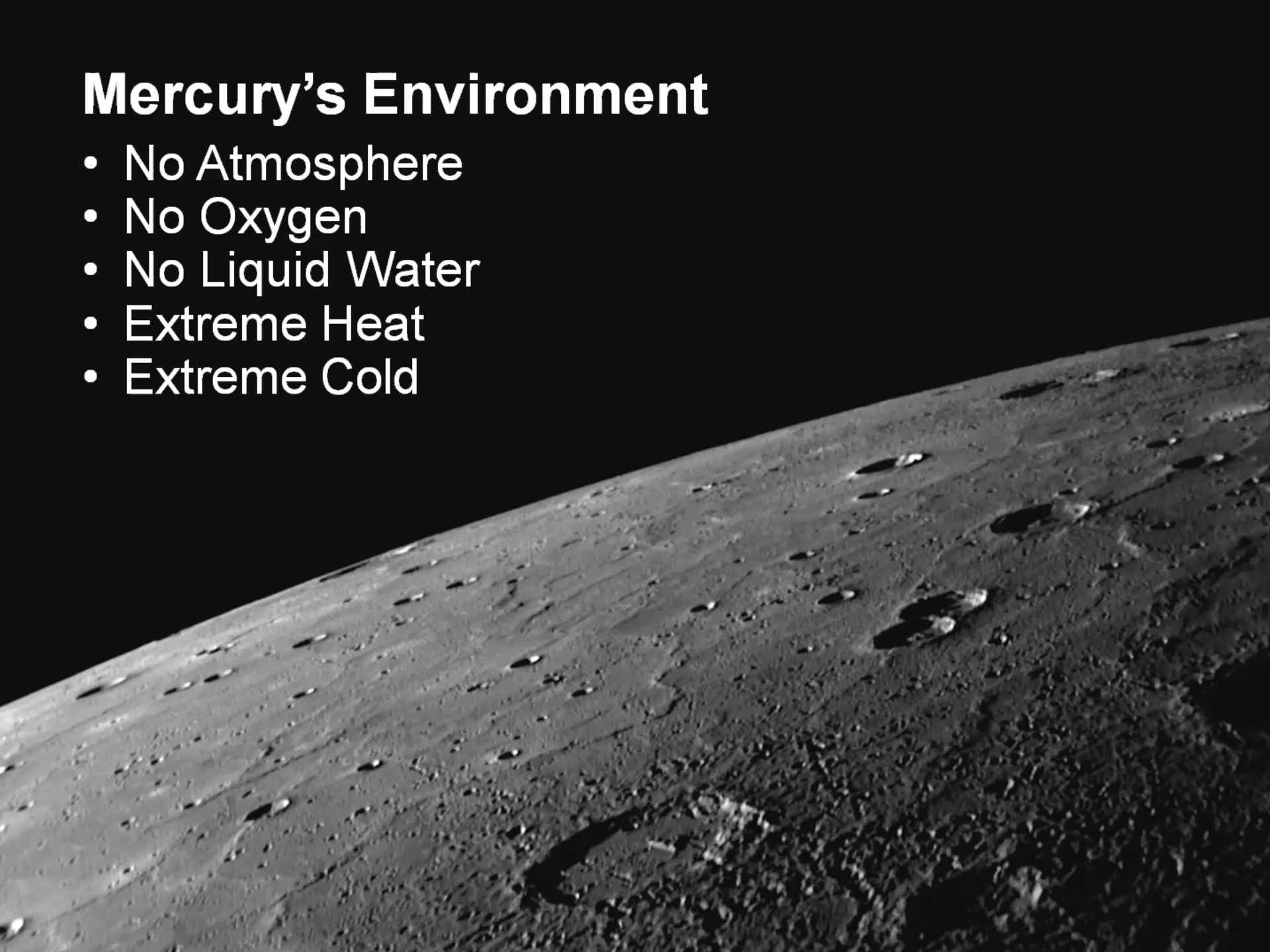
minutes	**3.2**
diameter (Earth=1)	**0.38**
mass (Earth=1)	**0.055**
mean distance from Sun (AU)	**0.39**

Rotation Rate: 59 Earth Days
Orbital Period: 81 Earth Days
Solar Day: 176 Earth Days
No Atmosphere


Temperature
- Daytime 950° F
- Nighttime: -346° F
Lava Flow
Scale: 65 mi across

Mercury's Environment

- No Atmosphere
- No Oxygen
- No Liquid Water
- Extreme Heat
- Extreme Cold

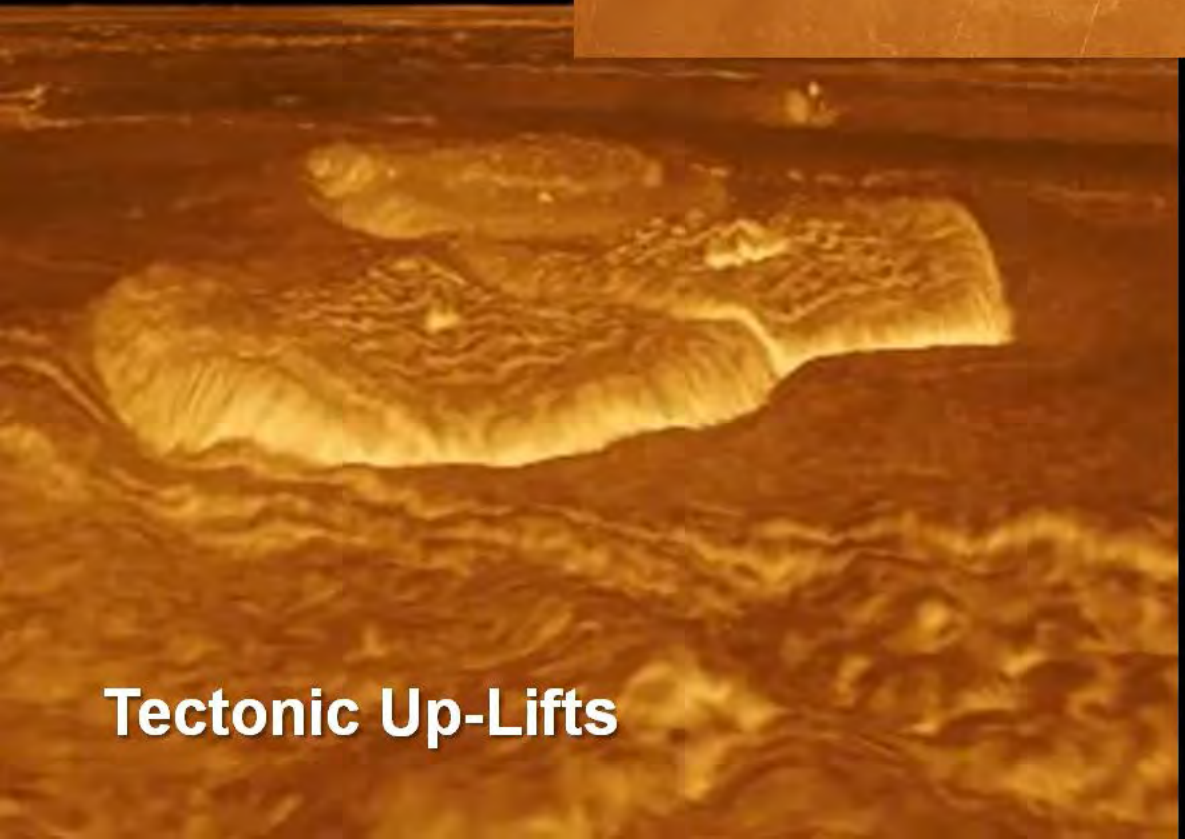


Venus

Venus

minutes	**6.0**
diameter (Earth=1)	**0.95**
mass (Earth=1)	**0.82**
mean distance from Sun (AU)	**0.72**

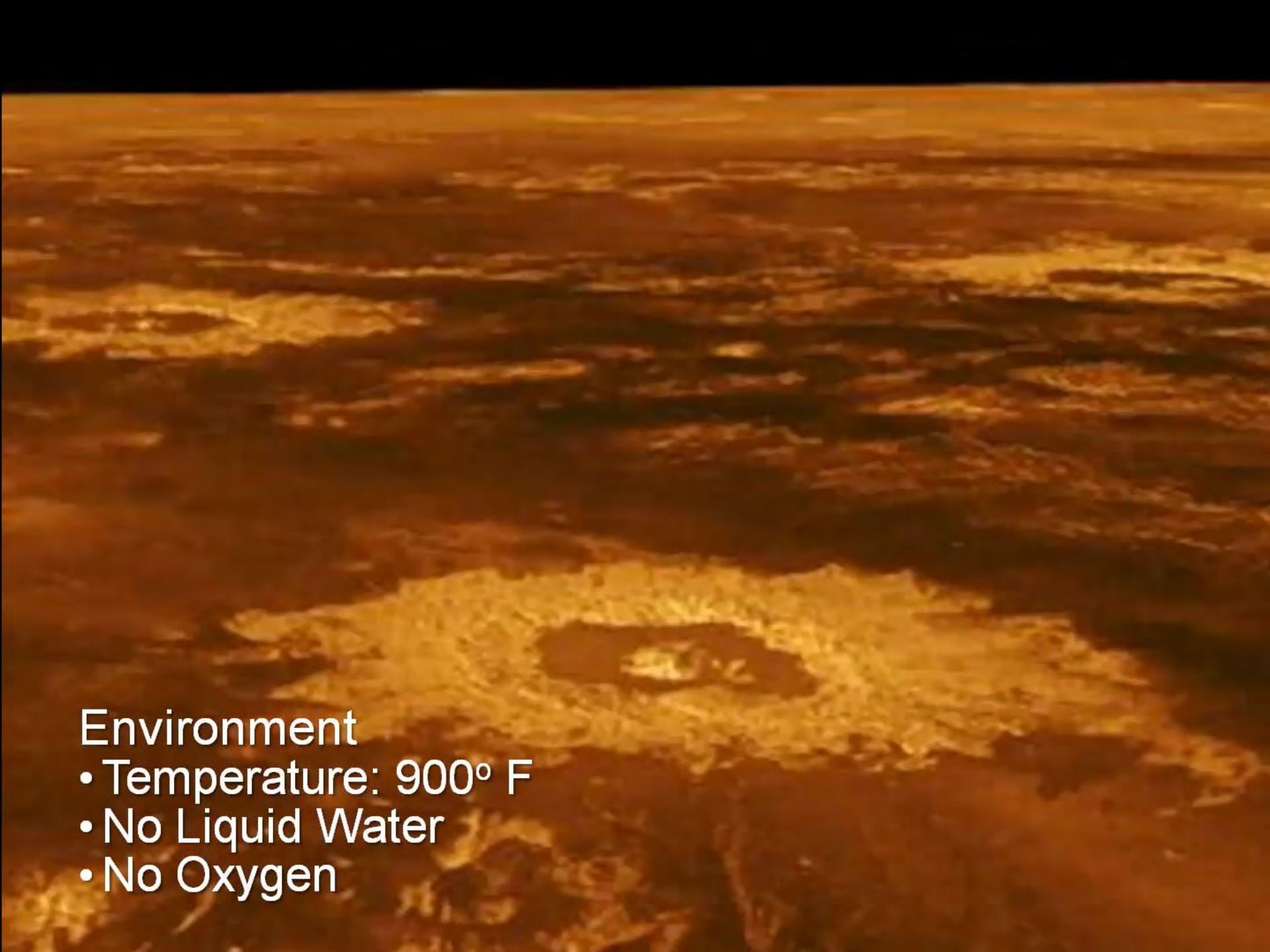
Radar Image



Environment

Atmosphere:

- 15 X Earth's
- 97% Carbon Dioxide
- Sulfuric Acid Clouds


Environment
• Temperature: 900° F
• No Liquid Water
• No Oxygen

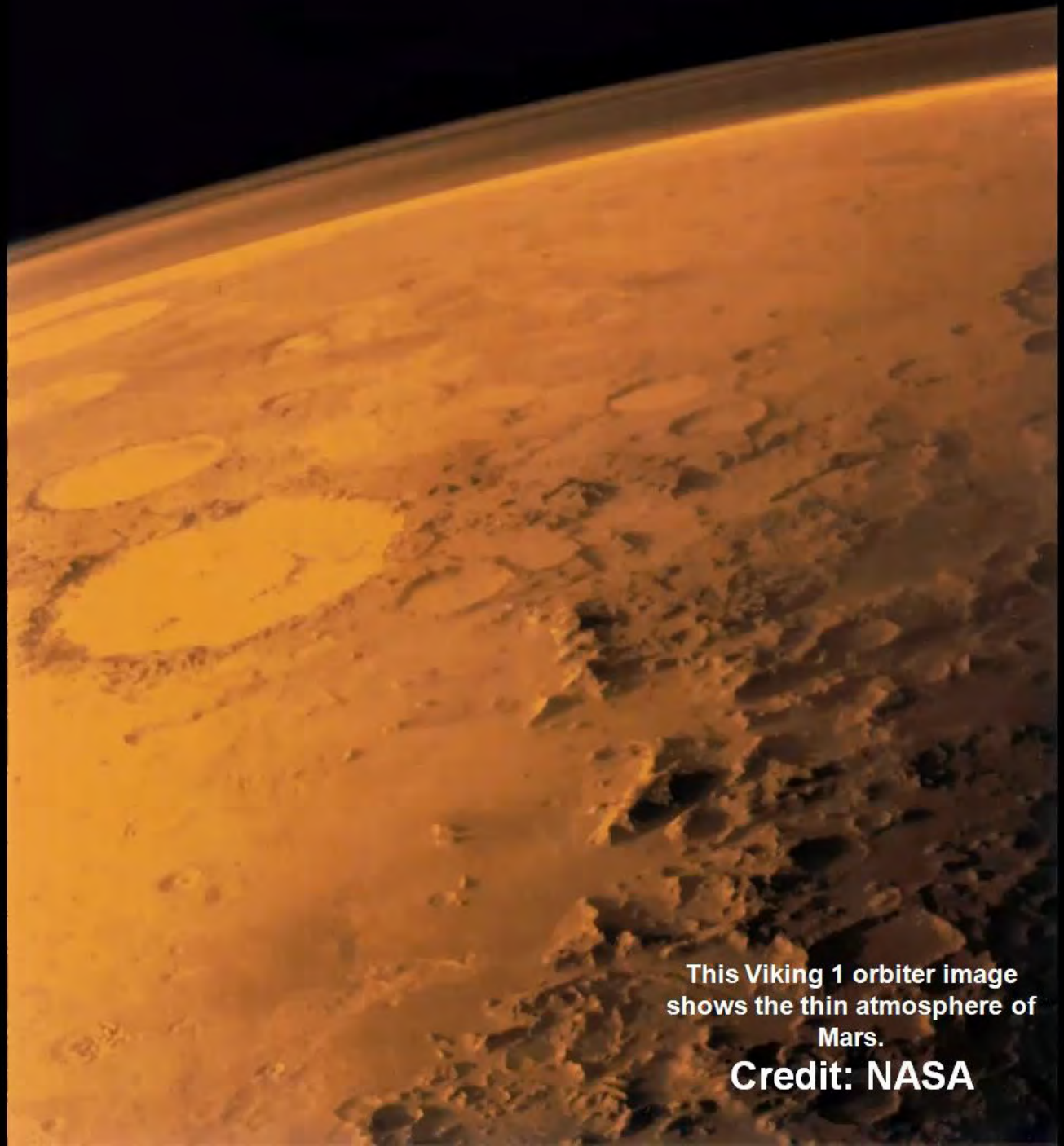
Venera 13 Lander

B&W Images of Surface of Venus

1 Mar 1982

Mars

minutes	**12.6**
diameter (Earth=1)	**0.53**
mass (Earth=1)	**0.11**
mean distance from Sun (AU)	**1.5**



This Viking 1 orbiter image shows the thin atmosphere of Mars.

Credit: NASA

Valles Marineris

The "Grand Canyon of Mars," but on a vastly greater scale—3000 miles long, averages width more than hundred miles. (13 Mar 2006)

NASA/JPL/Arizona State University


Martian Dust Devils

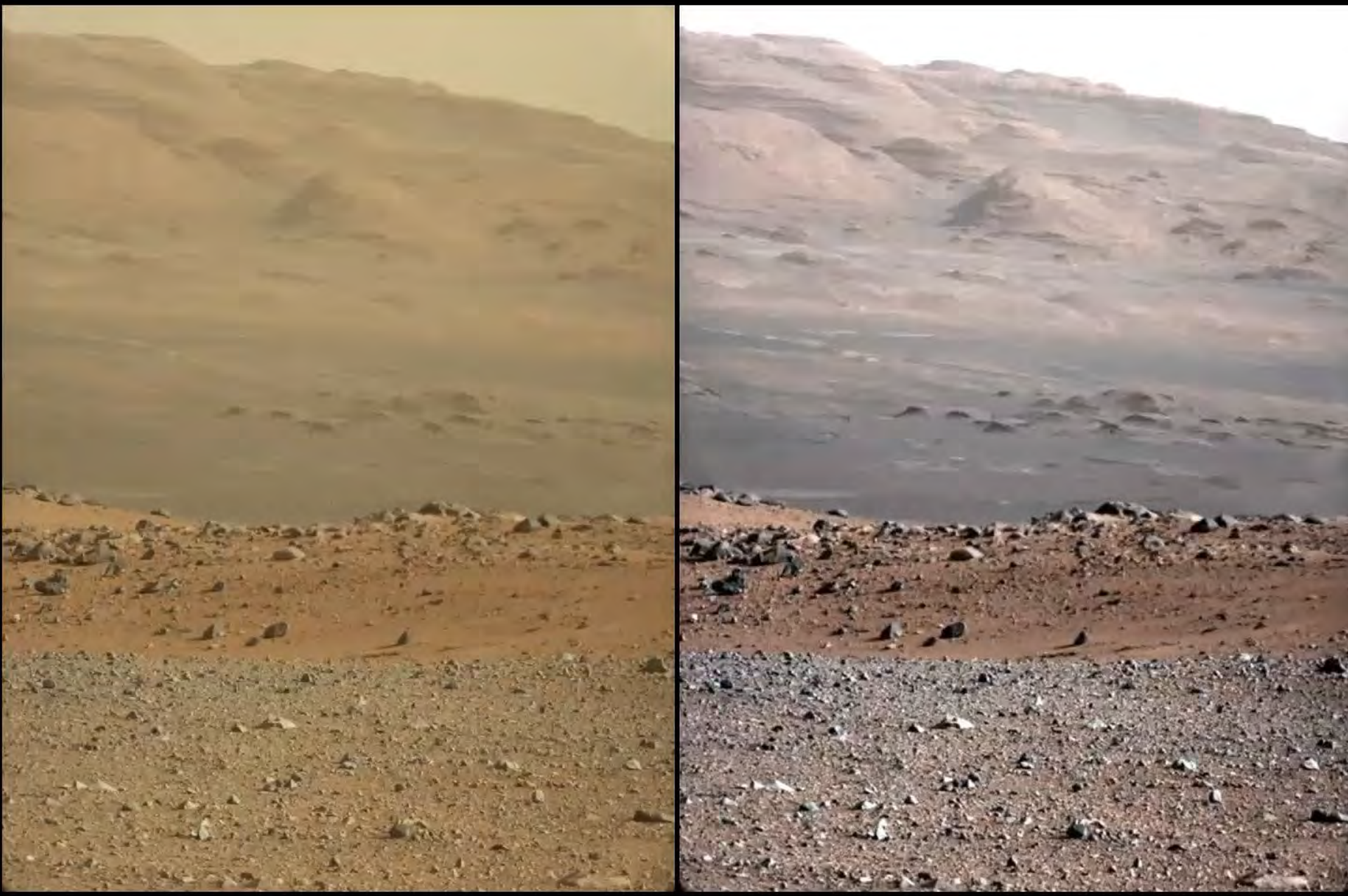

Dust Devil in HD

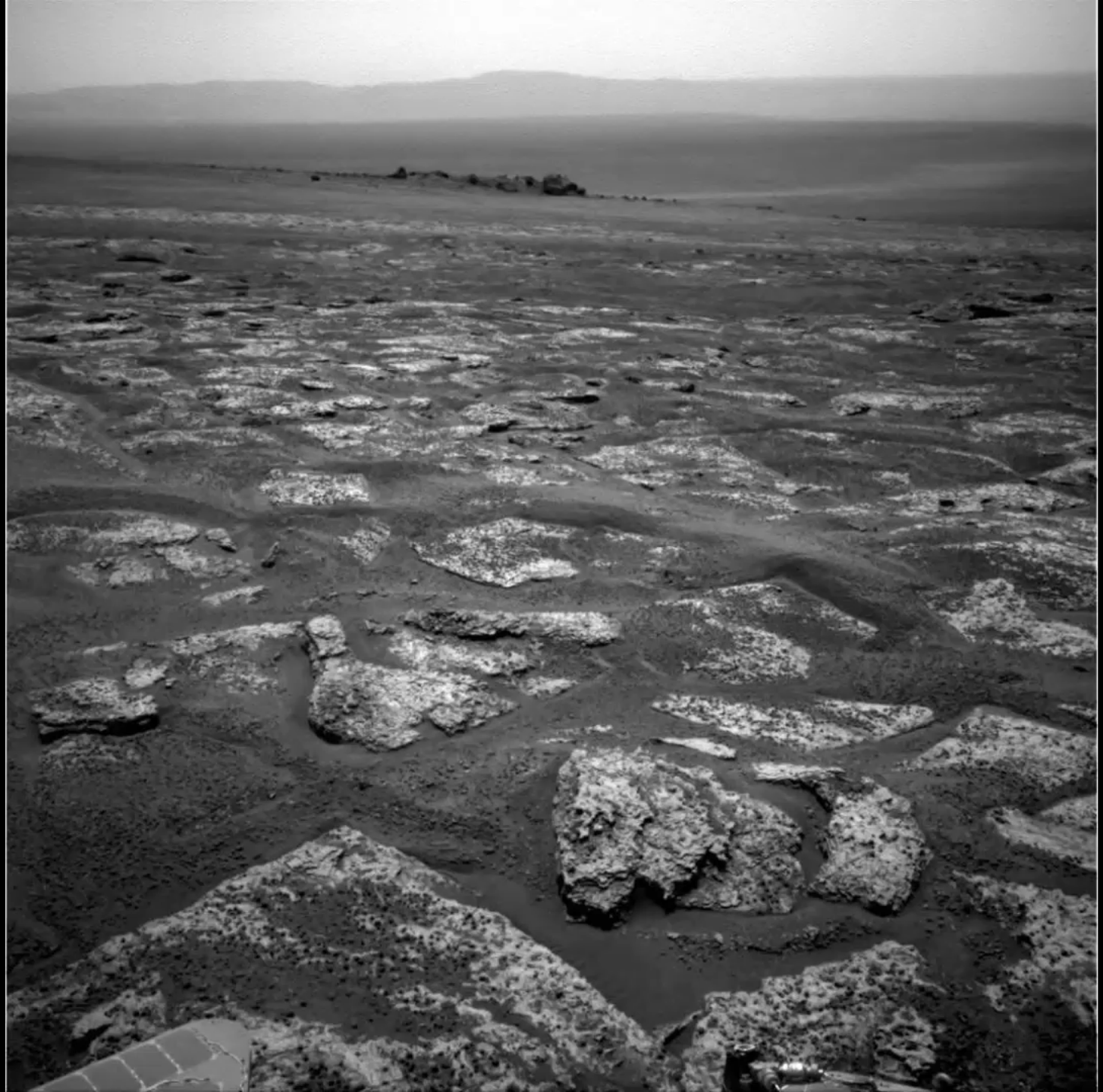

Curiosity on Mars

Gale Impact Crater

Central peak in foreground, rim in background

Image Credit: NASA/JPL-Caltech/
Malin Space Science Systems

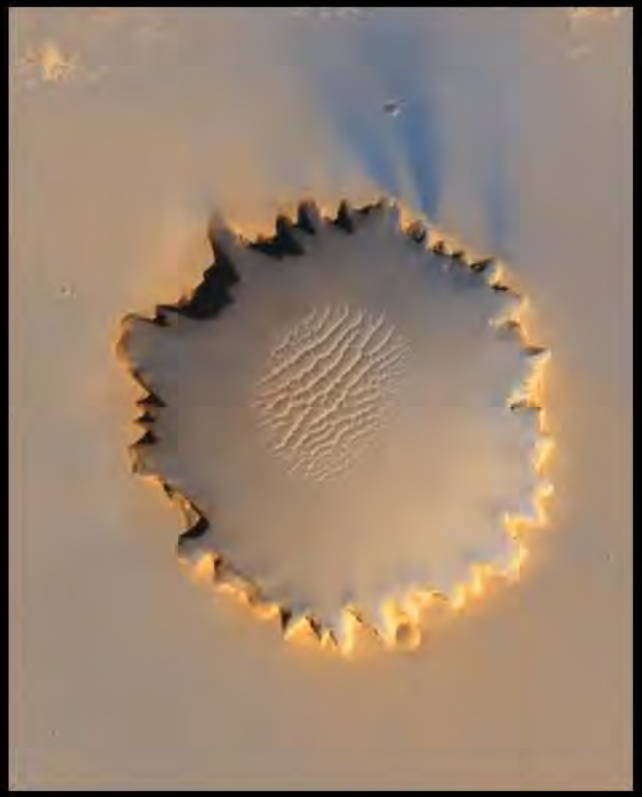





Tracks of
Opportunity

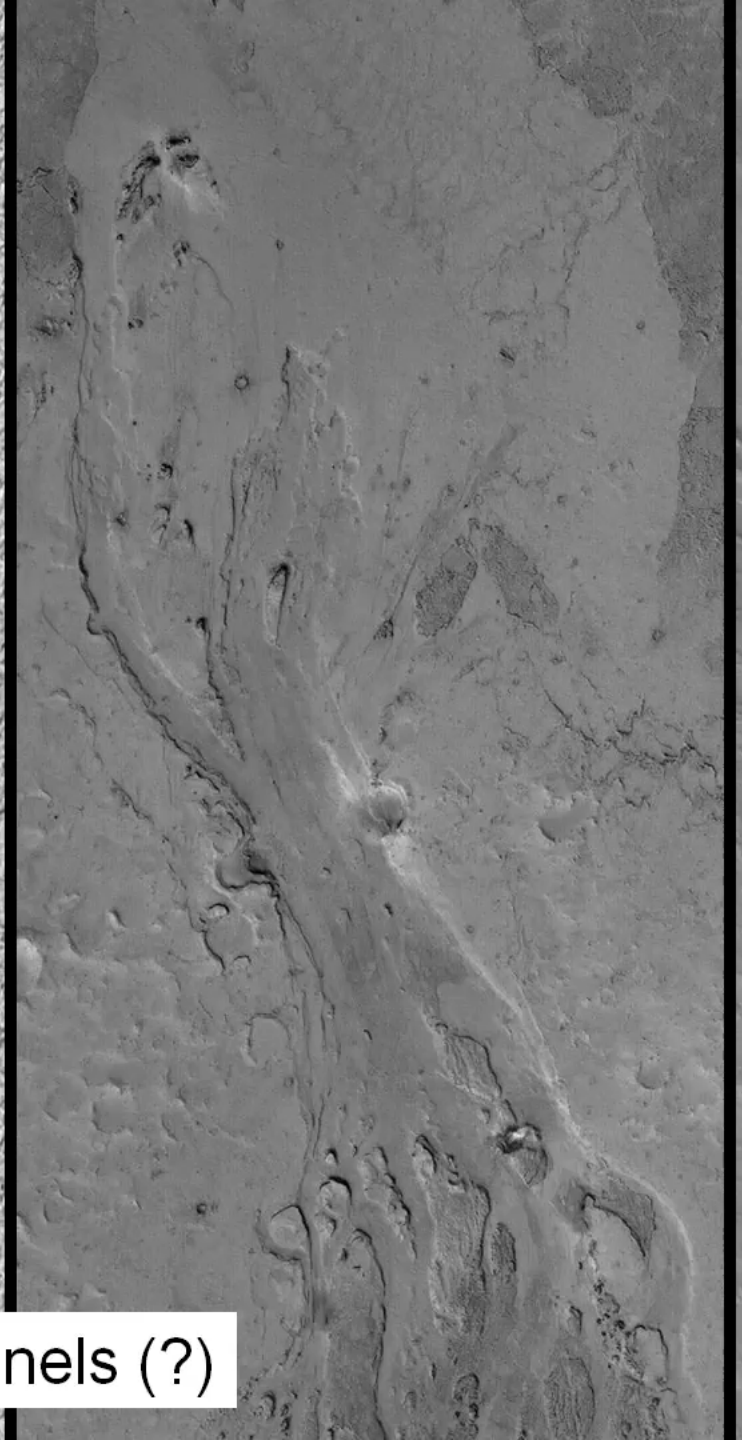
Victoria Crater

Mars rover Opportunity reached "Victoria Crater" in October 2006. The crater is 750 m across and 70 m deep with various rock outcroppings around the edges. Opportunity entered and studied Victoria until August 2008. (22 months)



Surface Features

Water Channels (?)



Sinks

Ares Vallis

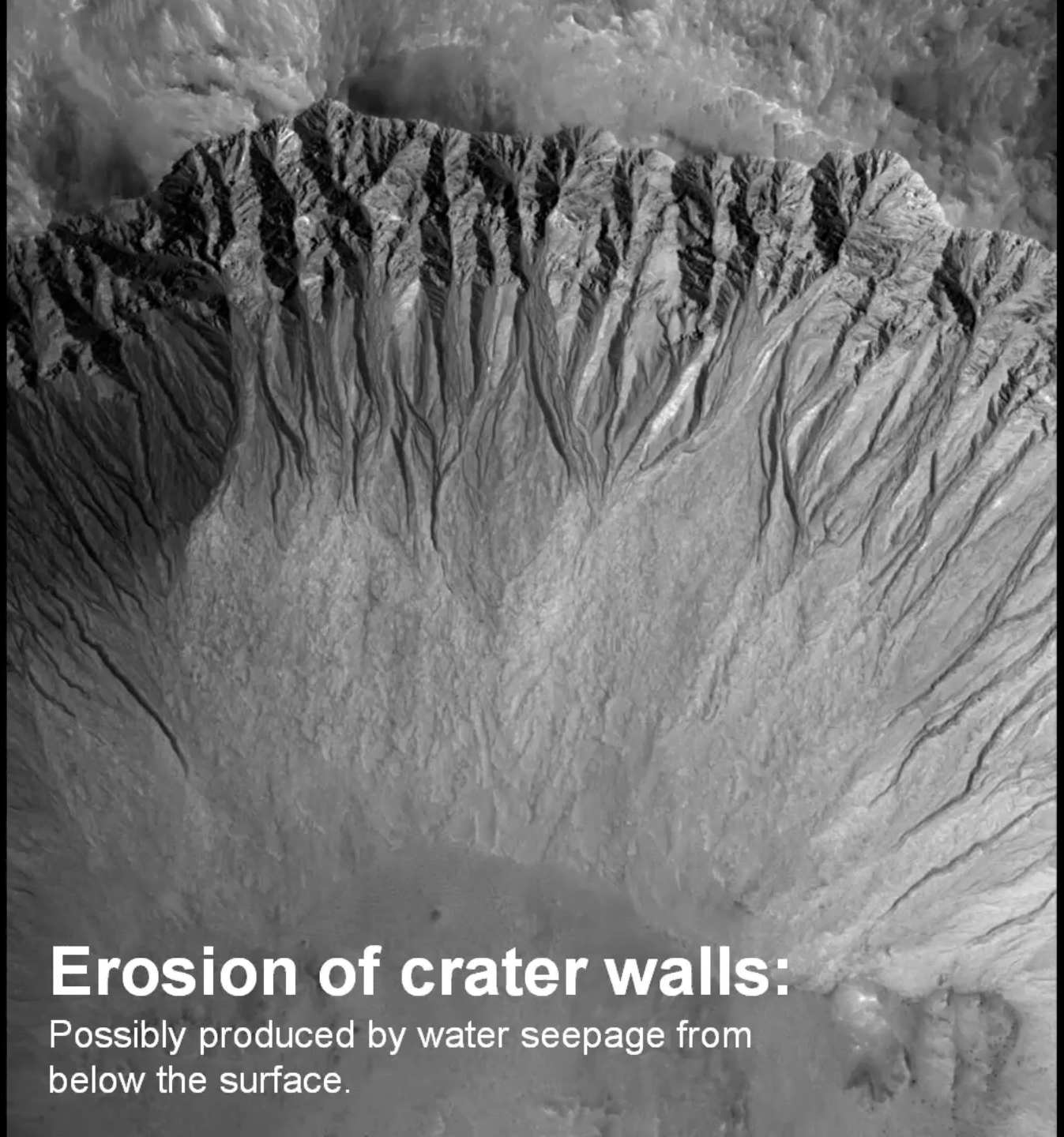
Tear-drop mesas extend behind the elevated rocky rims of impact craters that apparently diverted water flowa and prevented erosion.

Layering

What appear to be sedimentary layers on the floor of Danielson Crater


Sedimentary Rocks (?)


Martian “Blue Berries”
Image Credit: NASA/JPL/Cornell/USGS



Erosion of crater walls:

Possibly produced by water seepage from below the surface.

Erosion of crater walls:

Recent erosion formed a new channel and debris deposit. Despite the resemblance to water-formed ravines on Earth, because these events generally occur in winter, they may result from carbon dioxide frost that forms above on the rim and cascades down.

Recurring Slope Lineae

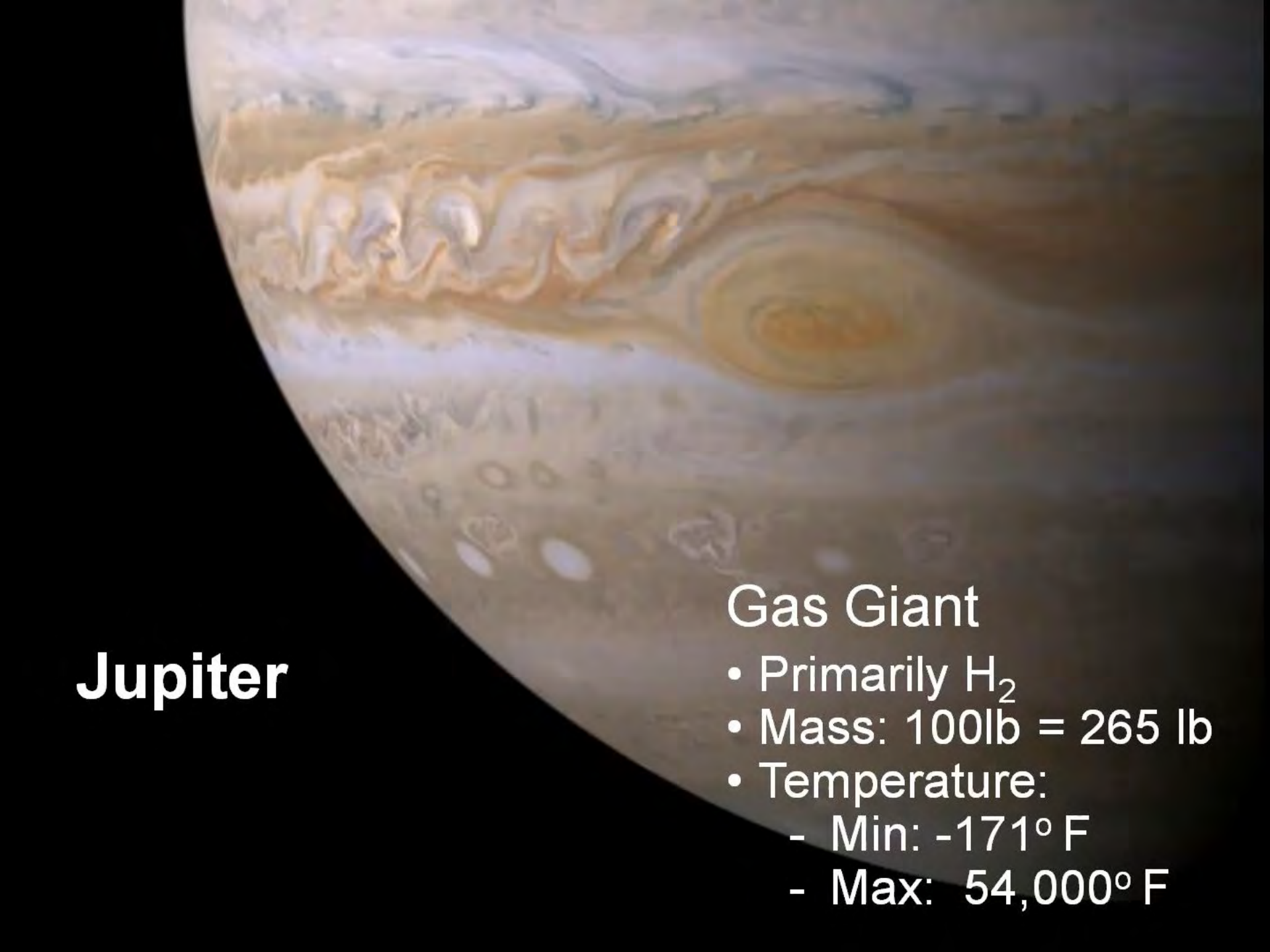
RSL on walls of Valles Marineris, disappear during cold seasons but reappear in warmer seasons. Spectral analysis best matches hydrated salts—magnesium perchlorate, magnesium chlorate, and sodium perchlorate.


Temperature:
• Max: -21° F
• Min: -191° F
No Liquid Water

Martian Sunset
viewed from Spirit

Jupiter

minutes	**43.3**
diameter (Earth=1)	**11.2**
mass (Earth=1)	**318**
mean distance from Sun (AU)	**5.2**

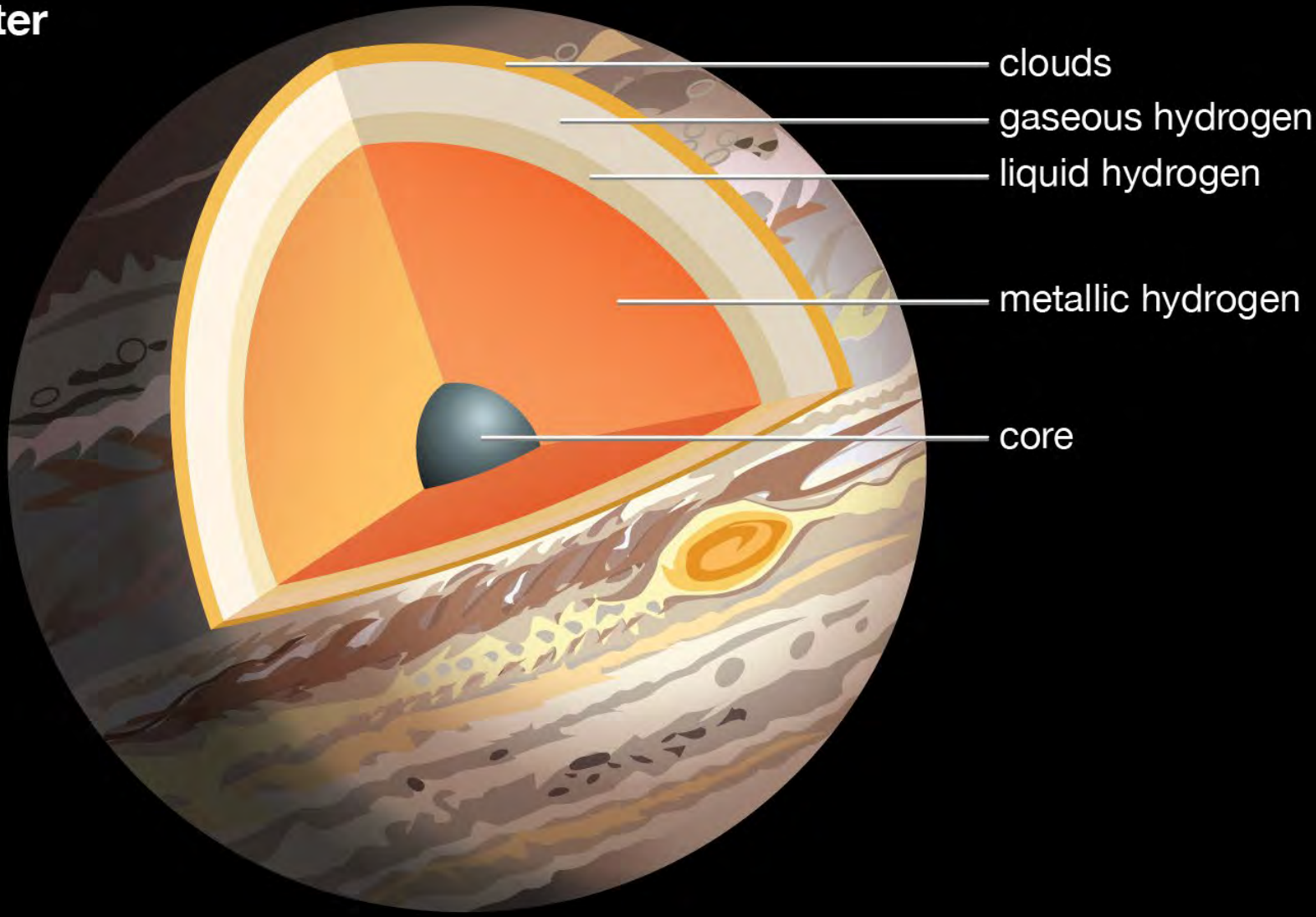


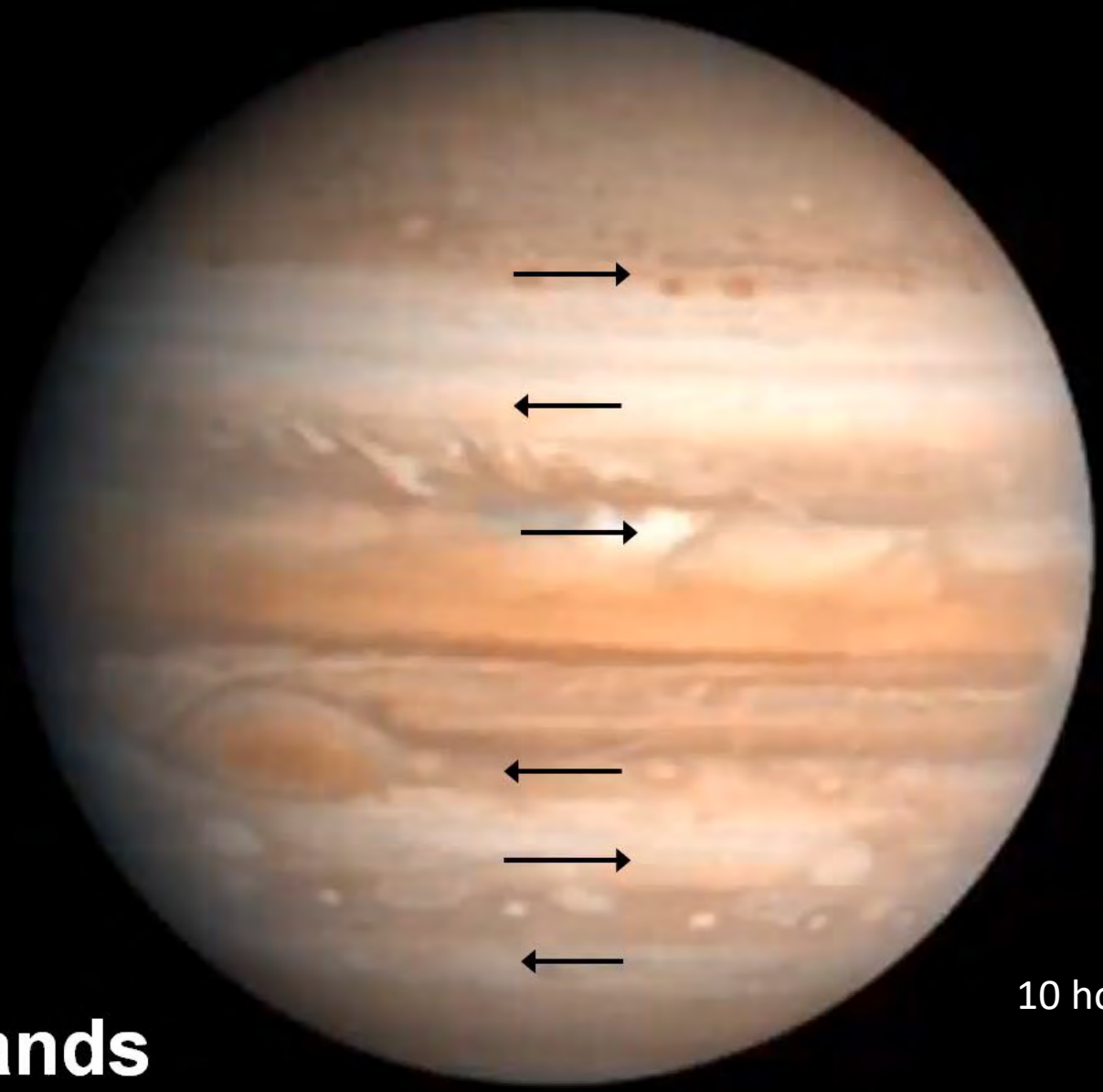
Jupiter

Gas Giant

- Primarily H_2
- Mass: 100lb = 265 lb
- Temperature:
  - Min: -171° F
  - Max: 54,000° F

Jupiter


clouds
gaseous hydrogen
liquid hydrogen
metallic hydrogen
core



Cloud Bands

10 hour Rotation


Jupiter' Red Spot

Jovian Environment

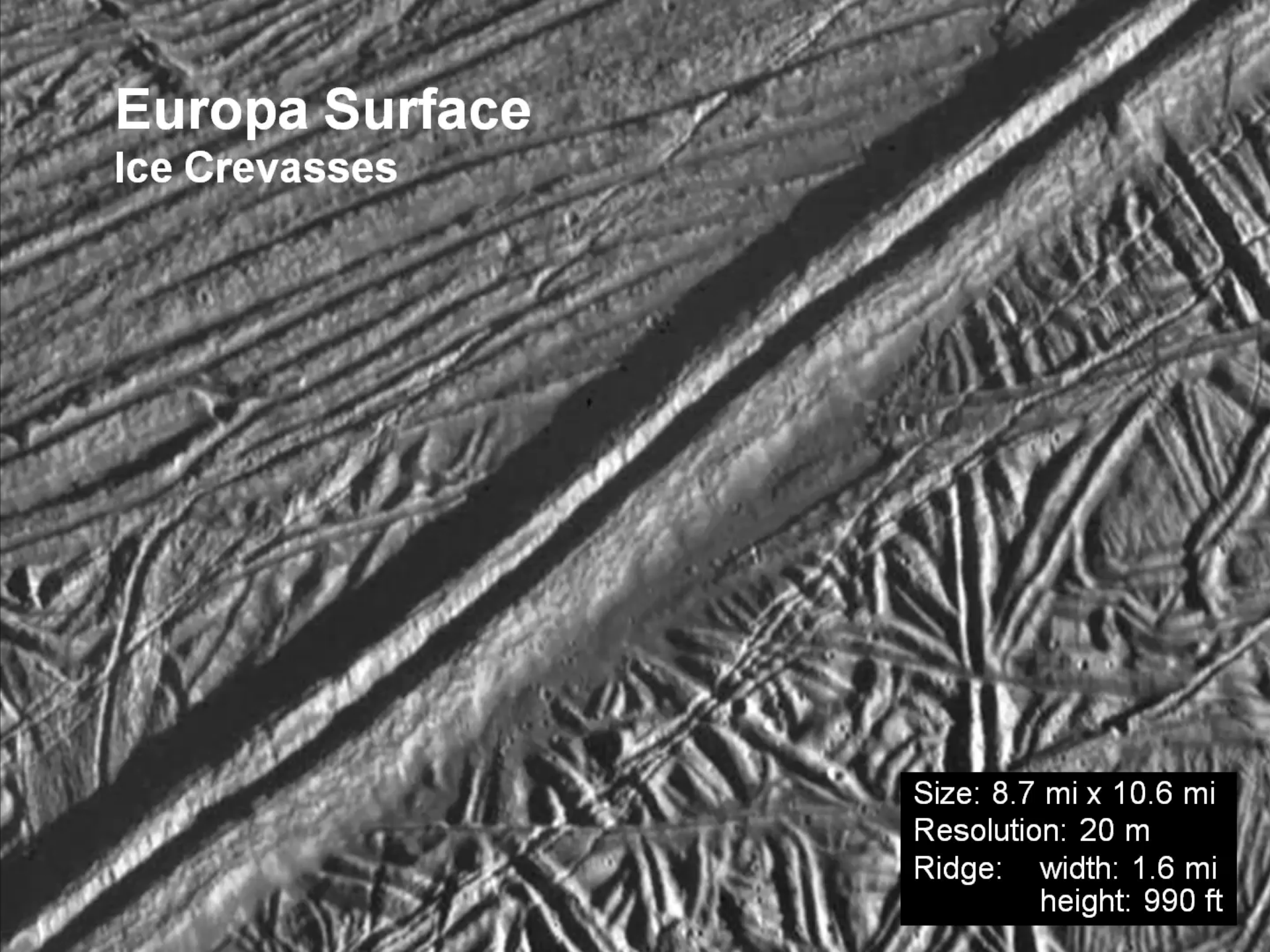
- No Liquid Water
- No Oxygen
- No Solid Surface

Jovian Moon, Io

Volcanic Explosion
silhouetted against
dark space over Io's limb.
Distance ~ 304,000 miles

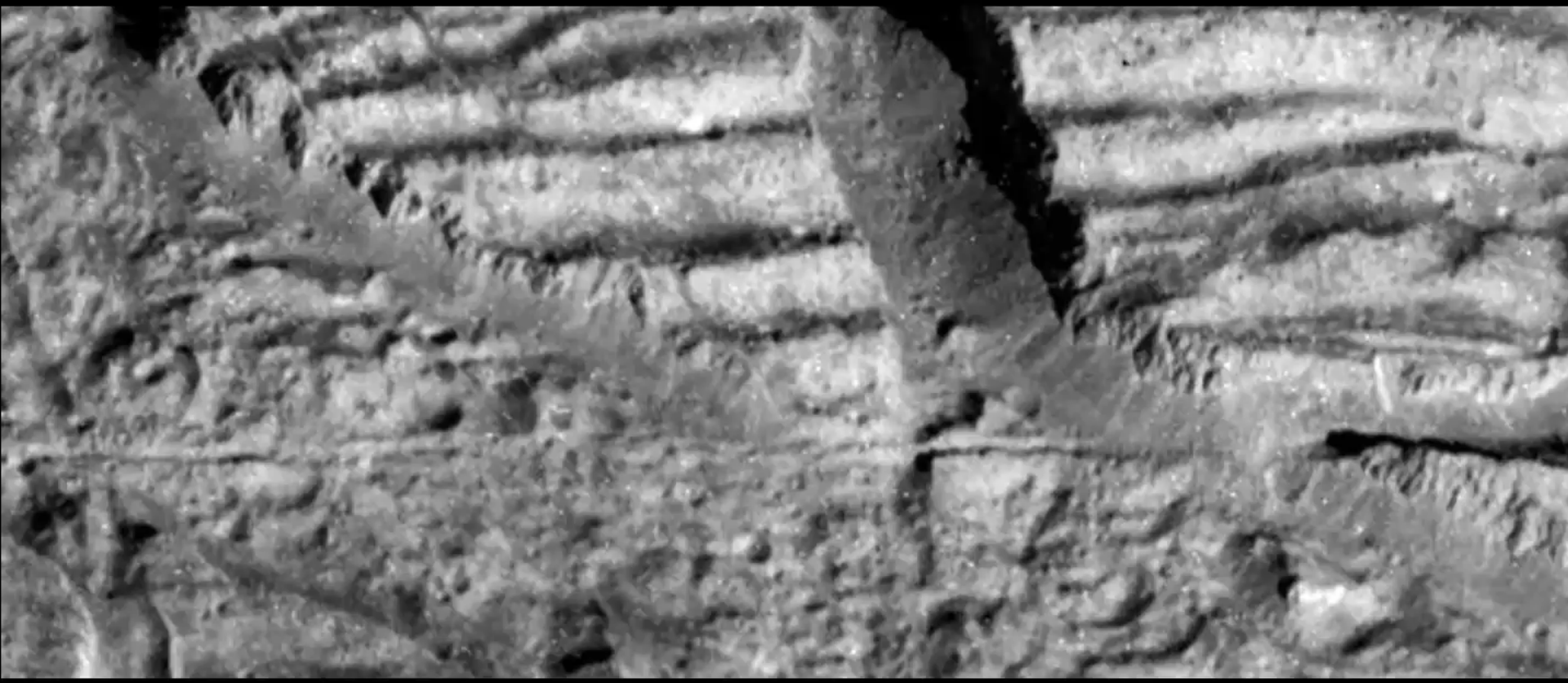
Voyager 1: March 4, 1979

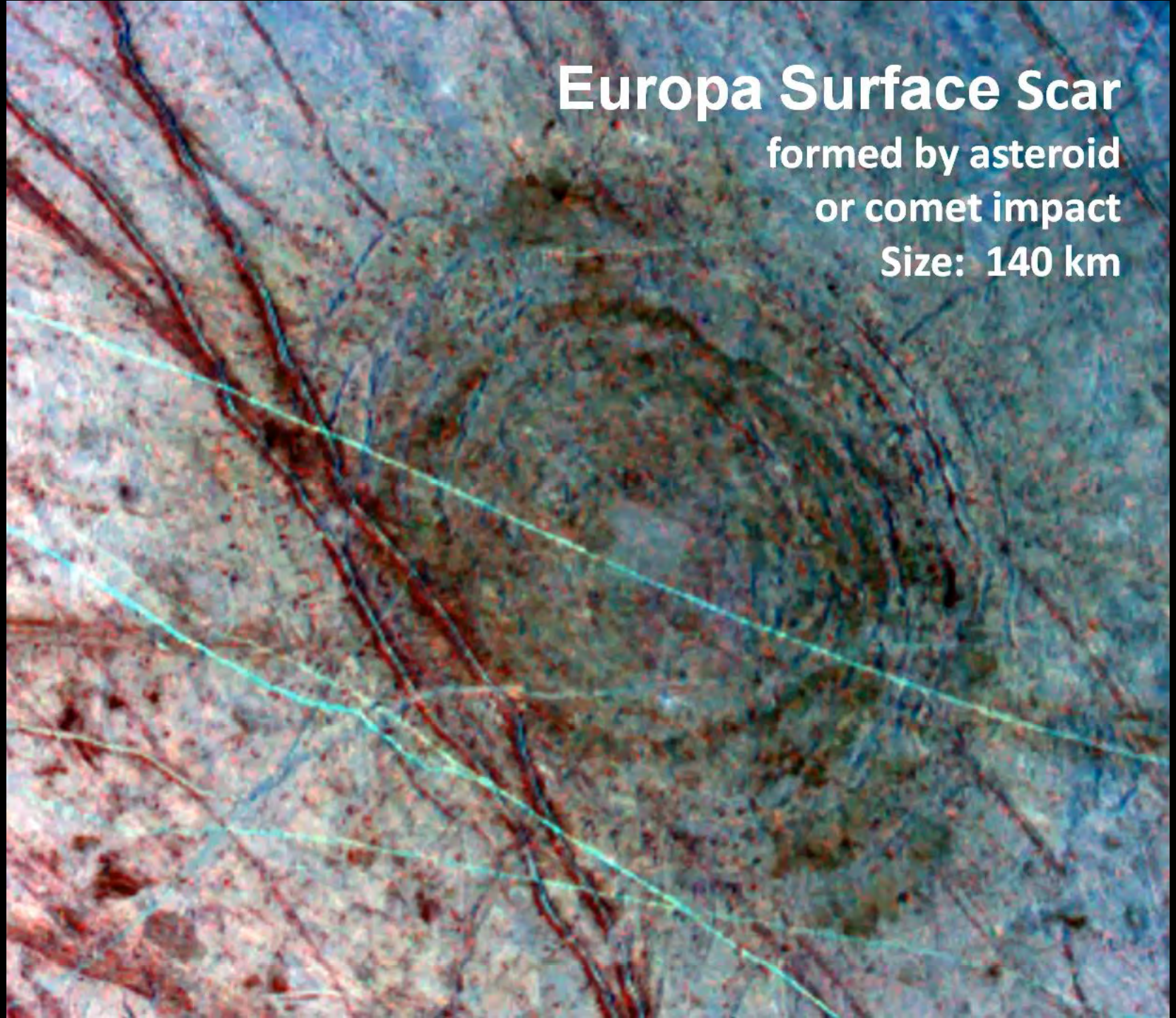
Jovian Moon
Europa


Europa Surface
Ice Crevasses
Size: 8.7 mi x 10.6 mi
Resolution: 20 m
Ridge: width: 1.6 mi
height: 990 ft

Europa Ice Clifts

Image ~ 2.5 mi across



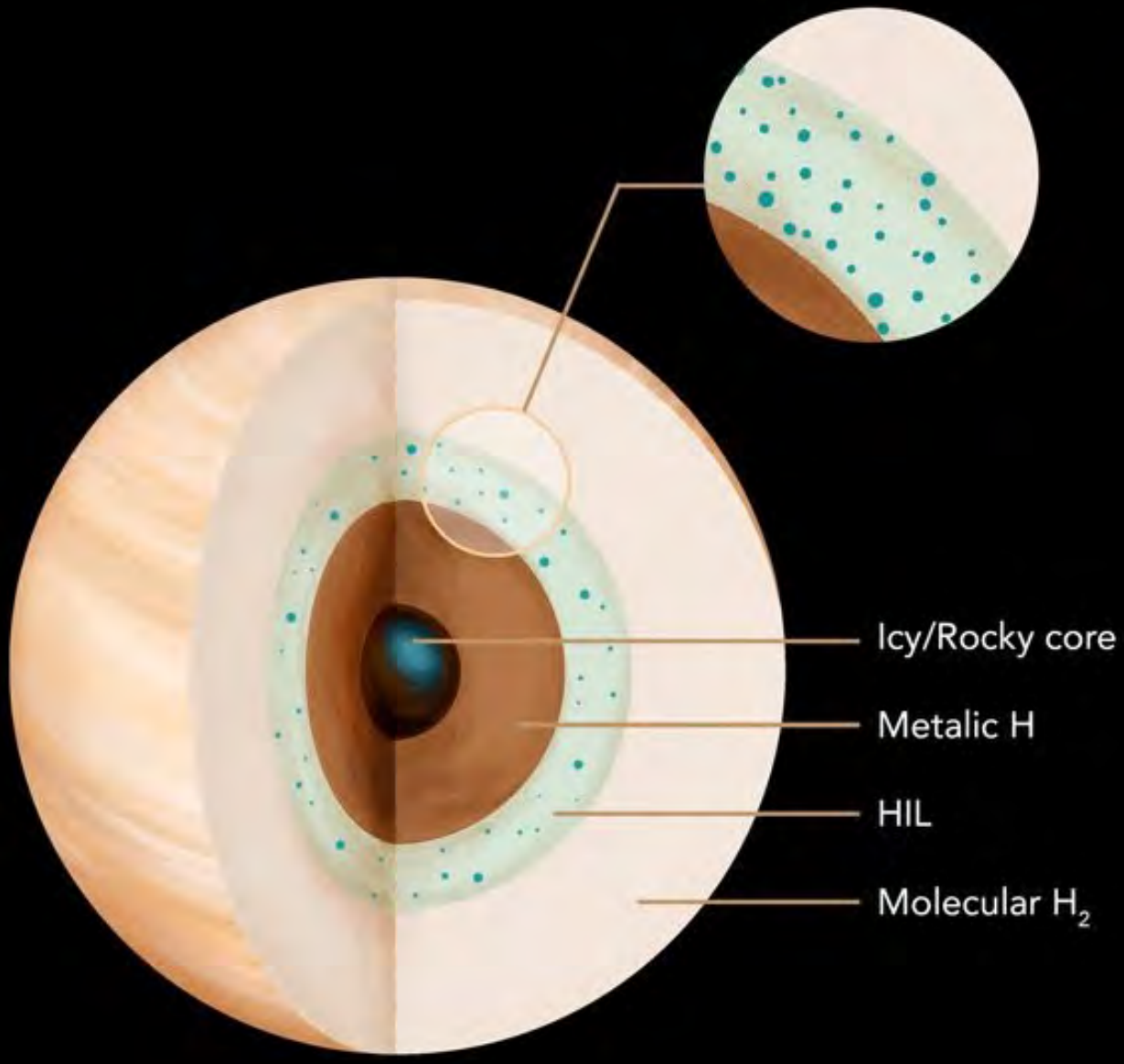

Europa Surface Scar
formed by asteroid
or comet impact
Size: 140 km

Saturn

Saturn

hours	**1.3**
diameter (Earth=1)	**9.4**
mass (Earth=1)	**95**
mean distance from Sun (AU)	**9.5**

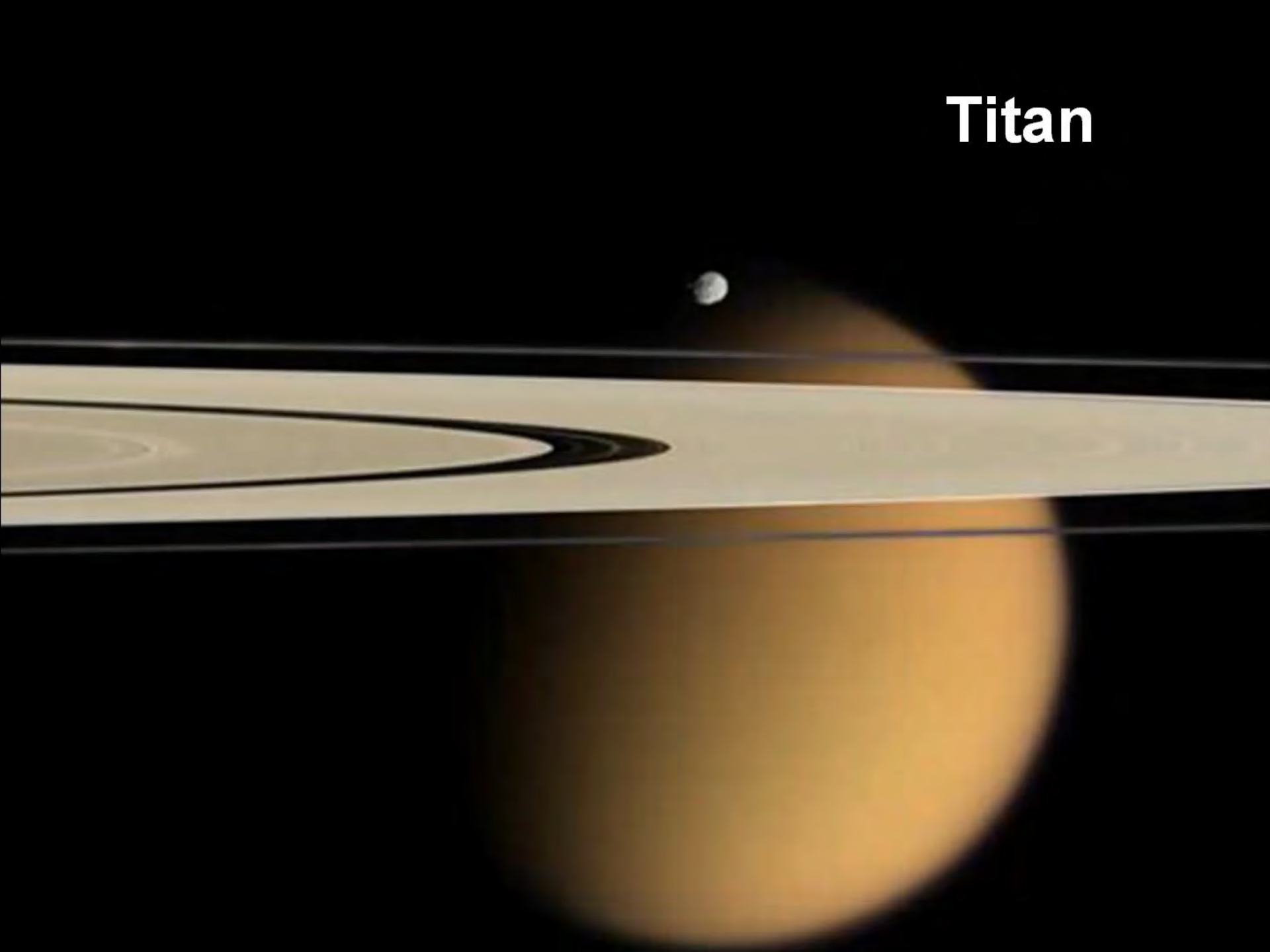

• Gigantic Gas Ball
• Similar to Jupiter
• No Liquid Water
• No Solid Surface
• No Oxygen
• Rings of Ice



Saturn


Rings

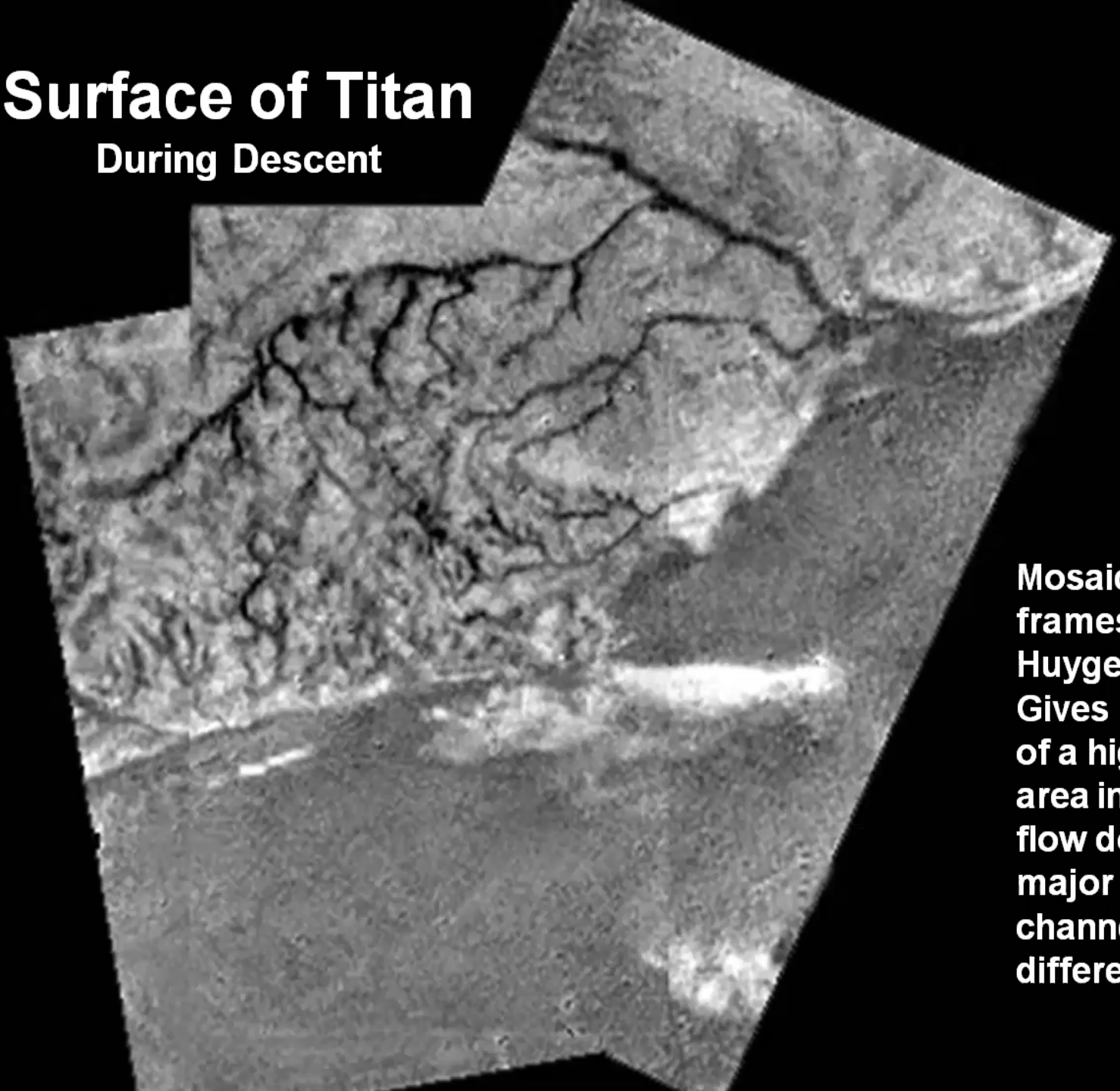

Shadows
Cast by Rings


Titan


Atmosphere of Titan
Viewed from Cassini Orbiter
31 March 2005

Surface of Titan

During Descent



Mosaic of three frames from the Huygens Lander Gives a detail view of a high ridge area including the flow down into a major river channel from different sources.

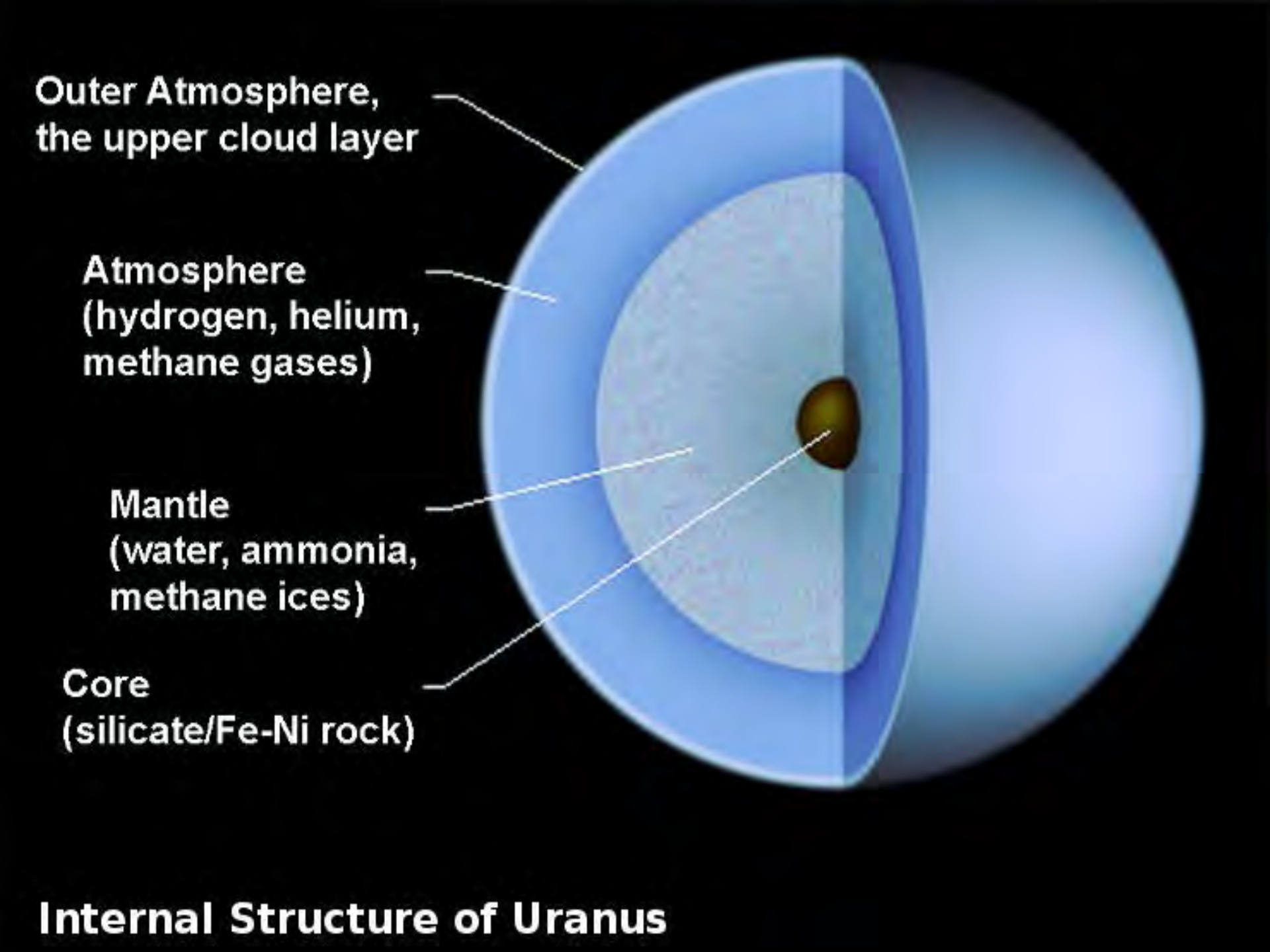
Surface of Titan

First Landing in Outer Solar System 14 January 2005

Temperature:	-290°F
Atmosphere:	95% Nitrogen, 5 %Methane
Rain, Rivers, and Lakes:	Liquid Methane, Ethane
Rocks:	Water Ice
Dunes:	Hydrocarbon “Sand”

Uranus

Hubble Telescope



Internal Structure of Uranus

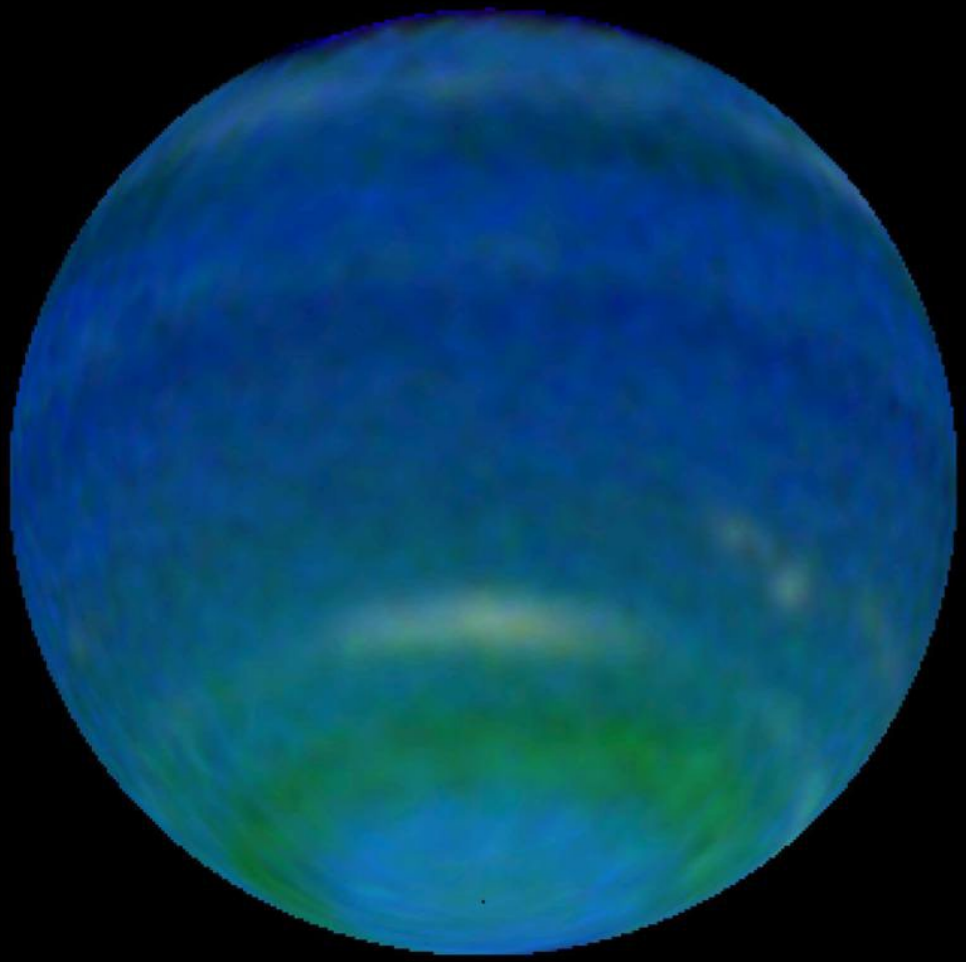
Neptune

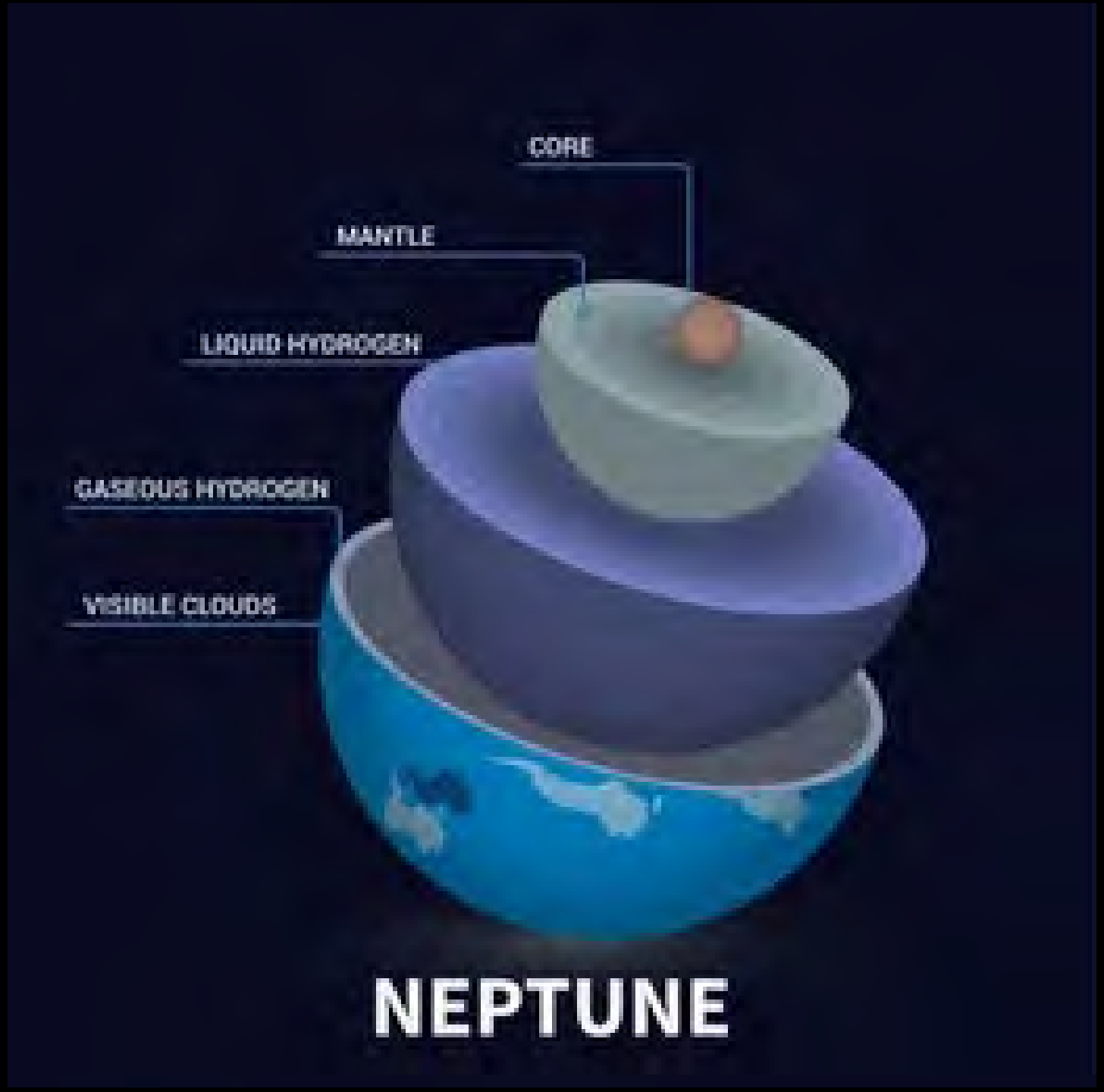
Scalding Hot Ammonia Ocean – Due to Radioactive Core

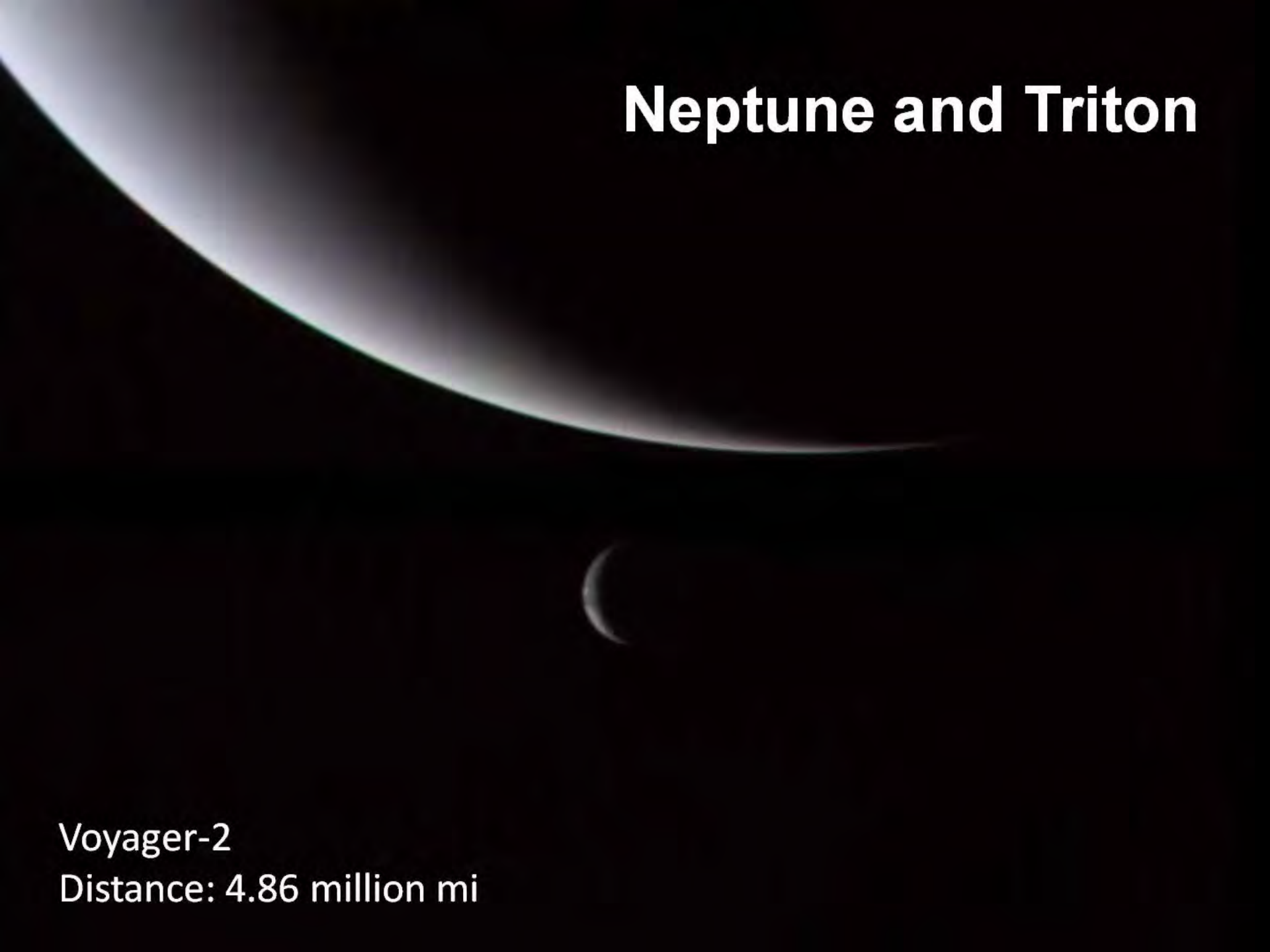
Voyager-2
Distance: 4.4 million mi

Neptune

hours	**4.2**
diameter (Earth=1)	**3.9**
mass (Earth=1)	**17**
mean distance from Sun (AU)	**30**




CORE
MANTLE
LIQUID HYDROGEN
GASEOUS HYDROGEN
VISIBLE CLOUDS
NEPTUNE


Neptune and Triton
Voyager-2
Distance: 4.86 million mi

Triton

Orit:	Retrograde
Polar Cap:	Frozen N_2 and Methane

Terrain:

Cantaloupe Pattern cause by cryovolcanic water Ice extrusions

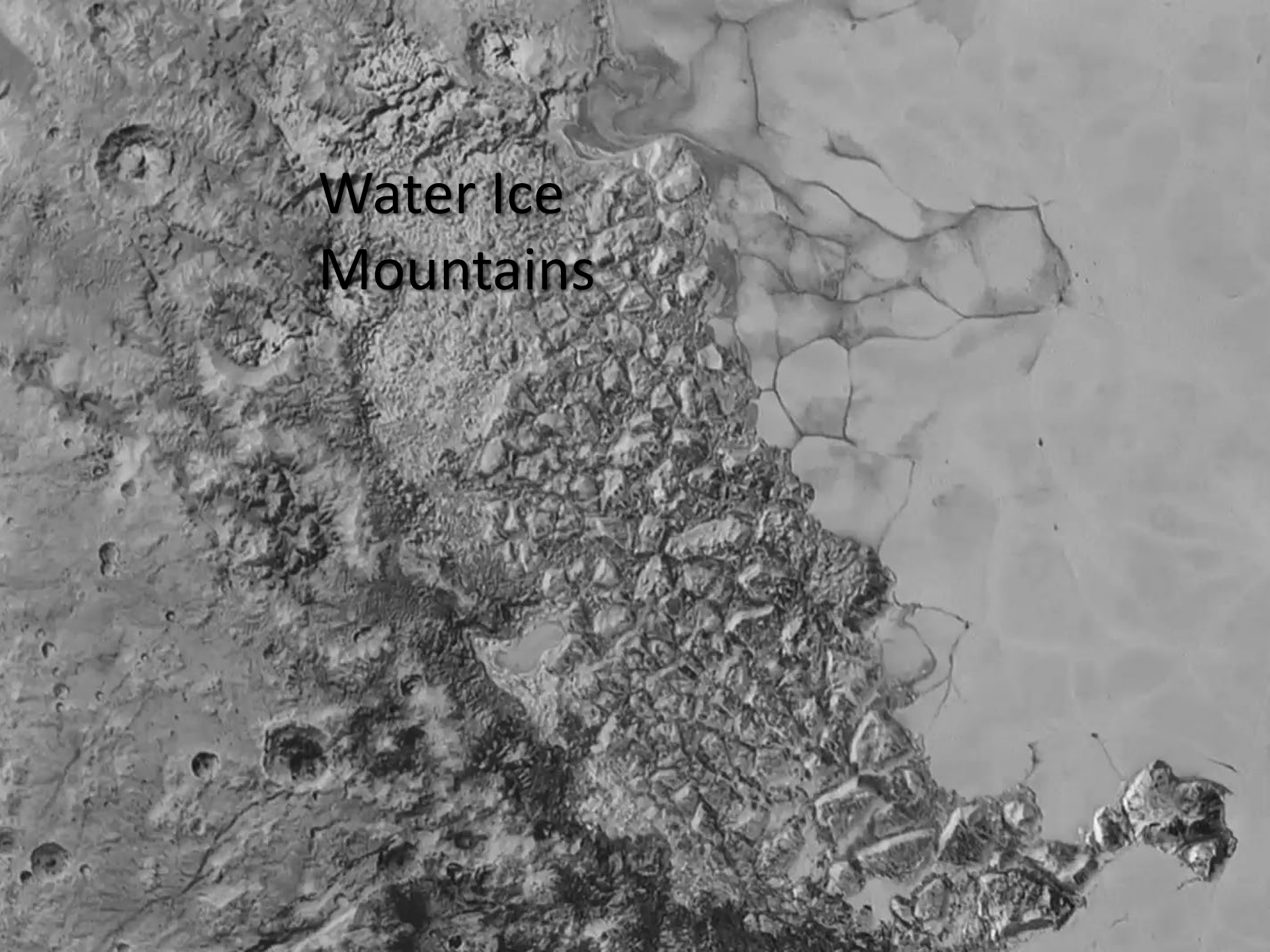
Pluto

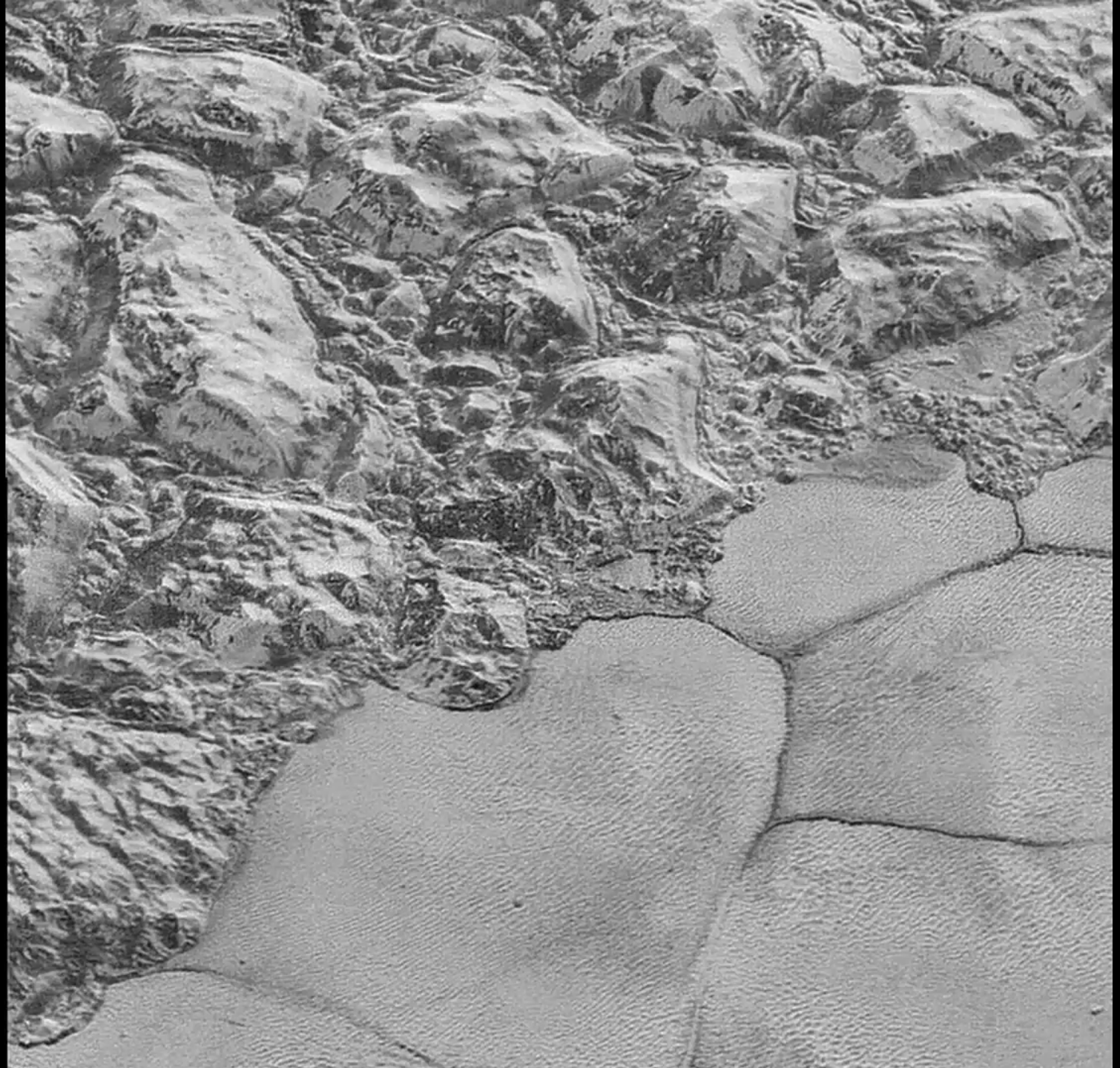
and moons
Charon, Nix and Hydra

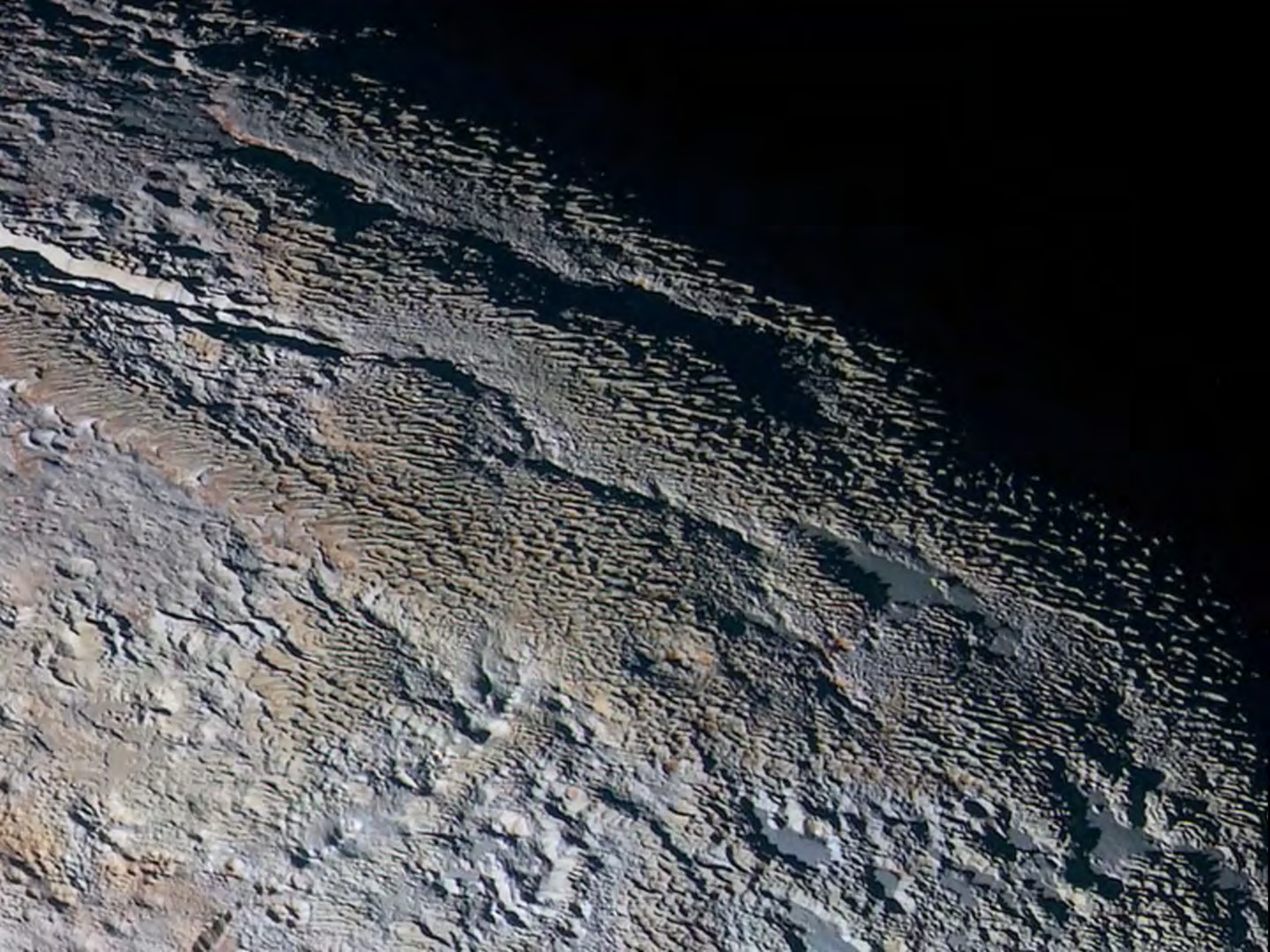
Pluto

hours	**5.5**
diameter (Earth=1)	**0.18**
mass (Earth=1)	**0.002**
mean distance from Sun (AU)	**39**


Nitrogen
Ice Sheet


Water Ice
Mountains






Slight
Atmosphere of
Sublimed
Nitrogen
Pluto
New Horizons (2015)

The Kuiper Belt

Earth

minutes	**8.3**
diameter (Earth=1)	**1**
mass (Earth=1)	**1**
mean distance from Sun (AU)	**1**

Earth is Different—Why?

"Now the earth
was formless and empty,
darkness was over the surface
of the deep, and the Spirit of
God was hovering over the
waters."

Genesis 1:2

Earth's Atmosphere and Oceans

"Let there be an expanse… God called the expanse sky."

Gen. 1:6-8

Earth's Land Masses

"Let the water under the sky be gathered to one place, and let the dry ground appear."

Gen. 1:9


Earth's Plant Life
Then God said, "Let the land produce vegetation. . ."
Gen. 1:11


"…and let birds fly above the earth across the expanse of the sky."
Gen. 1:20b

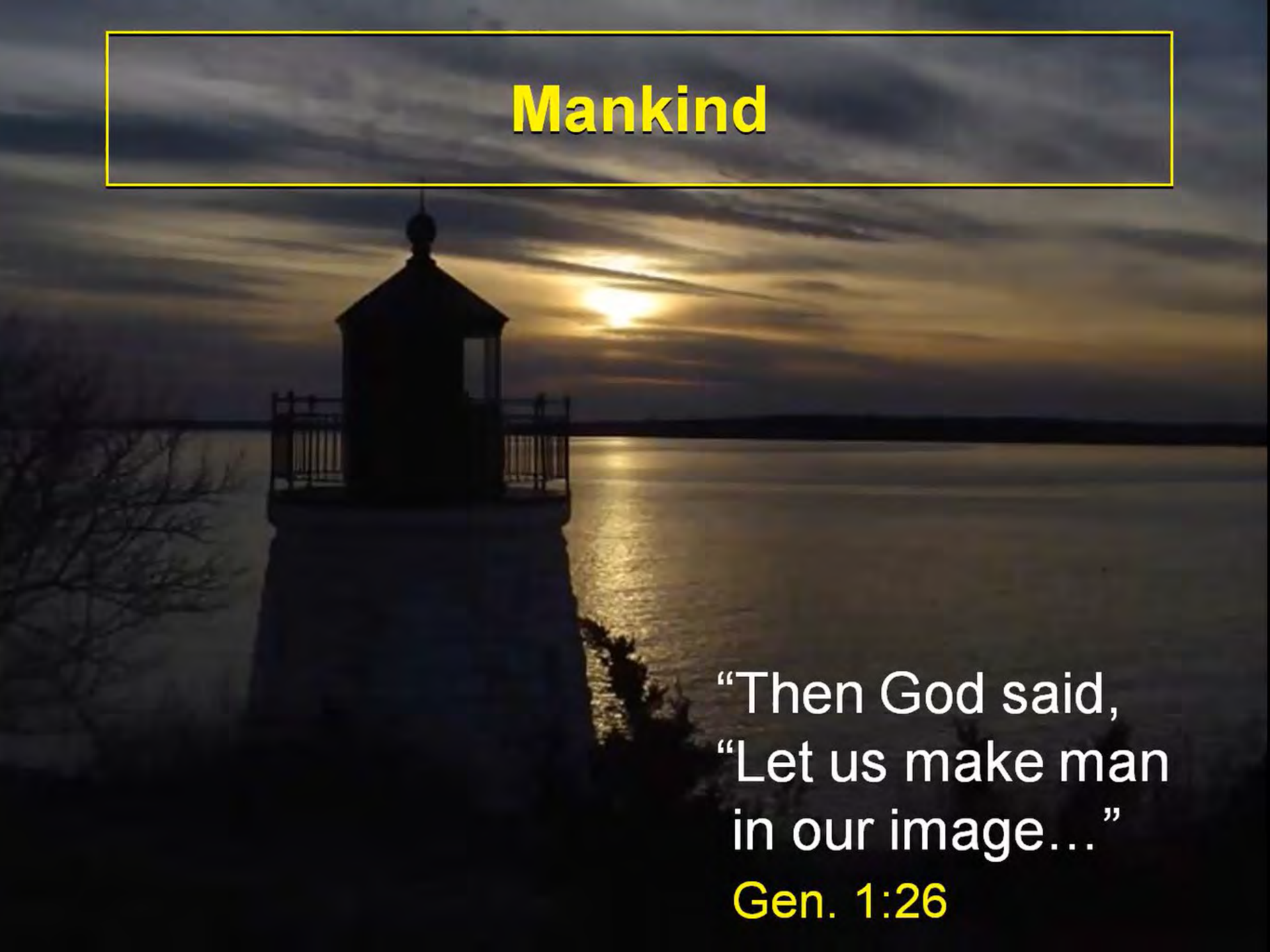
Earth's Animal Life

And God said, "Let the water team with living creatures…"

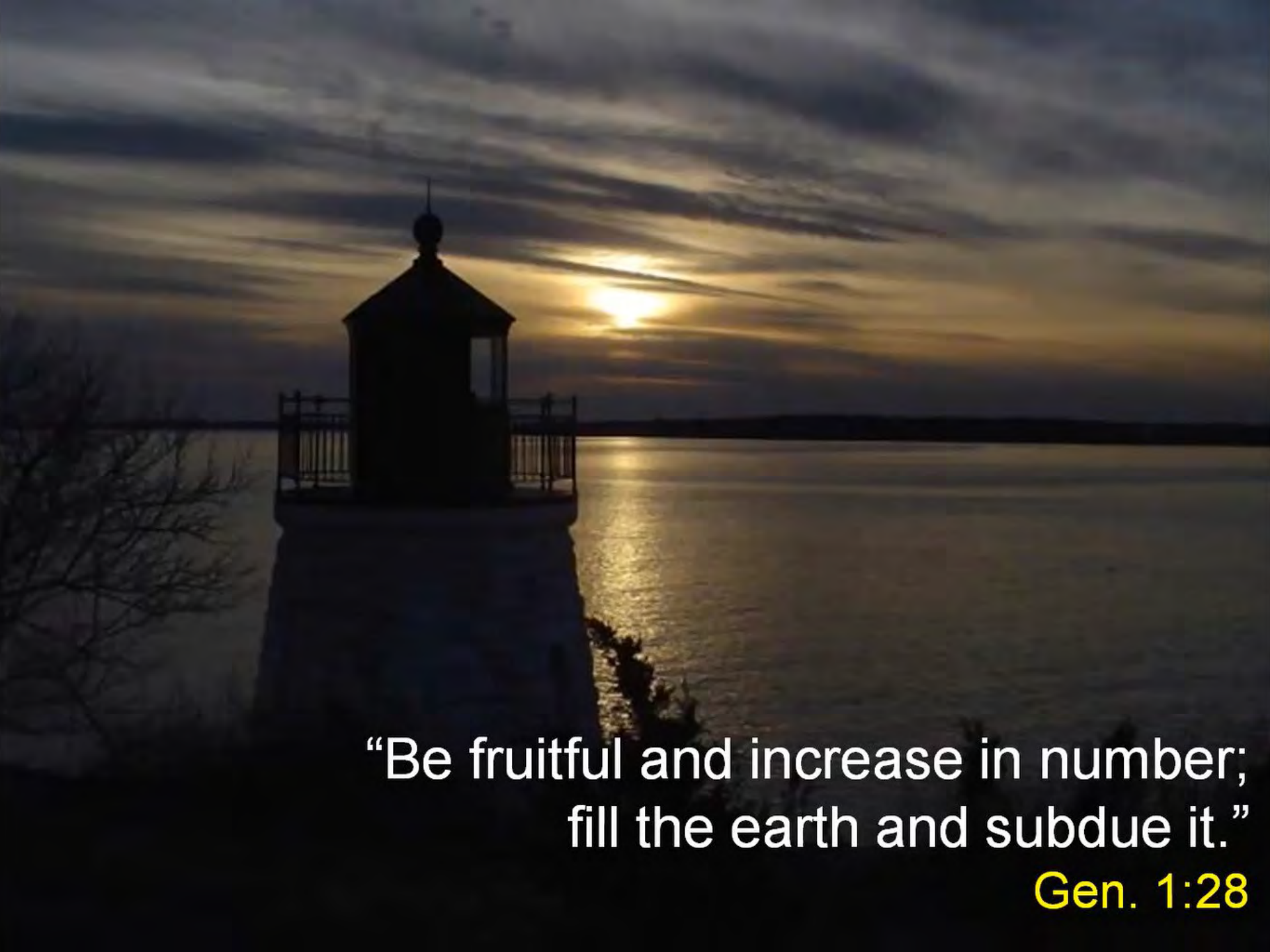
Gen. 1:20a

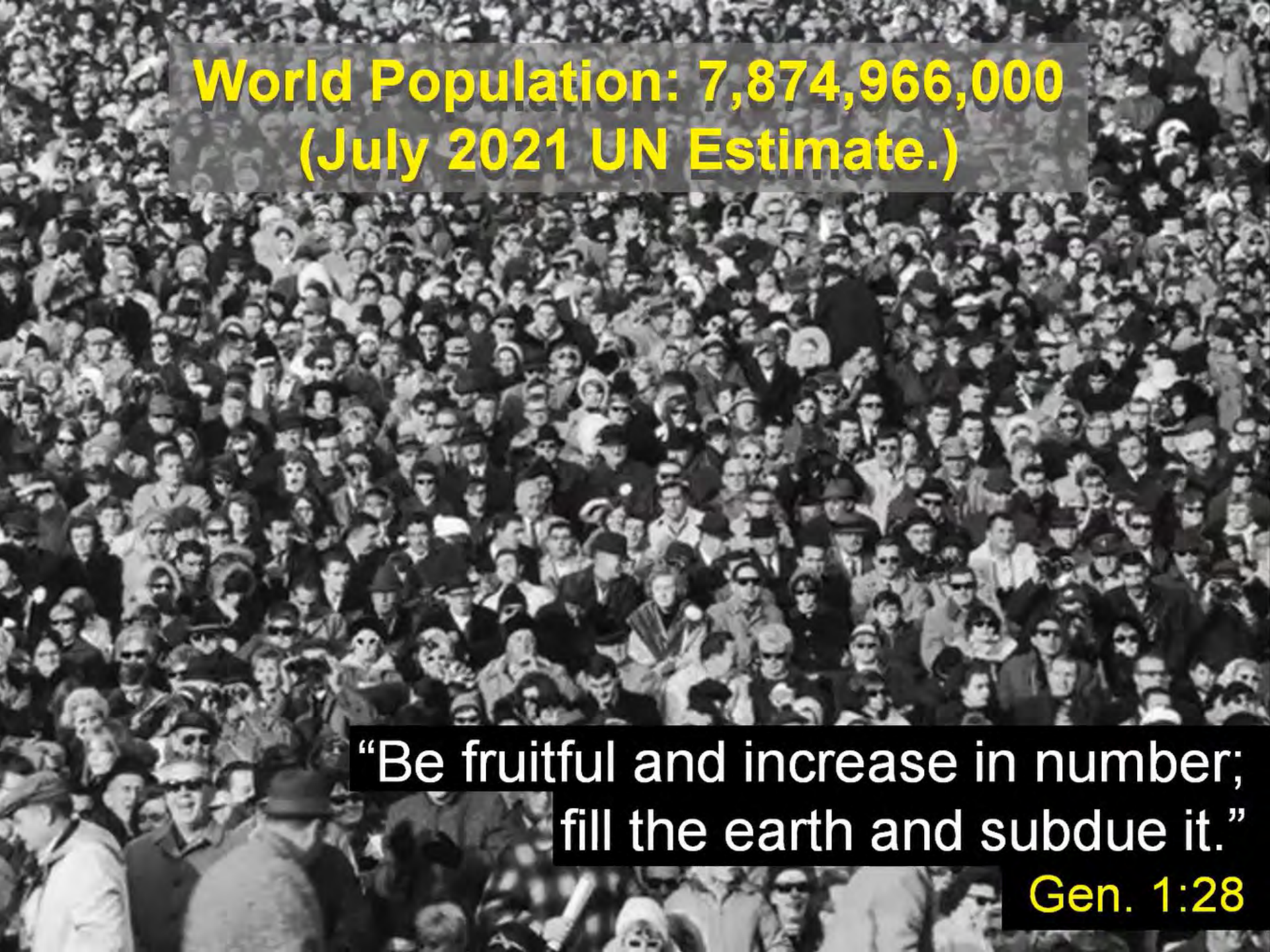

And God said,
“Let the land
produce living
creatures…”
Gen. 1:24

Mankind



"Then God said,
"Let us make man
in our image…"
Gen. 1:26


“Be fruitful and increase in number;
fill the earth and subdue it.”
Gen. 1:28


World Population: 7,874,966,000
(July 2021 UN Estimate.)
“Be fruitful and increase in number;
fill the earth and subdue it.”
Gen. 1:28

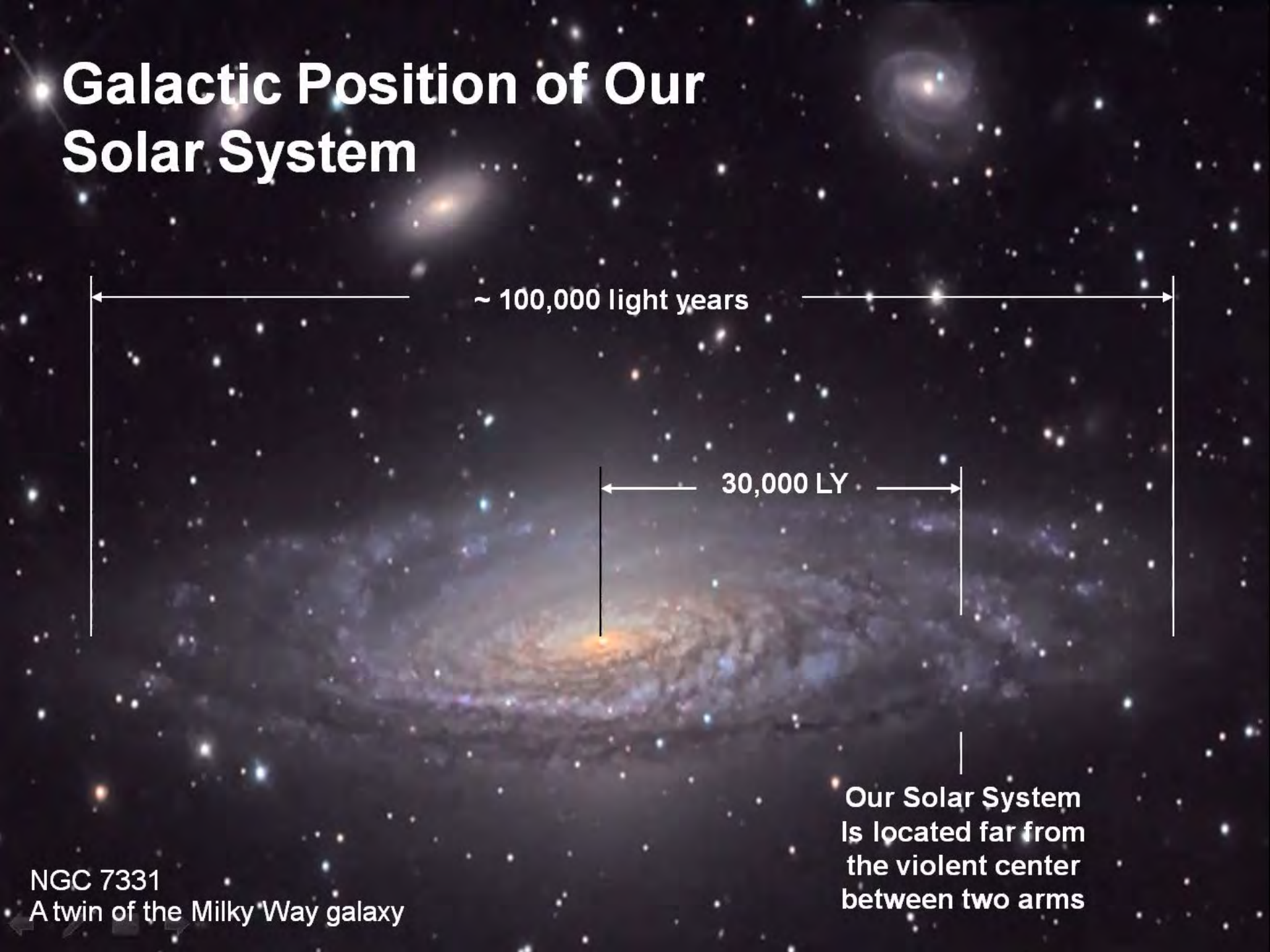

The Earth is Very Different

What is required for Earth to be a haven for life? What was the Spirit of God doing—hovering over the waters?

The Earth

and its special location

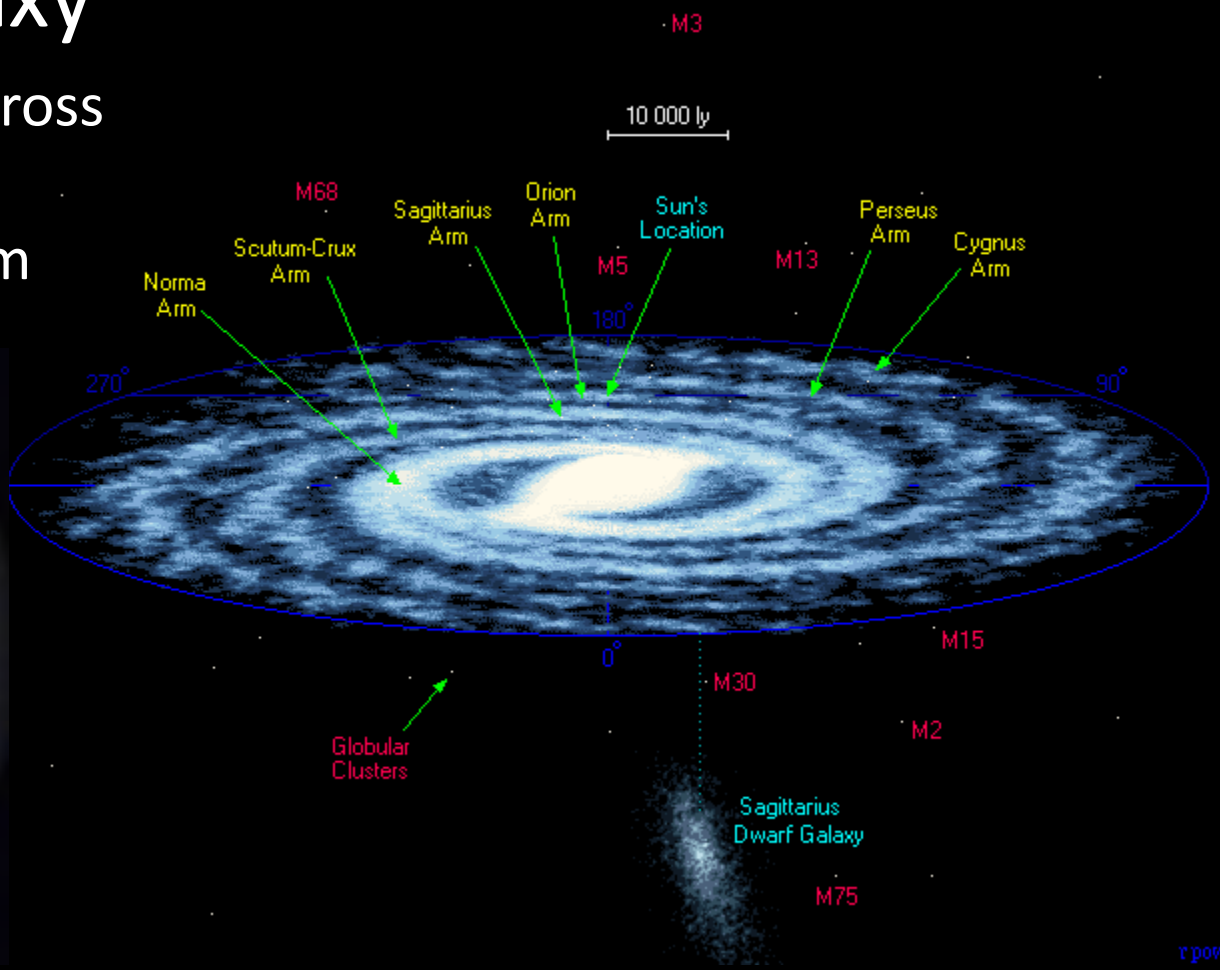
Galactic Position of Our Solar System



NGC 7331
A twin of the Milky Way galaxy

Milky Way Galaxy

- 100,000 Light-Years Across
- 400 billion stars
- Earth is 28,000 L-Y from center



Milky Way Galaxy Center


Violence at
the Center

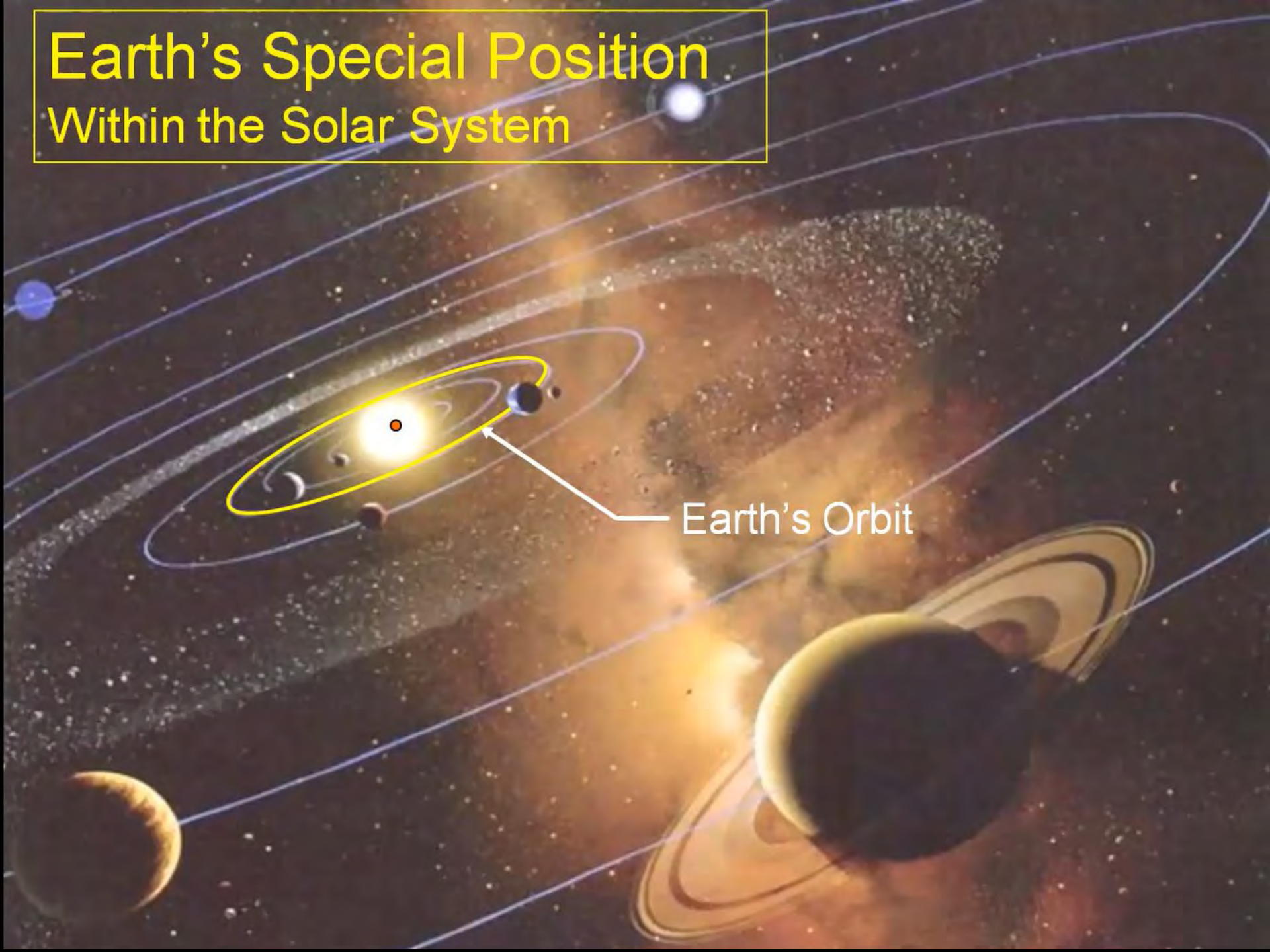
Effect of Galactic Location on Ability to Observe the Creation

The Milky Way Galaxy
Looking Toward the Outer Edge

Effect of Galactic Location on Ability to Observe the Creation

The Milky Way Galaxy
Looking Out of the Plane of the Disc

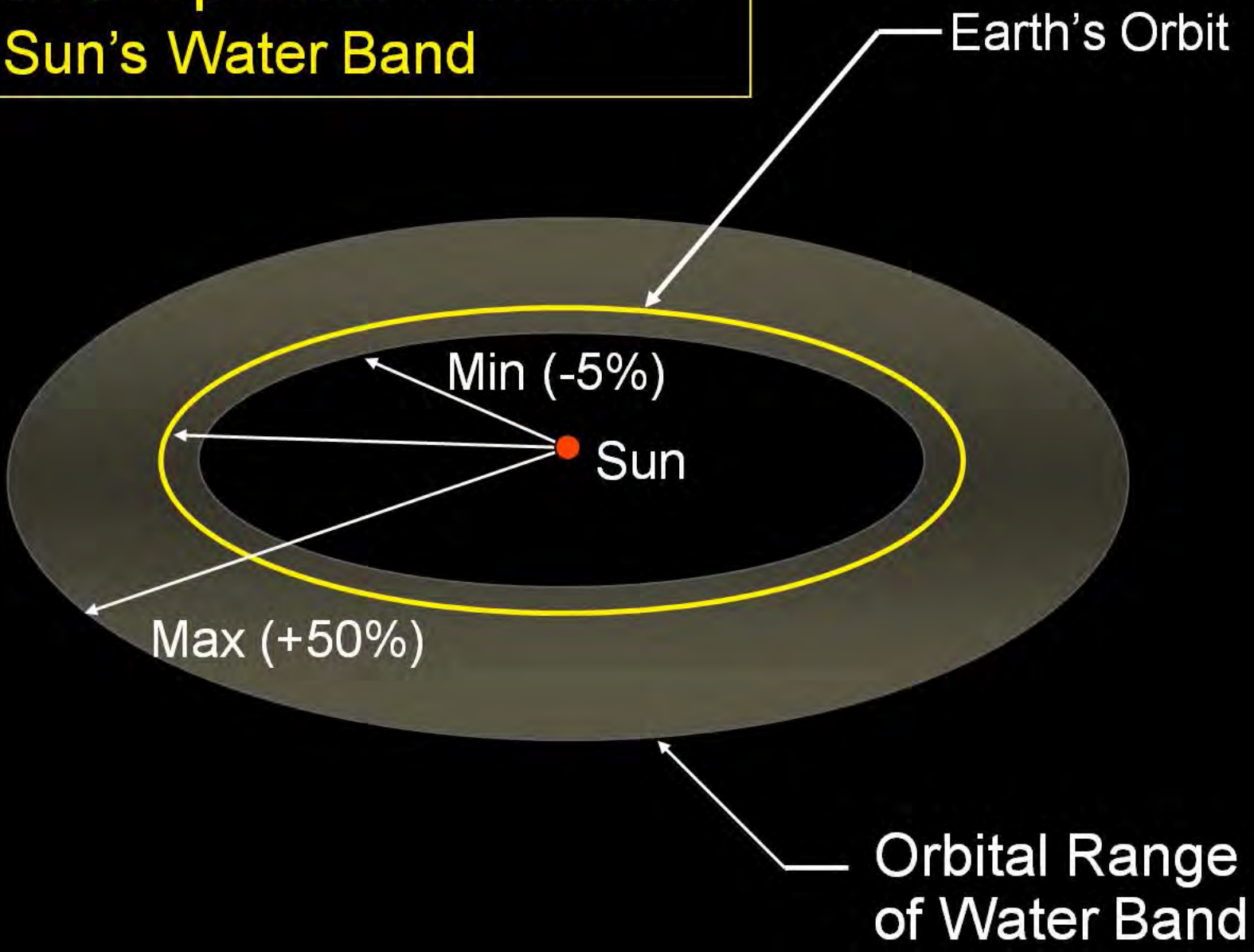
Earth's Special Position
Within the Solar System



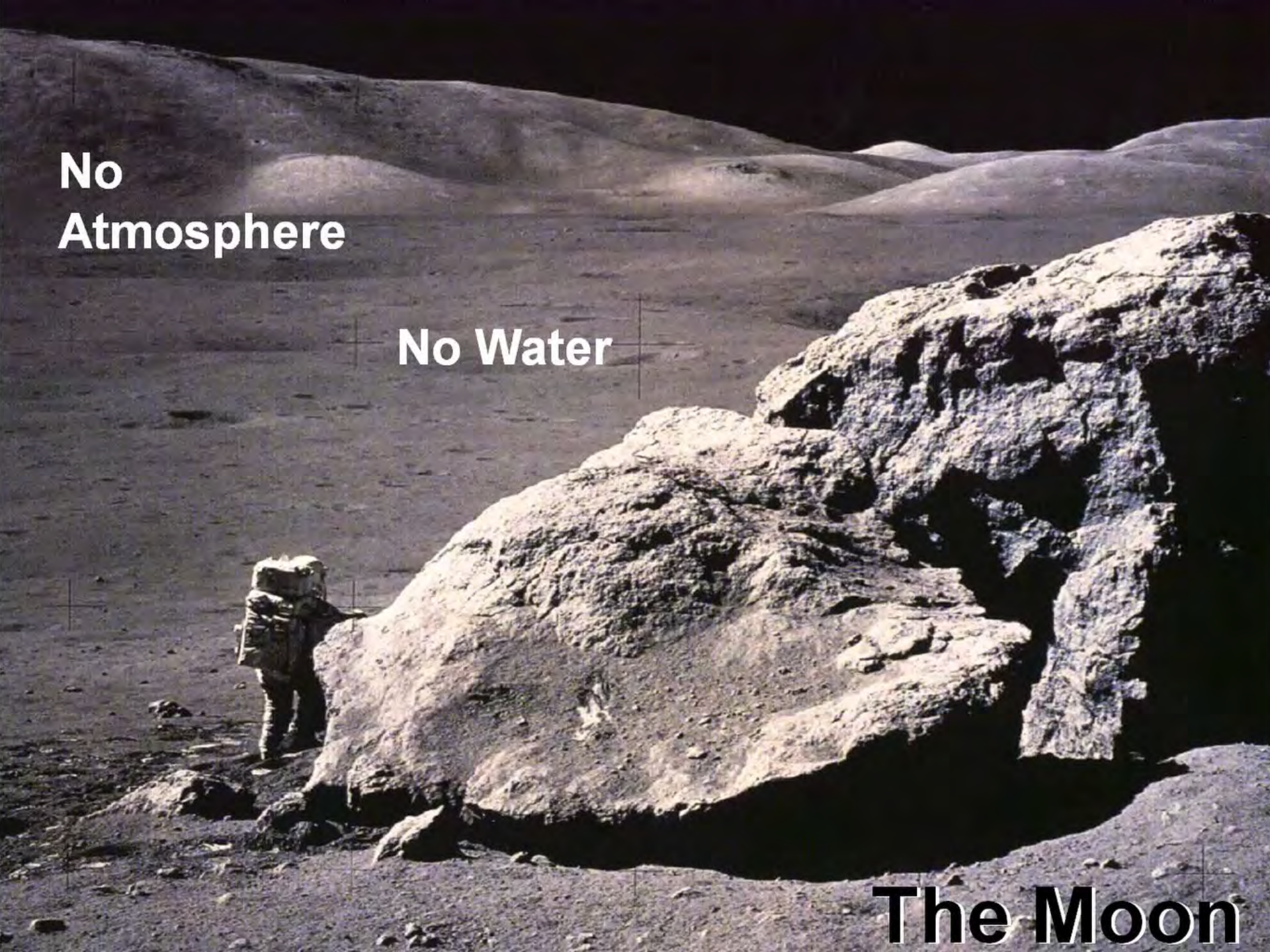
The Earth

and its special temperature

Earth's Special Position
The Sun's Water Band

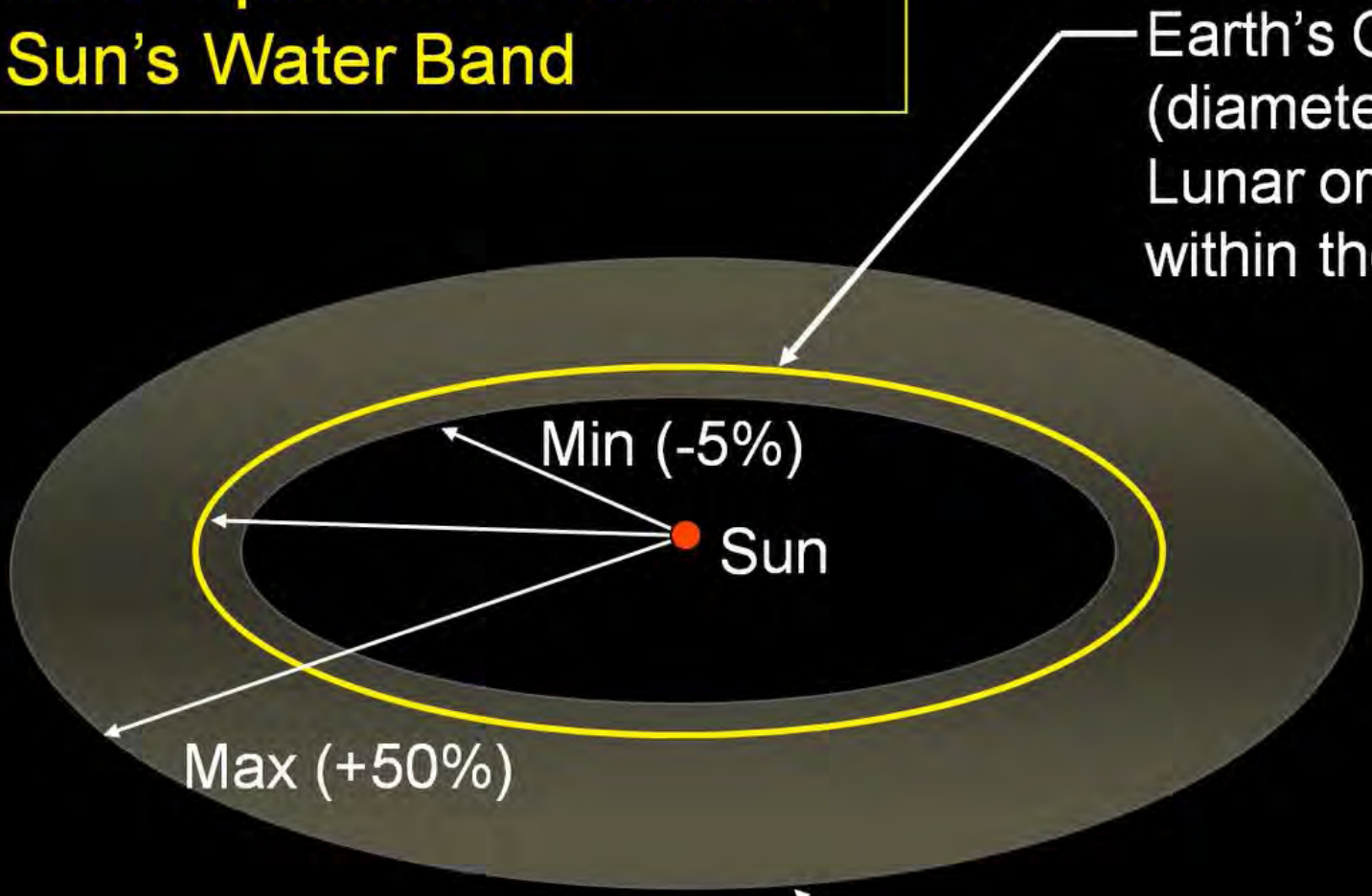


If the sun brightened just 10%,
Earth's oceans would evaporate

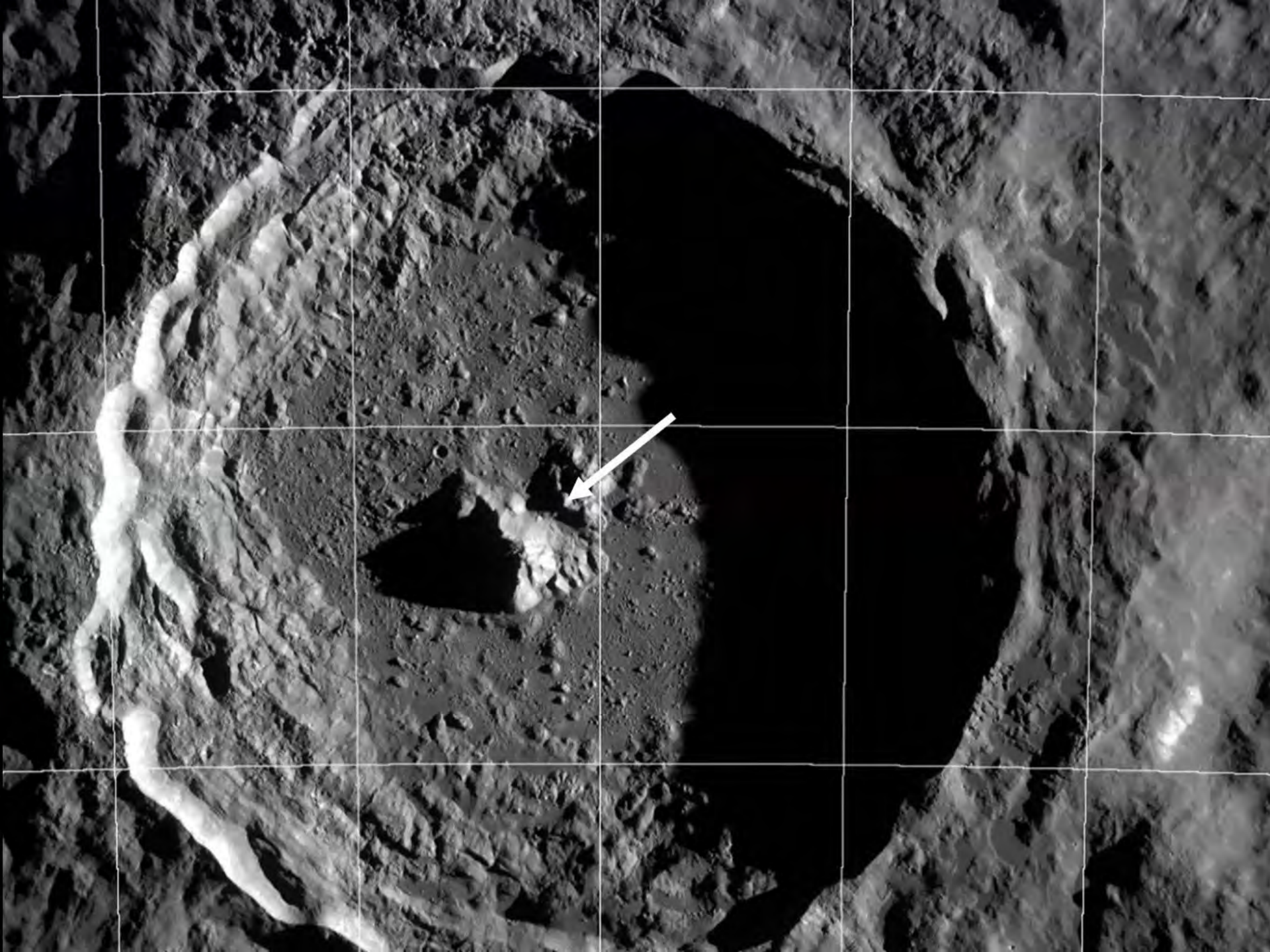

No
Atmosphere
No Water
The Moon

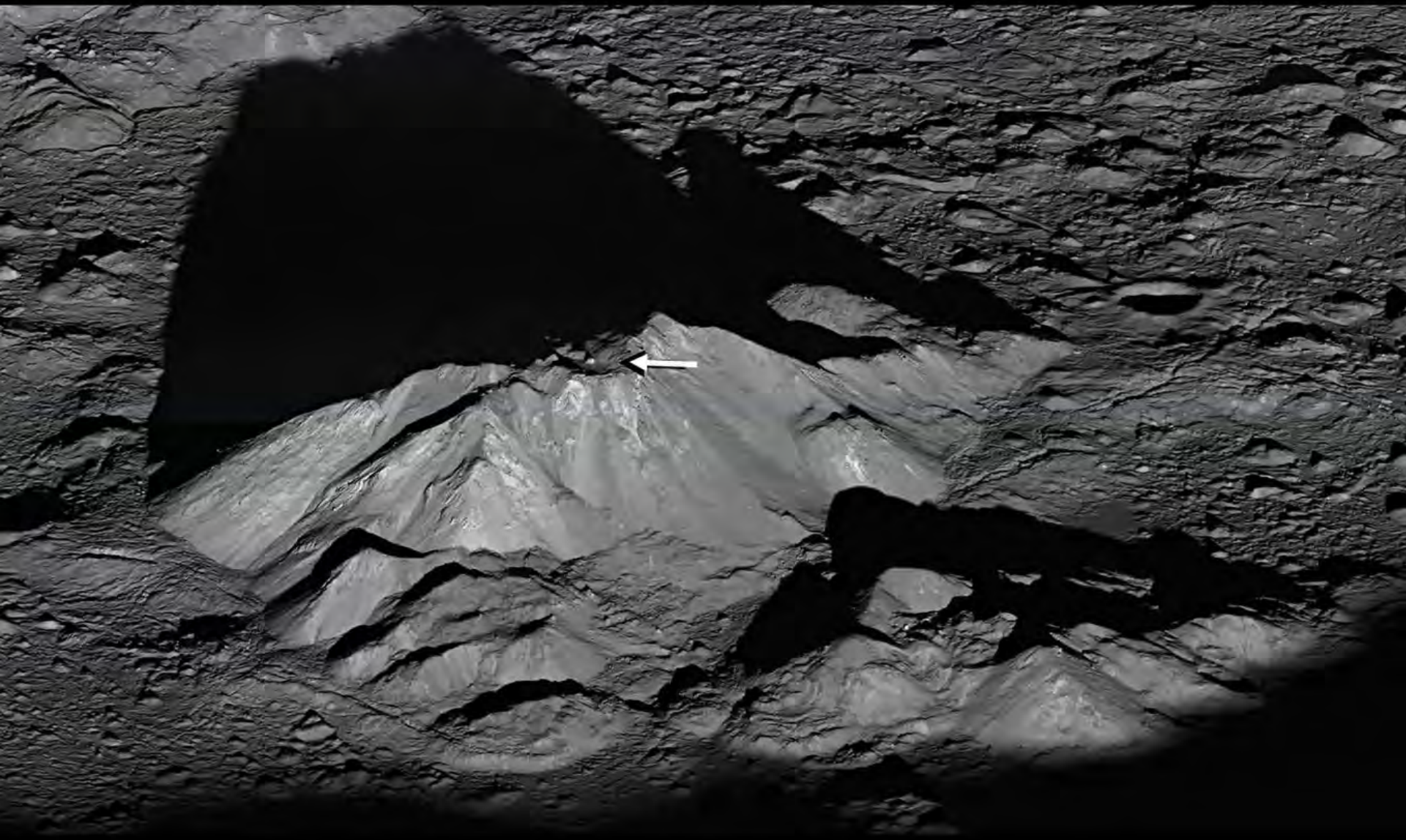
Earth's Special Position

The Sun's Water Band



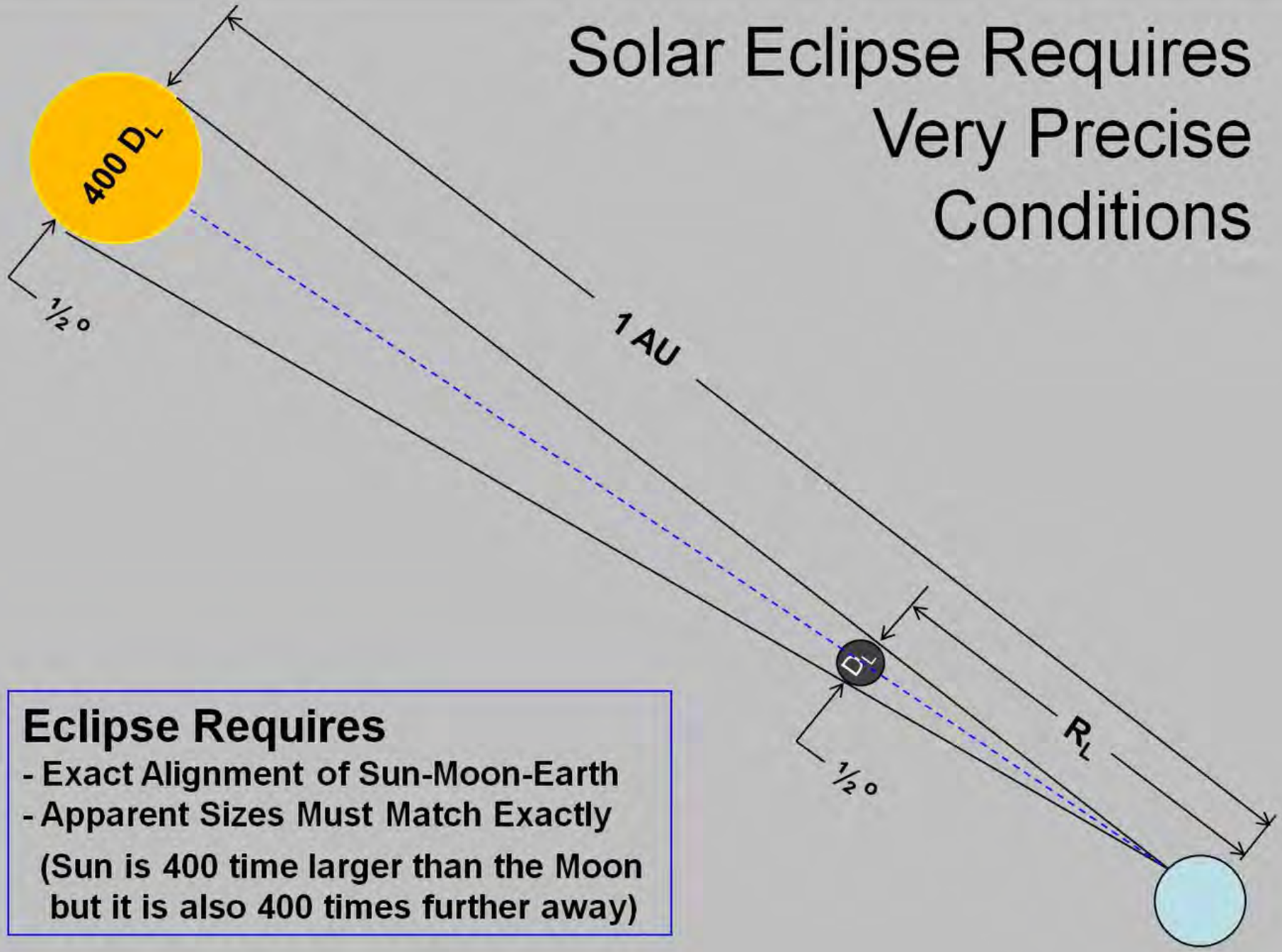
The Effect





The Importance of Size

Solar Eclipse Requires Very Precise Conditions



Eclipse Requires

- Exact Alignment of Sun-Moon-Earth
- Apparent Sizes Must Match Exactly

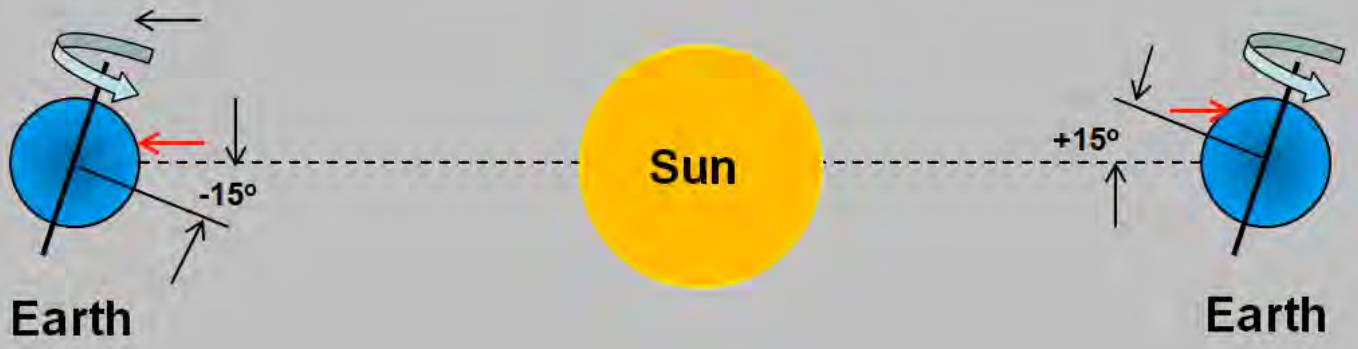
(Sun is 400 time larger than the Moon but it is also 400 times further away)

Earth's Unique Perspective:
Allows Views of the Creation

Solar Eclipse

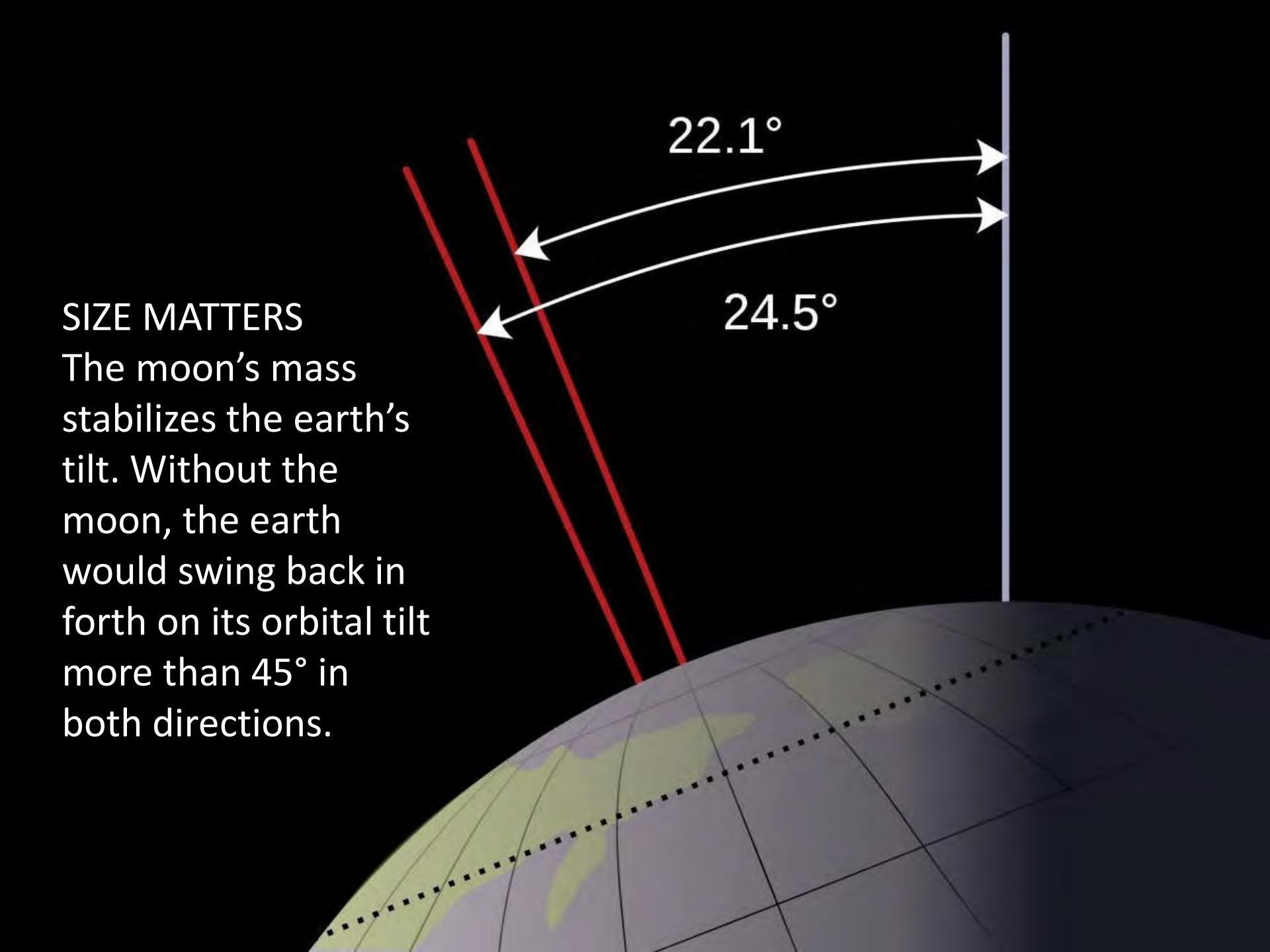
The Importance of Tilt

The Earth's tilt causes the seasons and helps circulate warm and cold water in the Oceans

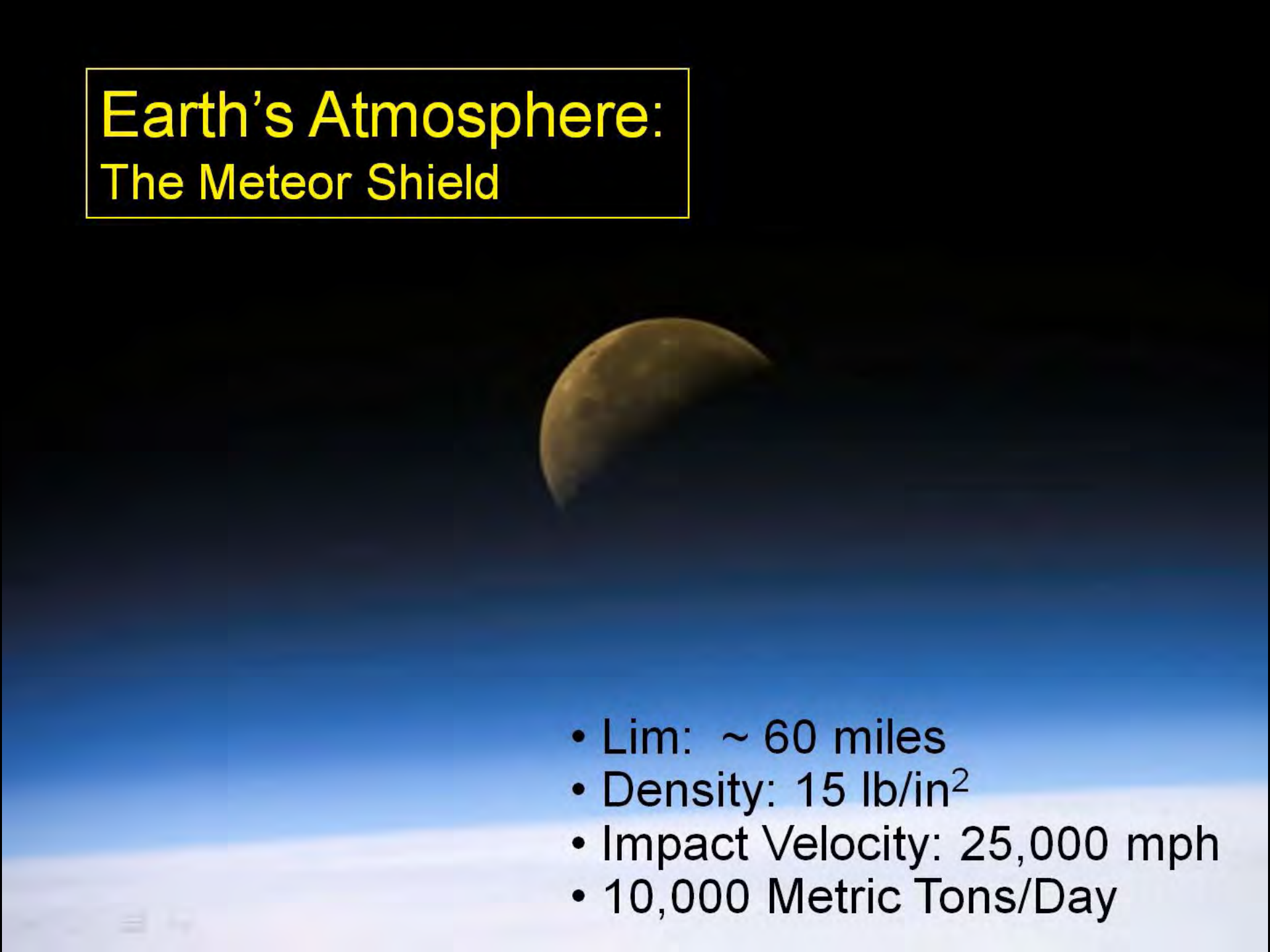


The Earth's tilt is stabilize by the Moon—the right mass at precisely the required distance

SIZE MATTERS
The moon's mass stabilizes the earth's tilt. Without the moon, the earth would swing back in forth on its orbital tilt more than 45° in both directions.



Earth's Atmosphere:
The Meteor Shield



- Lim: ~ 60 miles
- Density: 15 lb/in^2
- Impact Velocity: 25,000 mph
- 10,000 Metric Tons/Day

The Sun and its life-supporting characteristics

Radius: 433,000 mi (109 R_E)

Mass: 431,000 M_E (743x mass of planets)

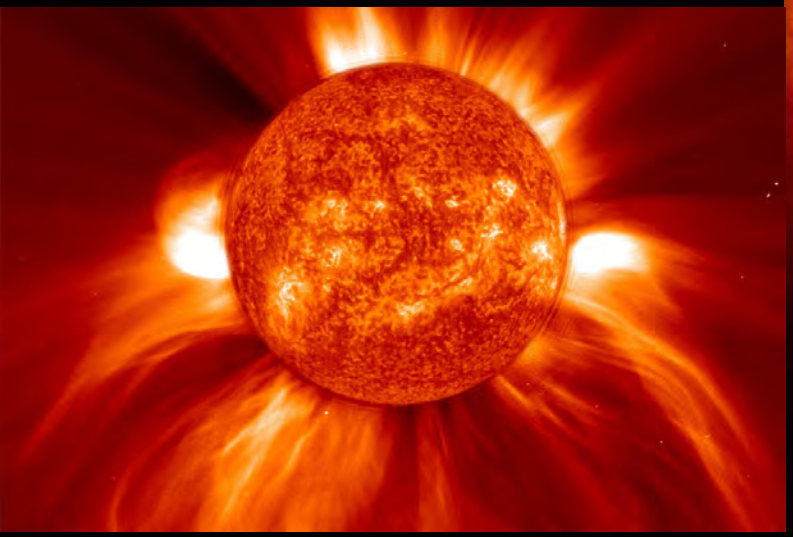
Radiation: -Majority of emissions in visible part of spectrum

- Intensity of Visible Light is 500,000 times that of X-Rays

Stability: No extreme variation

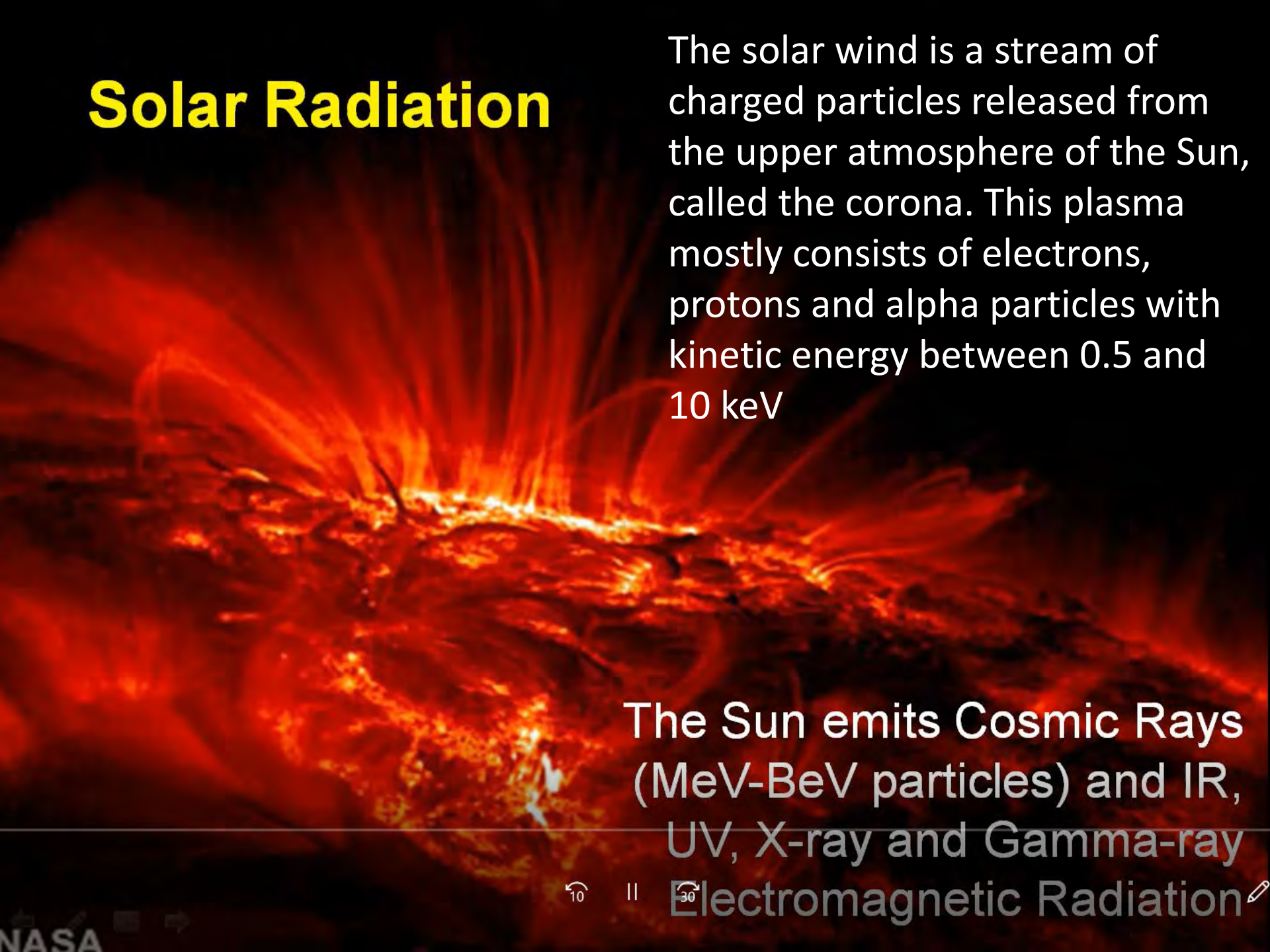
Our Sun

diameter (Earth=1)	**109**
mass (Earth=1)	**330,000**



Solar Radiation

The solar wind is a stream of charged particles released from the upper atmosphere of the Sun, called the corona. This plasma mostly consists of electrons, protons and alpha particles with kinetic energy between 0.5 and 10 keV

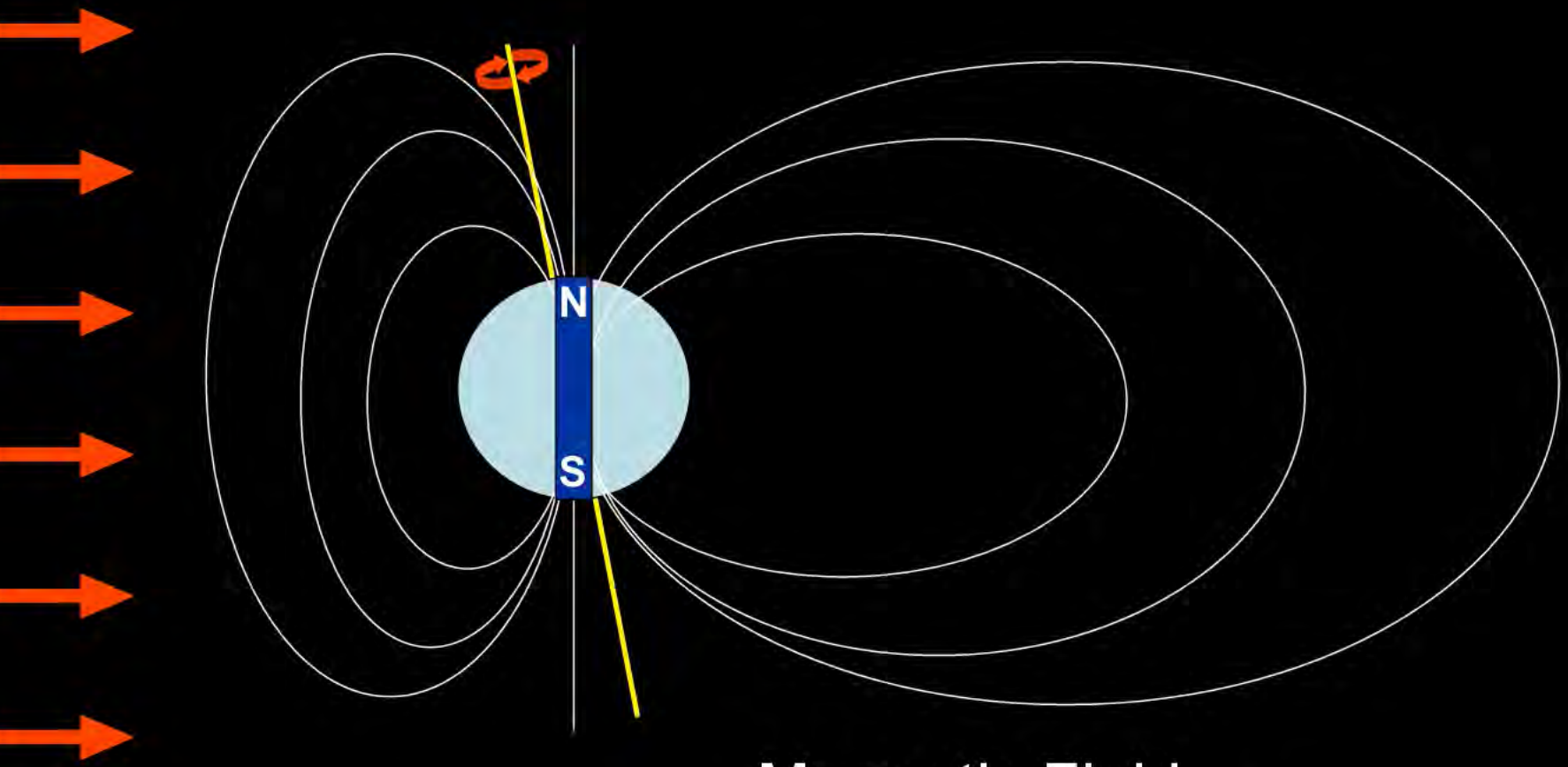


The Sun emits Cosmic Rays (MeV-BeV particles) and IR, UV, X-ray and Gamma-ray Electromagnetic Radiation

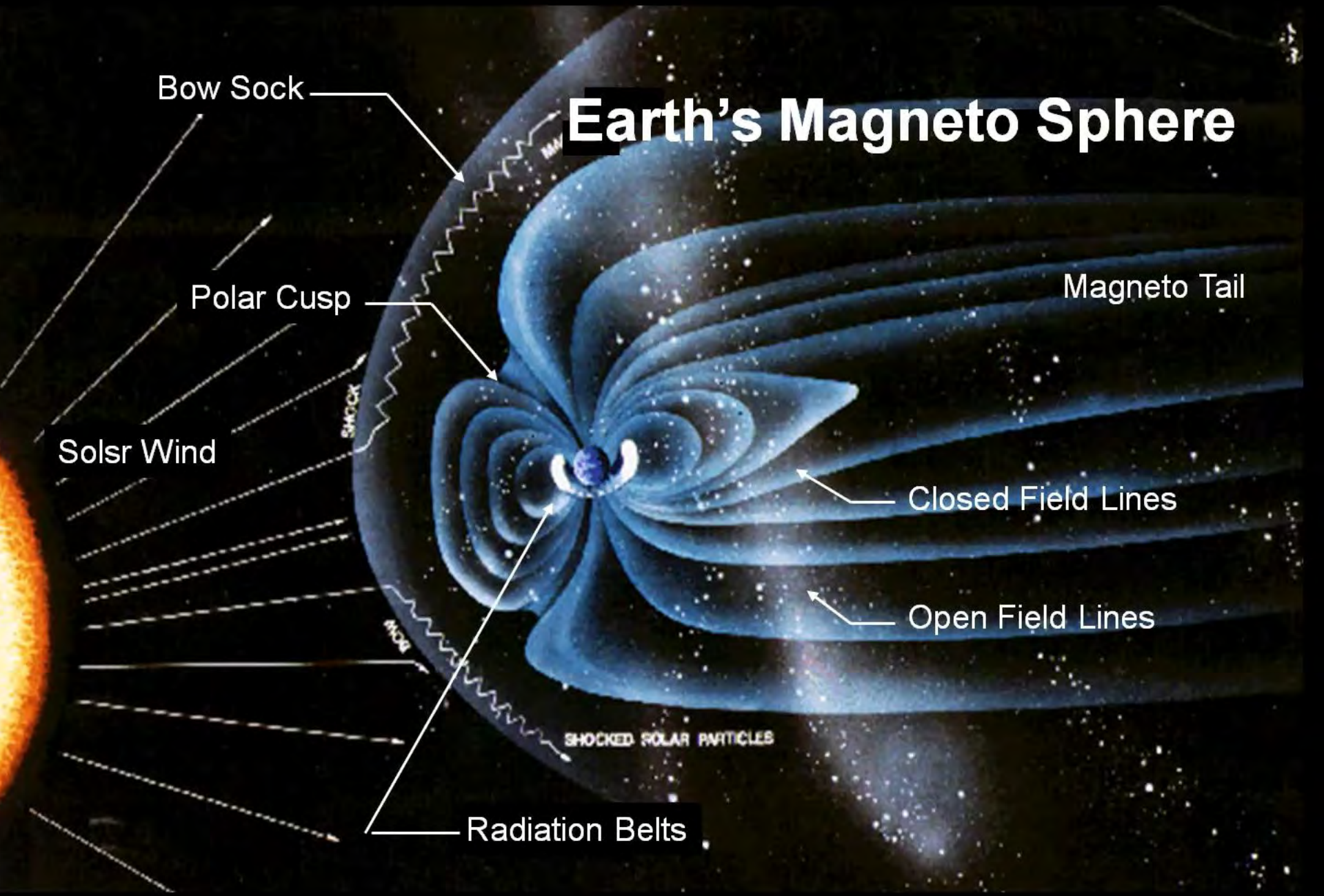
NASA

Earth's Magnetic Field:
Energetic Particle Shield

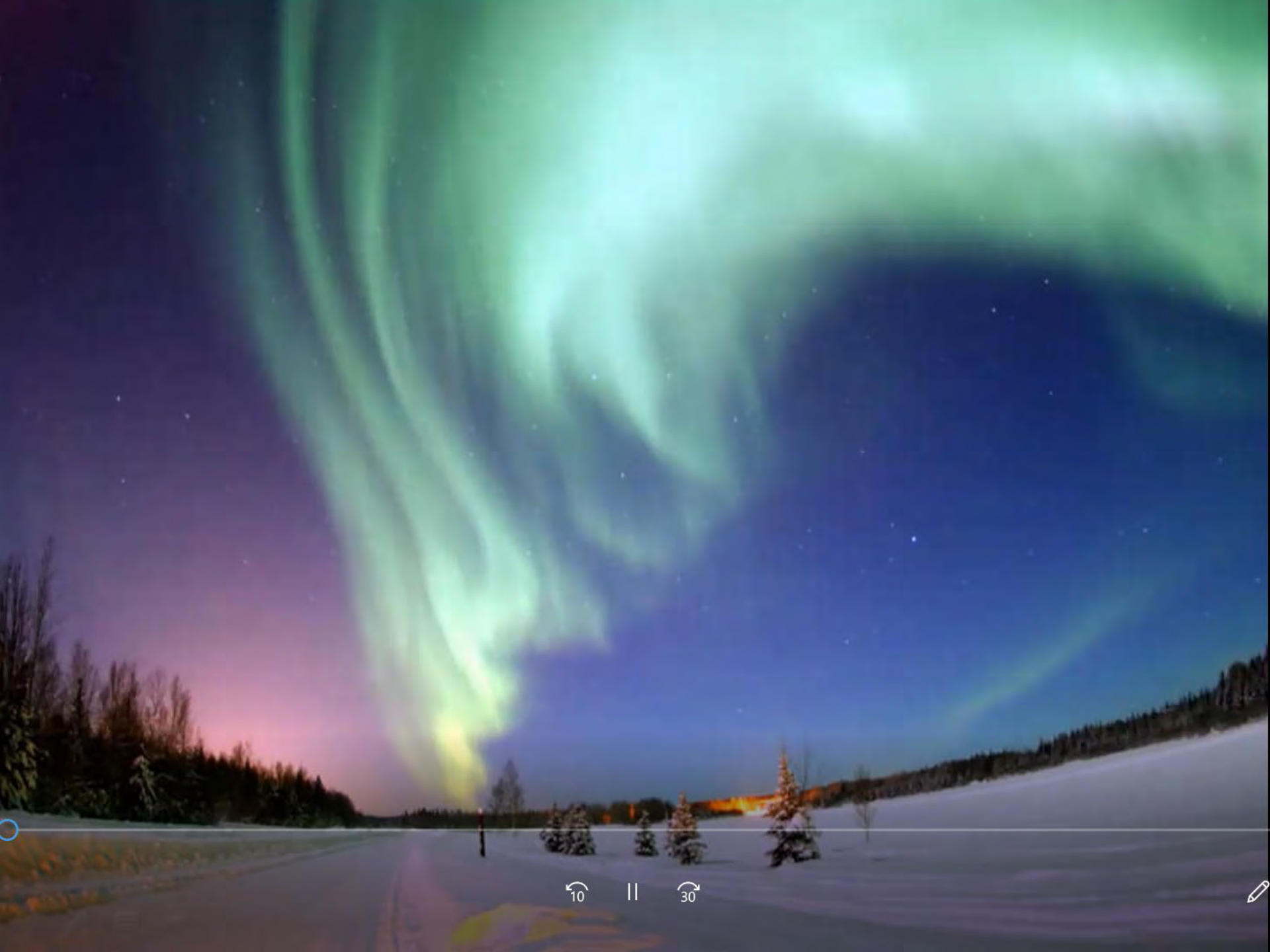
Solar Wind
& Cosmic Rays



Magnetic Field—
Solar Wind Interaction


Earth's Magneto Sphere
Bow Sock
Polar Cusp
Solsr Wind
Magneto Tail
Closed Field Lines
Open Field Lines
Radiation Belts
SHOCKED SOLAR PARTICLES

Red and green colors predominate in this view of the Aurora Australis photographed from the Space Shuttle in May 1991 at the peak of the last geomagnetic maximum. The payload bay and tail of the Shuttle can be seen on the right hand side of the picture.

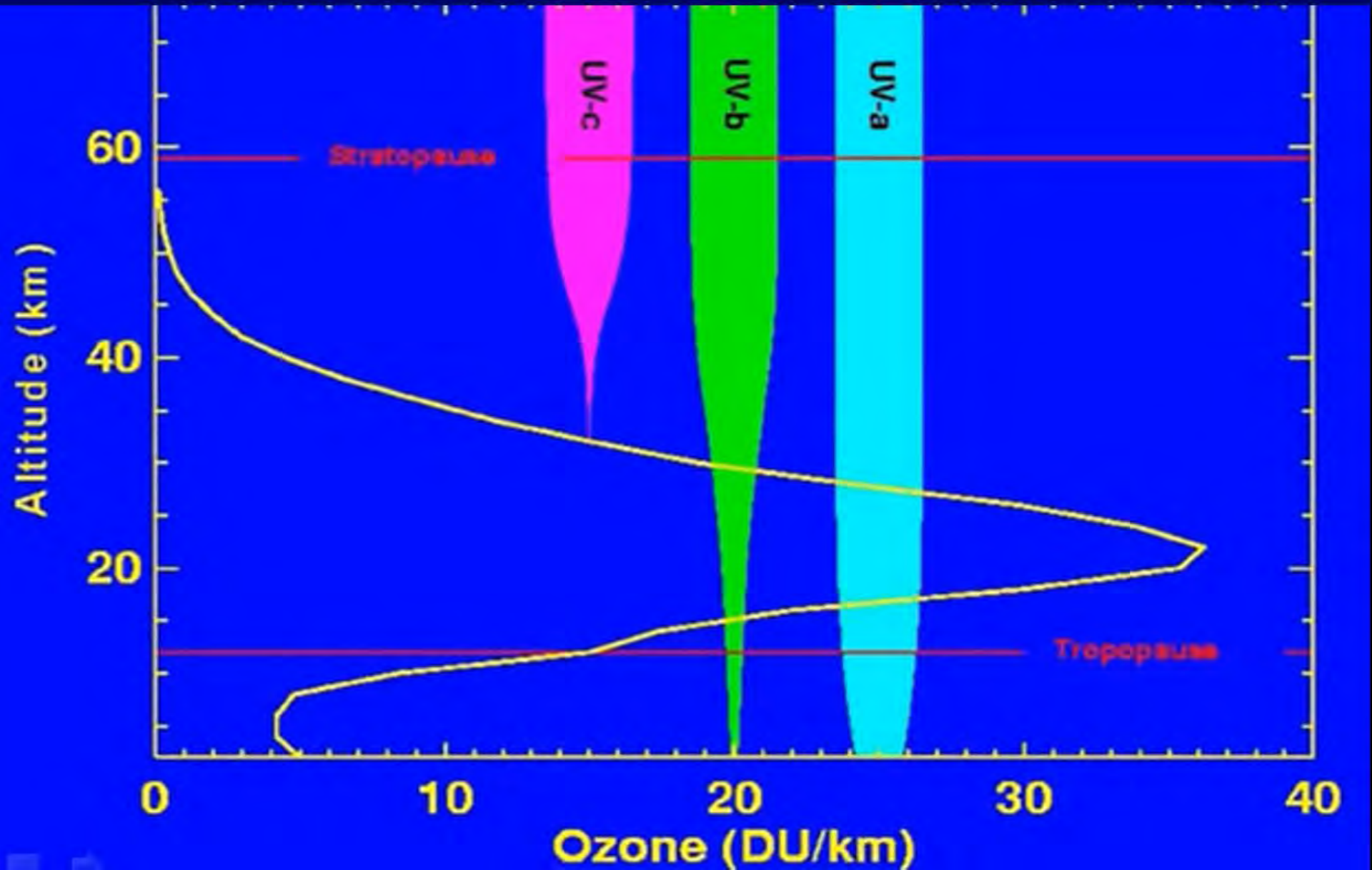

10
30

Earth's Ozone Layer:
UV Radiation Shield

Height: ~ 20-50 miles

- Composition: O_3
- Characteristic: UV Absorber

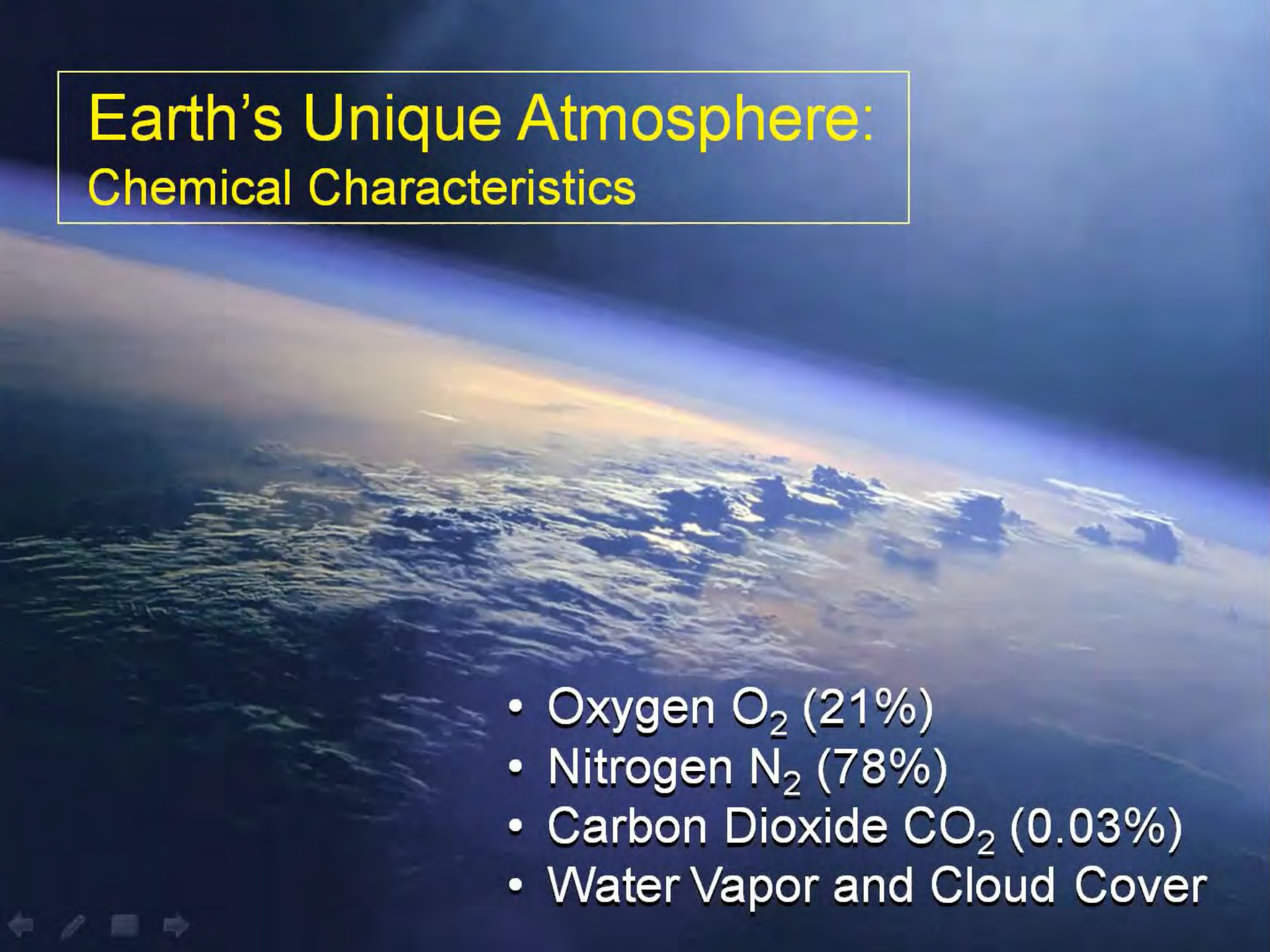
UV Screening by The Ozone Layer

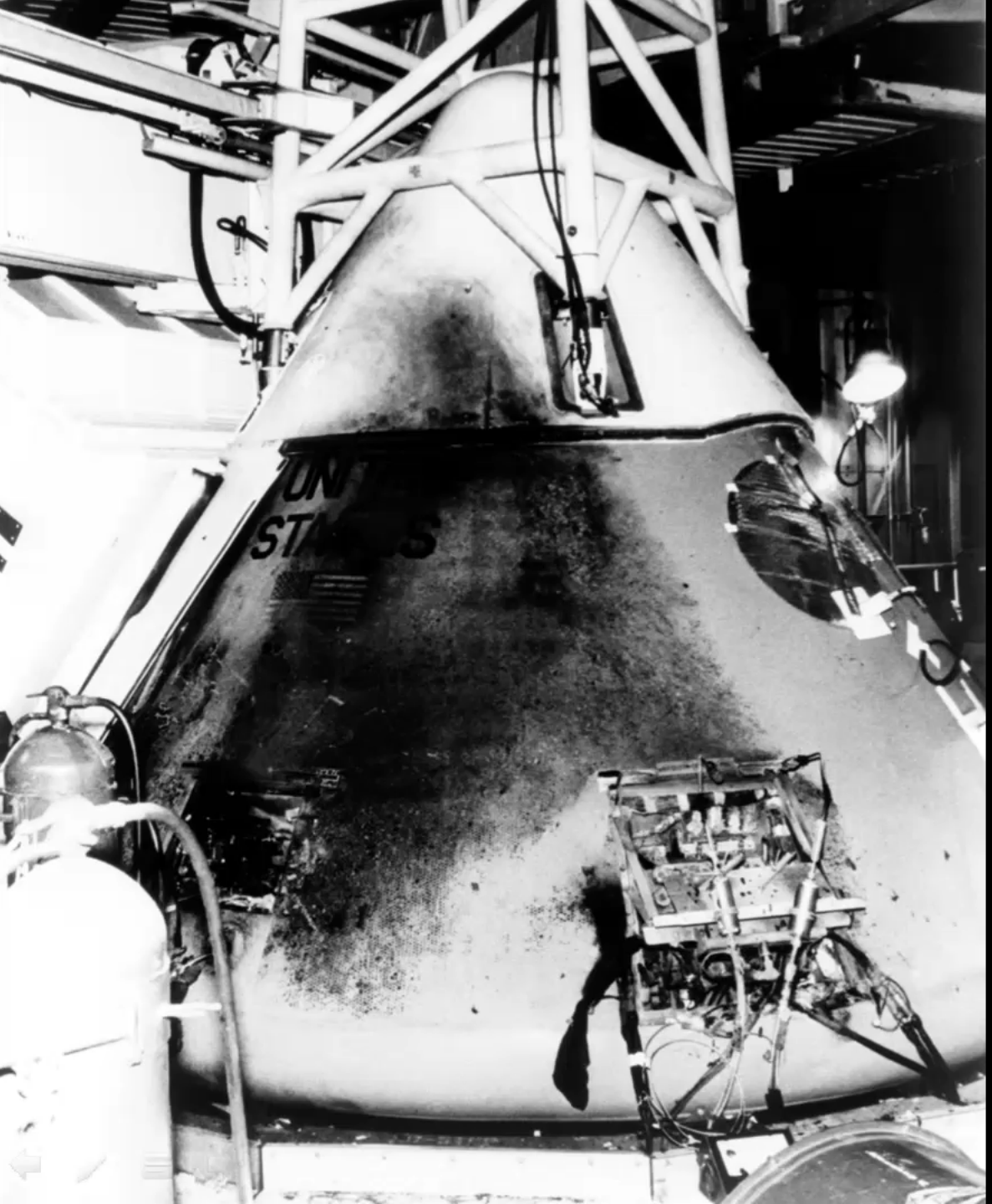


Planetary Factors that Control The Earth's Temperature

The factors required to maintain Earth's special temperature and its ability to sustain water permanently on its surface, in addition to its preferred distance from the Sun and solar radiance; also depends on planetary characteristics and include at least:

1. Cloud Cover
2. Atmospheric Composition
3. Atmospheric Circulation
4. Ocean Circulation
5. Tilt of Earth's Axis
6. Radioactive Decay in Earth's Core


Earth's Unique Atmosphere:
Chemical Characteristics
• Oxygen O_2 (21%)
• Nitrogen N_2 (78%)
• Carbon Dioxide CO_2 (0.03%)
• Water Vapor and Cloud Cover



October 18, 1966

The Apollo-1 Accident

Cause:

100% Oxygen cabin atmosphere at 2 psi above normal atmospheric pressure (>5X partial pressure of oxygen in the atmosphere at sea level)

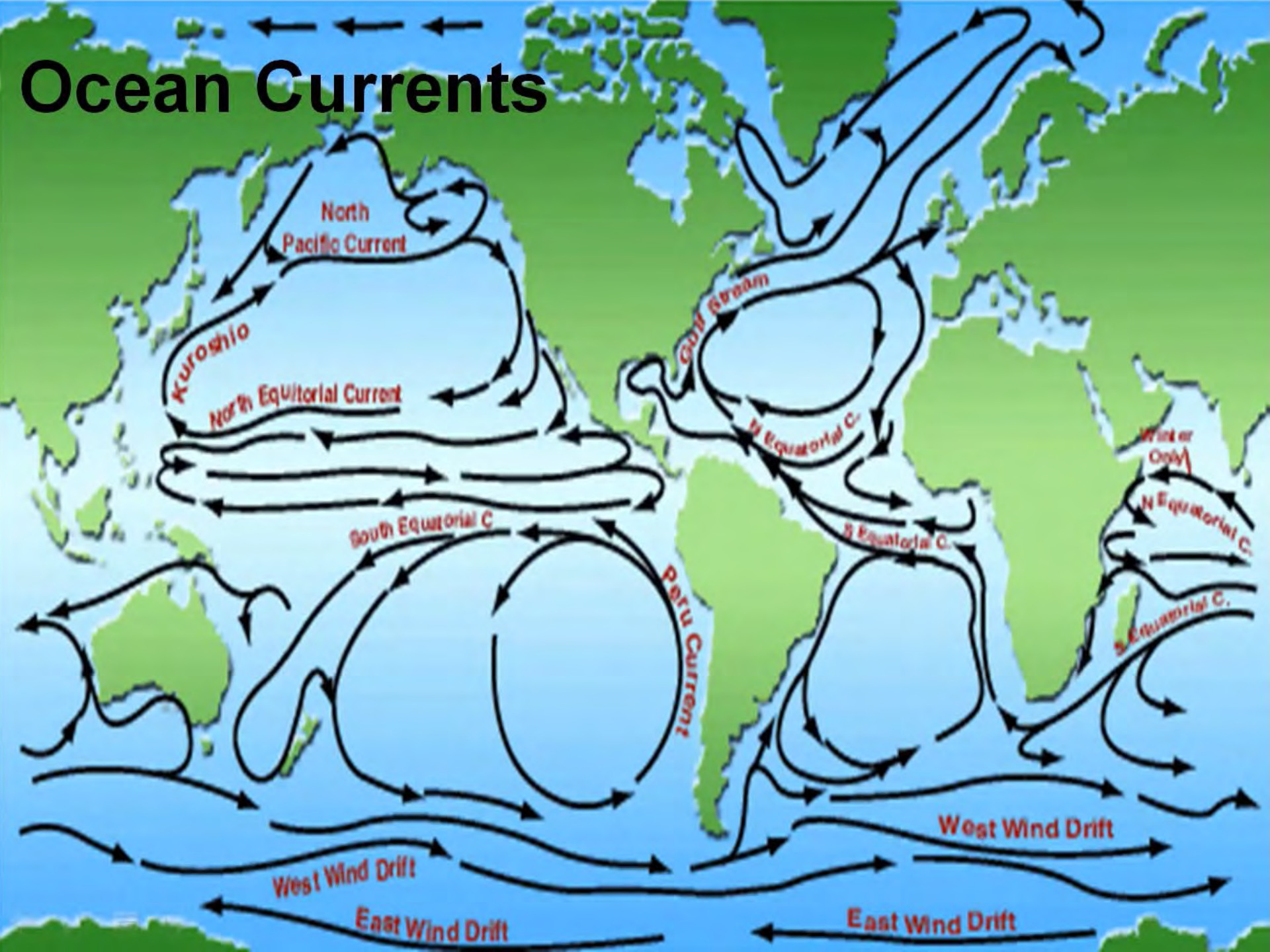
Redesign:

60% oxygen and 40% nitrogen 14.7 psi.

Although our atmosphere has sufficient oxygen to enable the metabolism required for life, and normal combustion, because it is 78% nitrogen, oxidation is controllable.


Earth's Oceans:
The Uniqueness of Water

Ocean Currents




Ice Floats!

Because Ice floats, it breaks up and melts in the summer.


If ice did not float…

The most striking result of some fifty years of space exploration is the unavoidable realization that the

Earth is very special

…as would be expected from Genesis 1

"One cannot be exposed to the law and order of the universe without concluding that there must be a Divine Intent behind it all."

Werner von Braun
October 1976

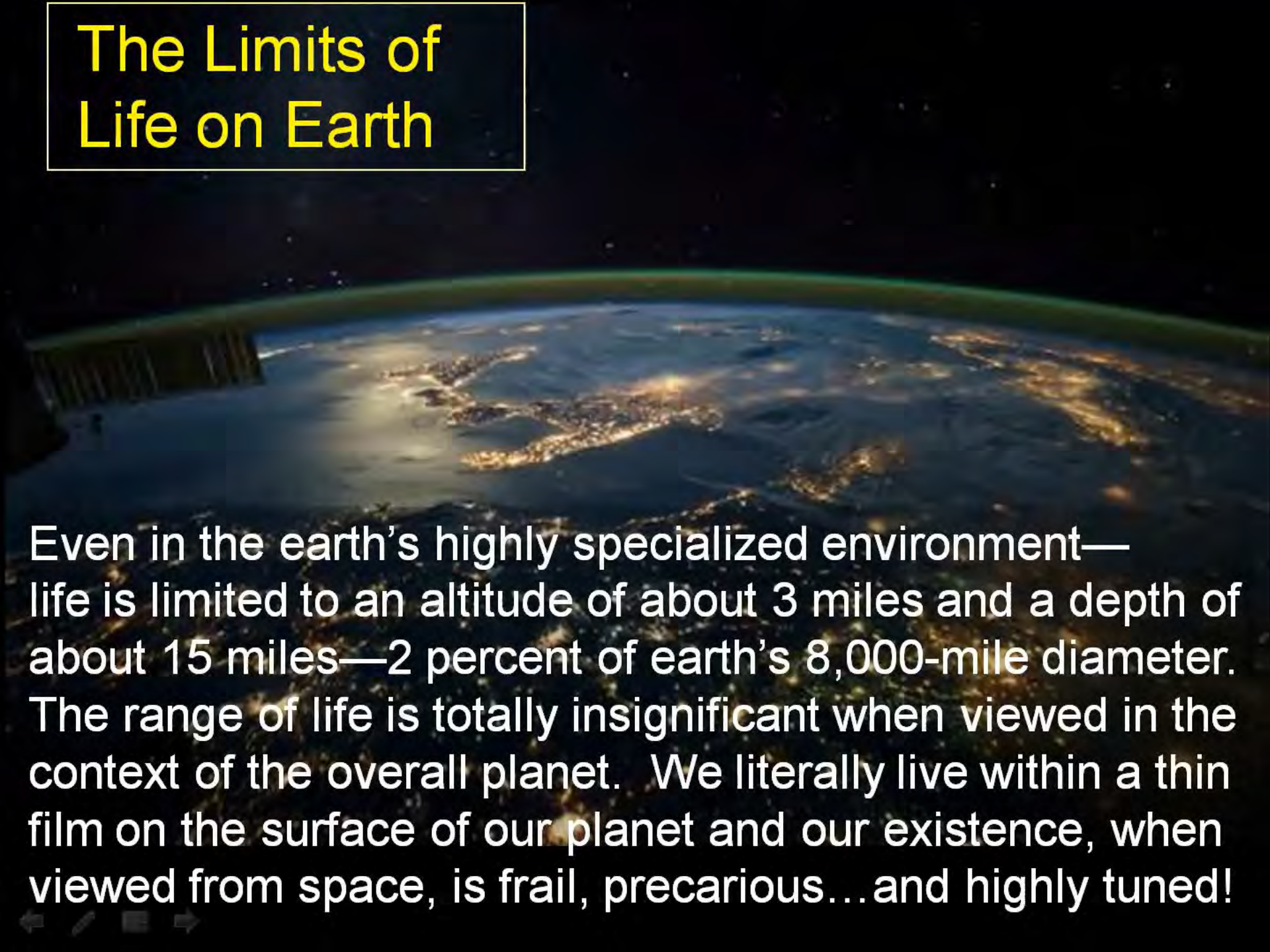
The Admonition of Scripture

"For since the creation of the world, God's invisible qualities—his eternal power and divine nature—have been clearly seen, being understood from what has been made…"

Romans 1:20

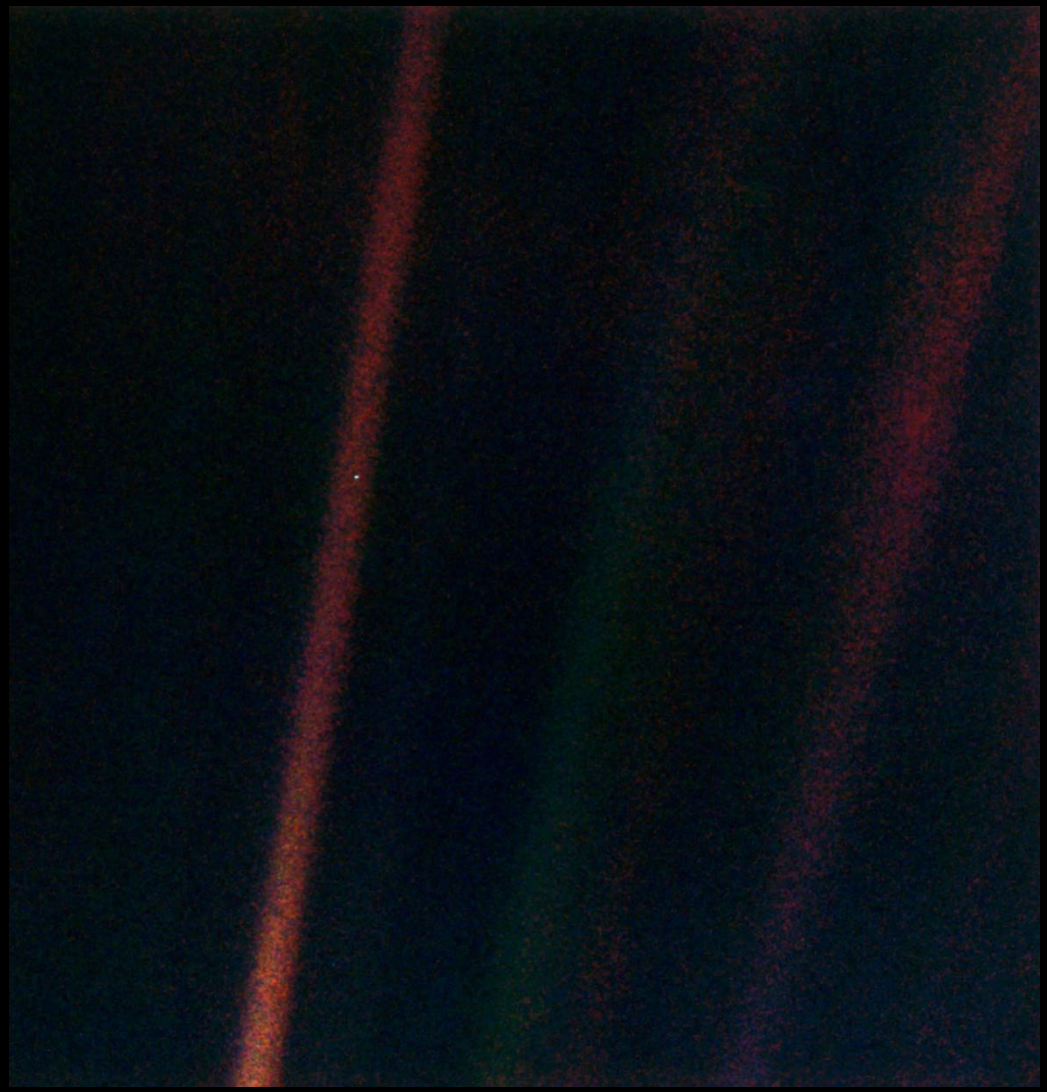

In a real sense,
Earth is an oasis—
a garden in which
God has planted life

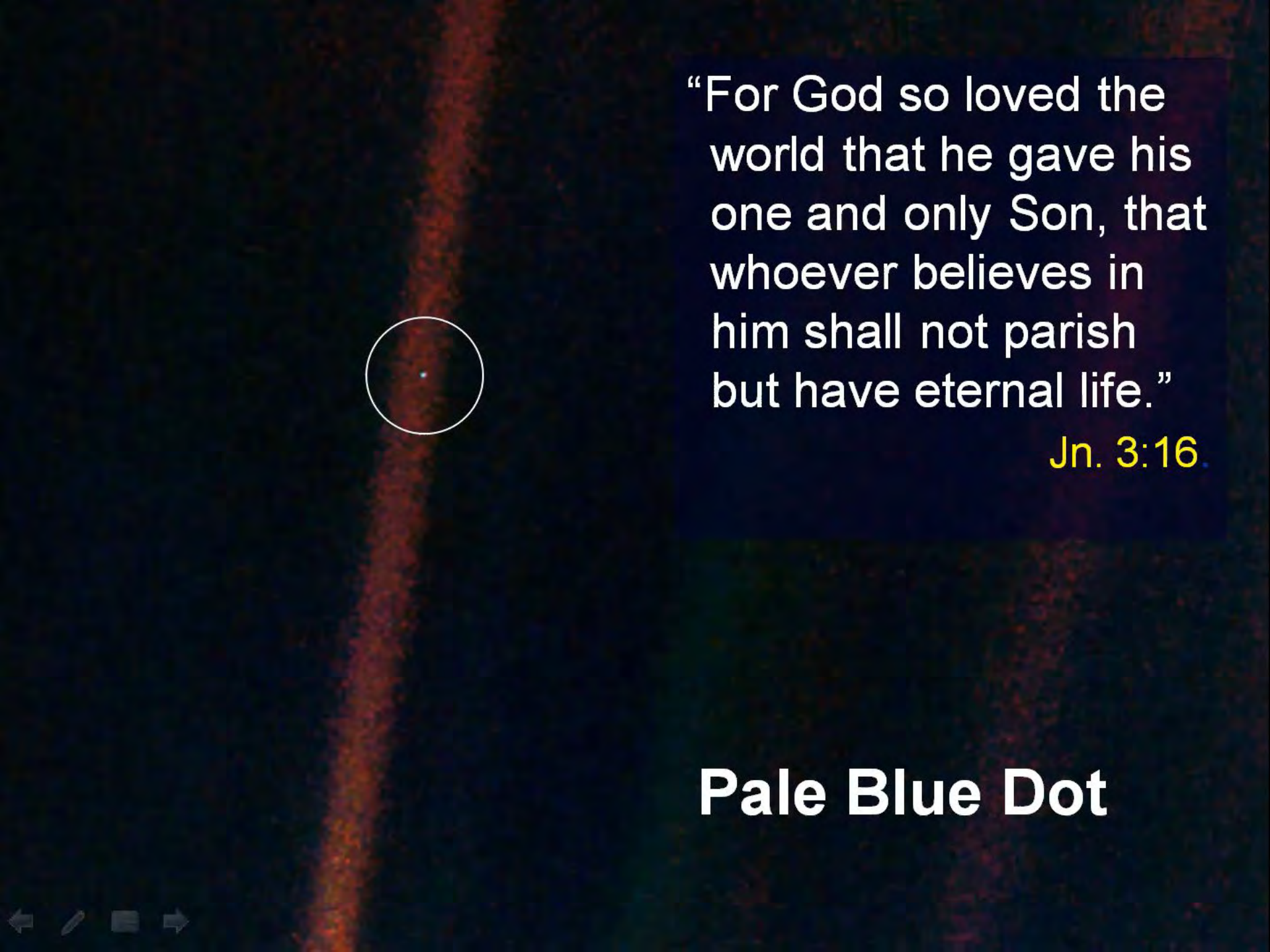
The Limits of Life on Earth



Even in the earth's highly specialized environment—life is limited to an altitude of about 3 miles and a depth of about 15 miles—2 percent of earth's 8,000-mile diameter. The range of life is totally insignificant when viewed in the context of the overall planet. We literally live within a thin film on the surface of our planet and our existence, when viewed from space, is frail, precarious…and highly tuned!

The Pale Blue Dot




"For God so loved the world that he gave his one and only Son, that whoever believes in him shall not parish but have eternal life."
Jn. 3:16.
Pale Blue Dot