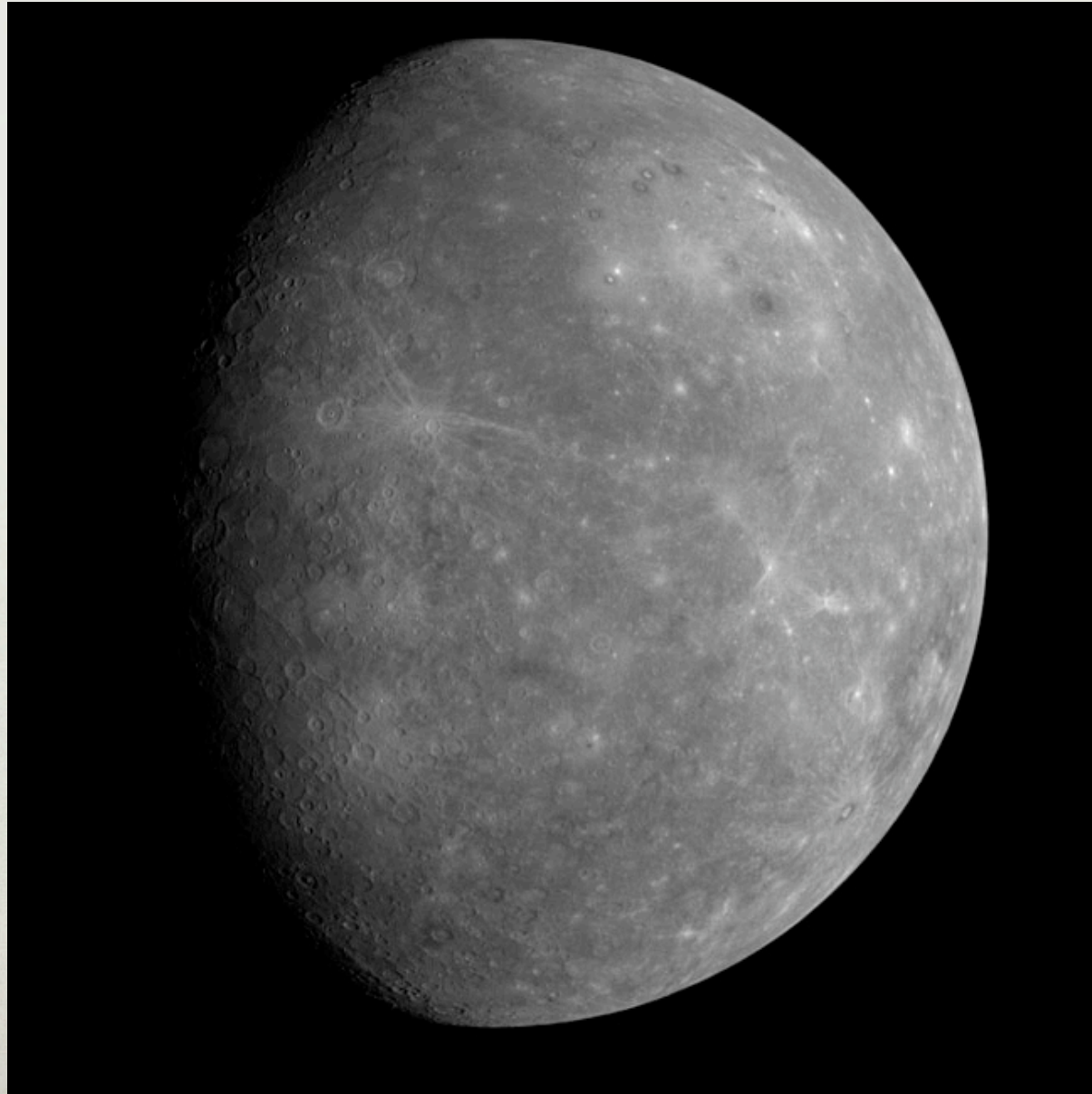


# Planets and Exoplanets

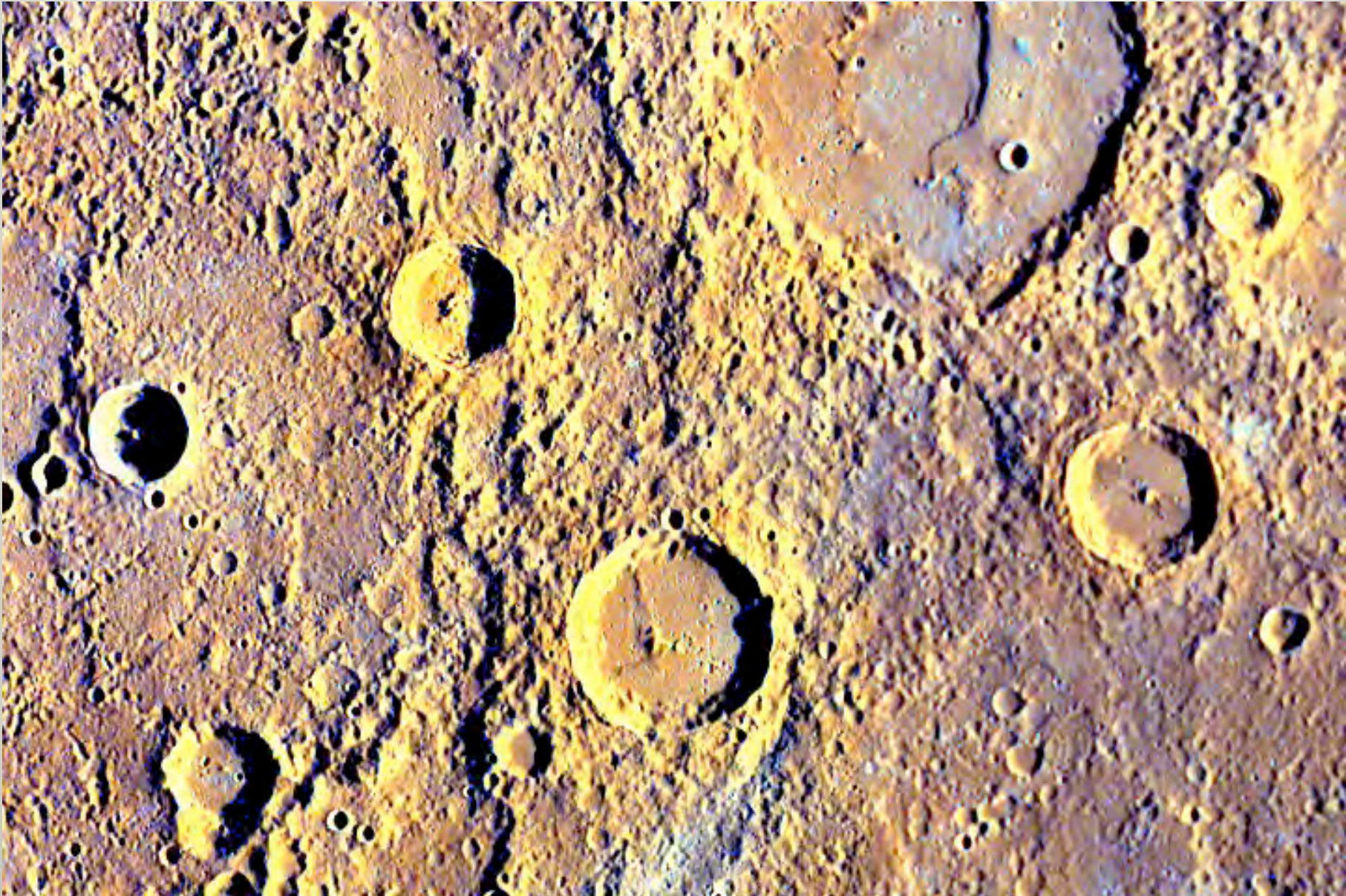
Observations of Solar System Planets

# MERCURY FROM MESSENGER

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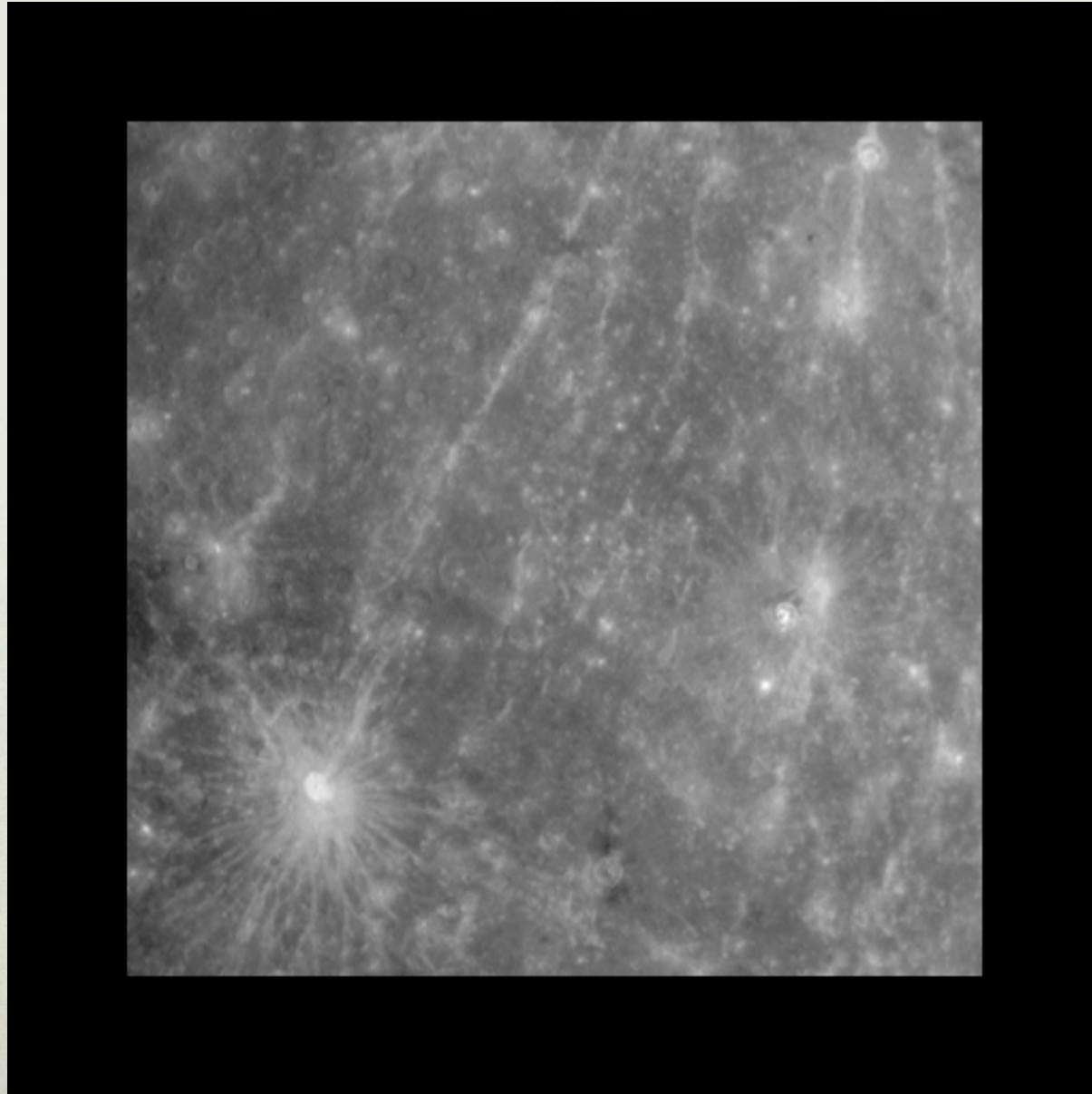


# MERCURY SURFACE DETAILS



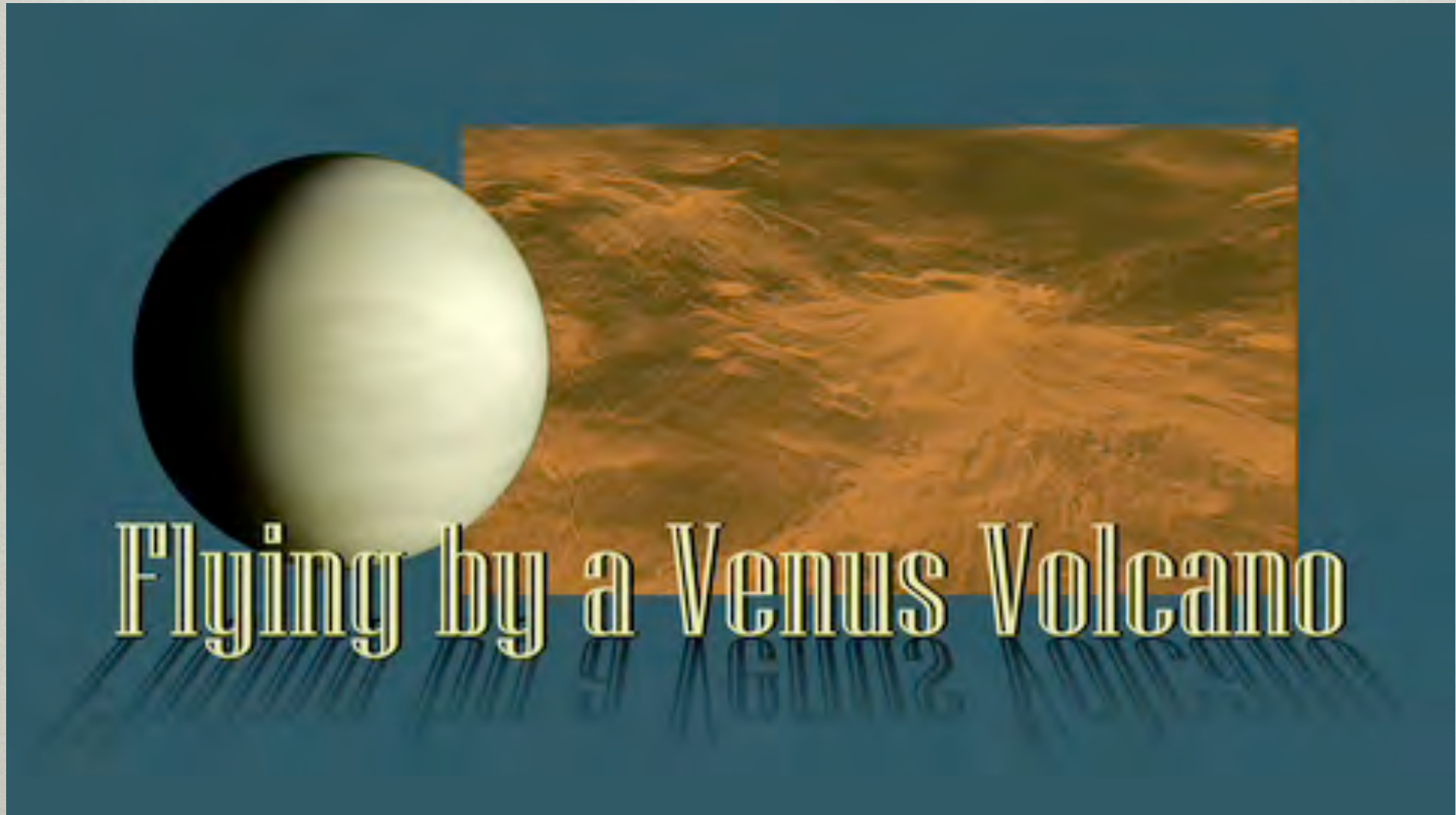
# LEAVING MERCURY

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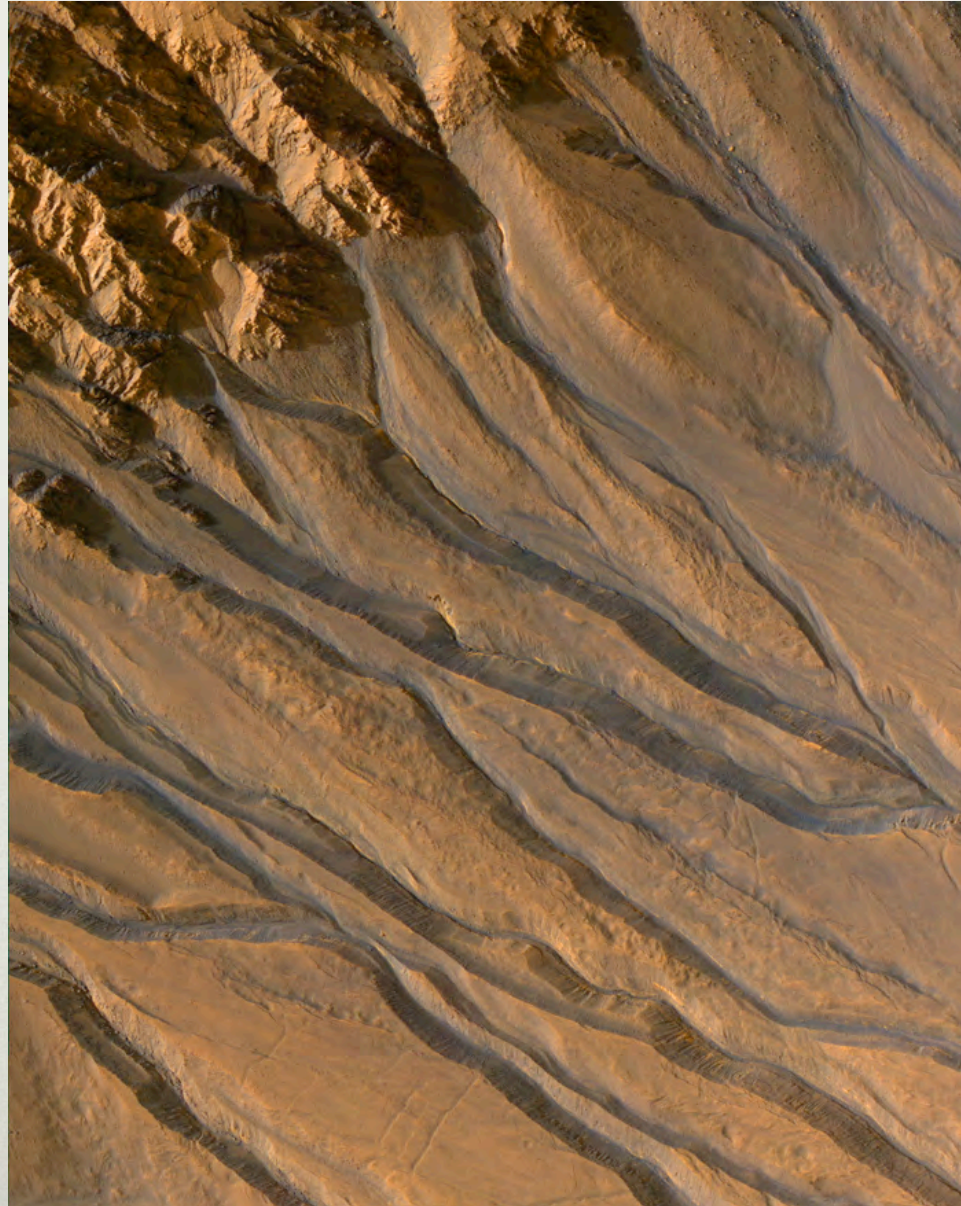
# VENUS VOLCANO

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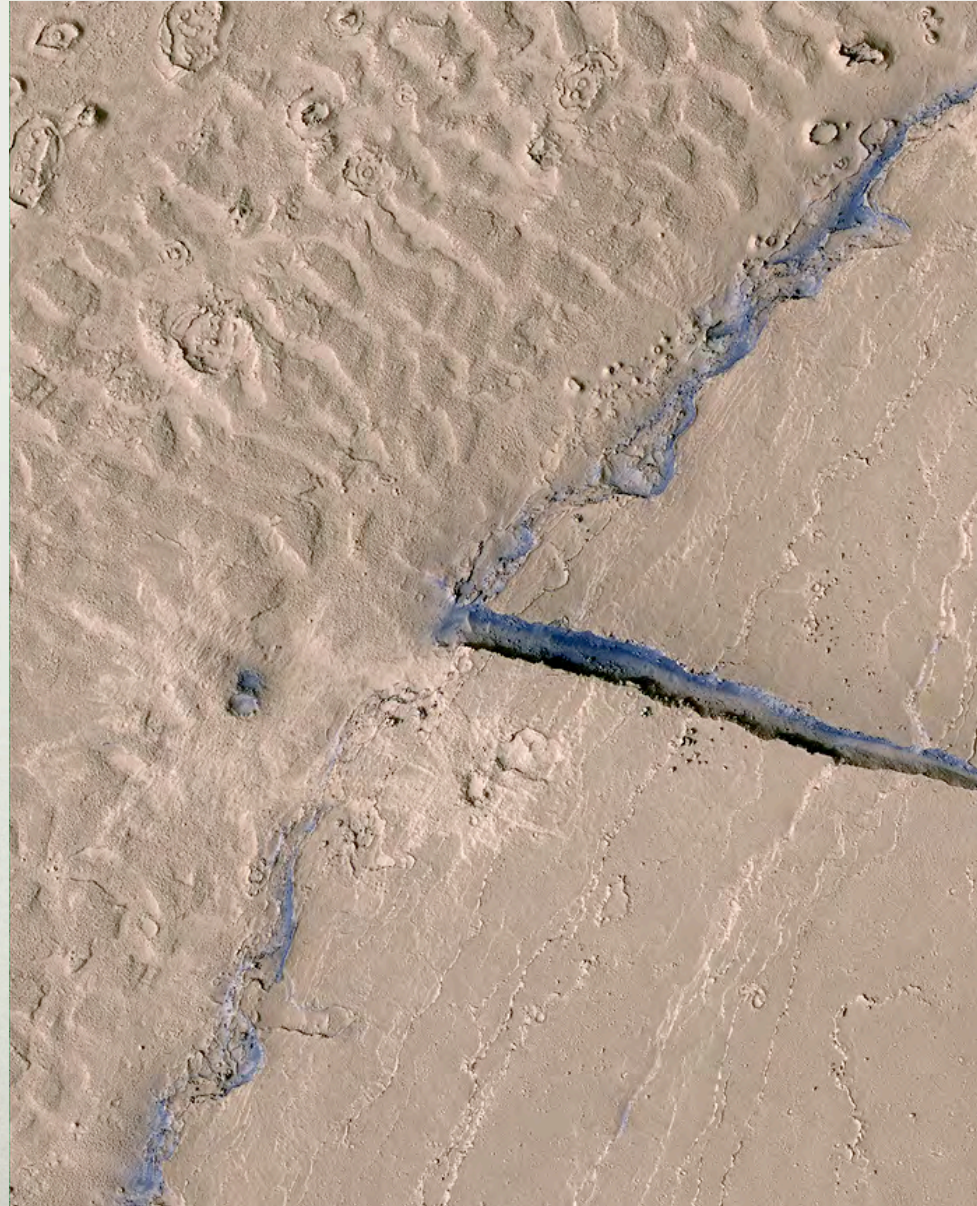
# MARS GULLY CHANNELS

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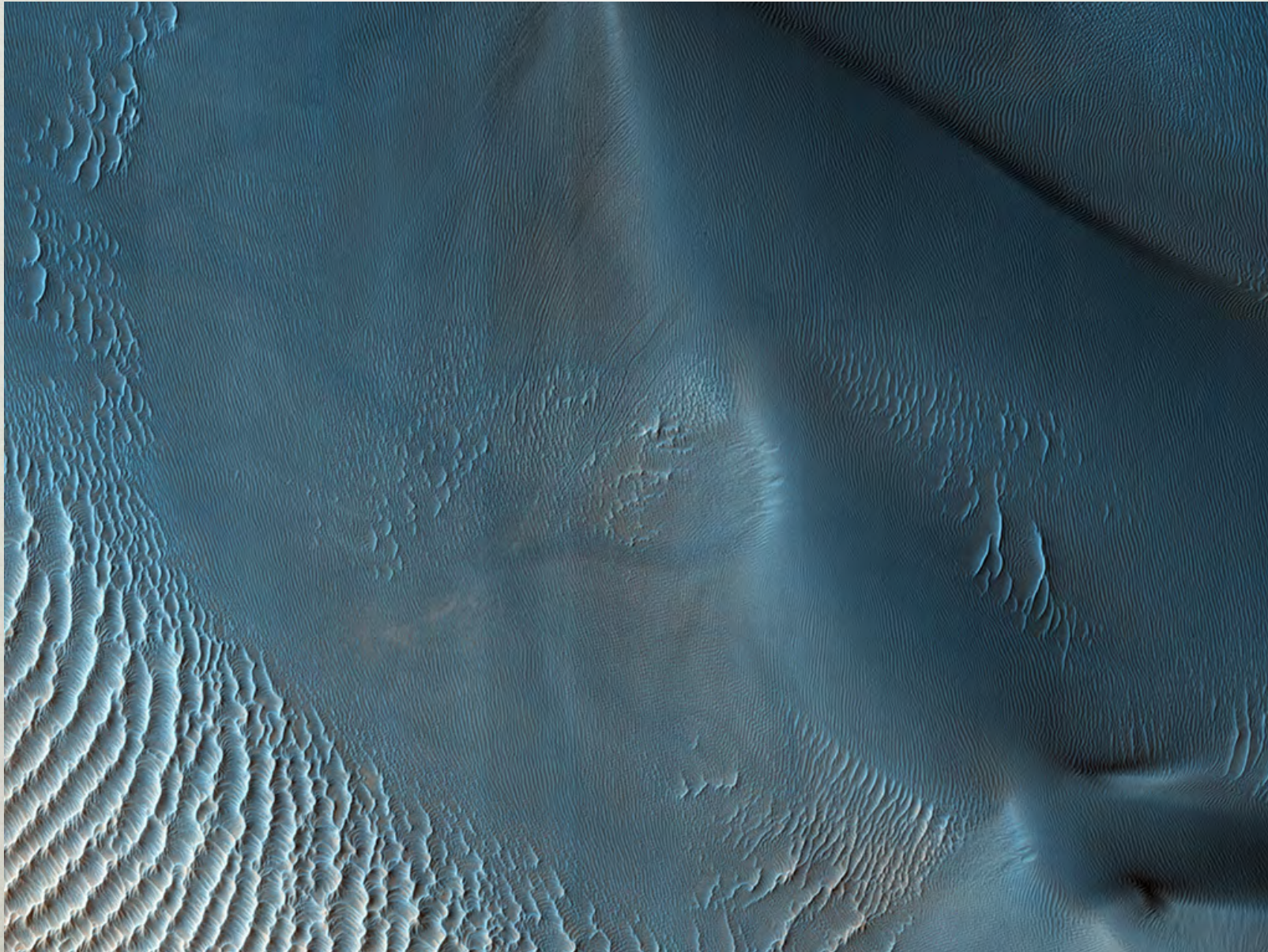
# MARS LAVA CHANNELS

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# MARS SAND DUNES

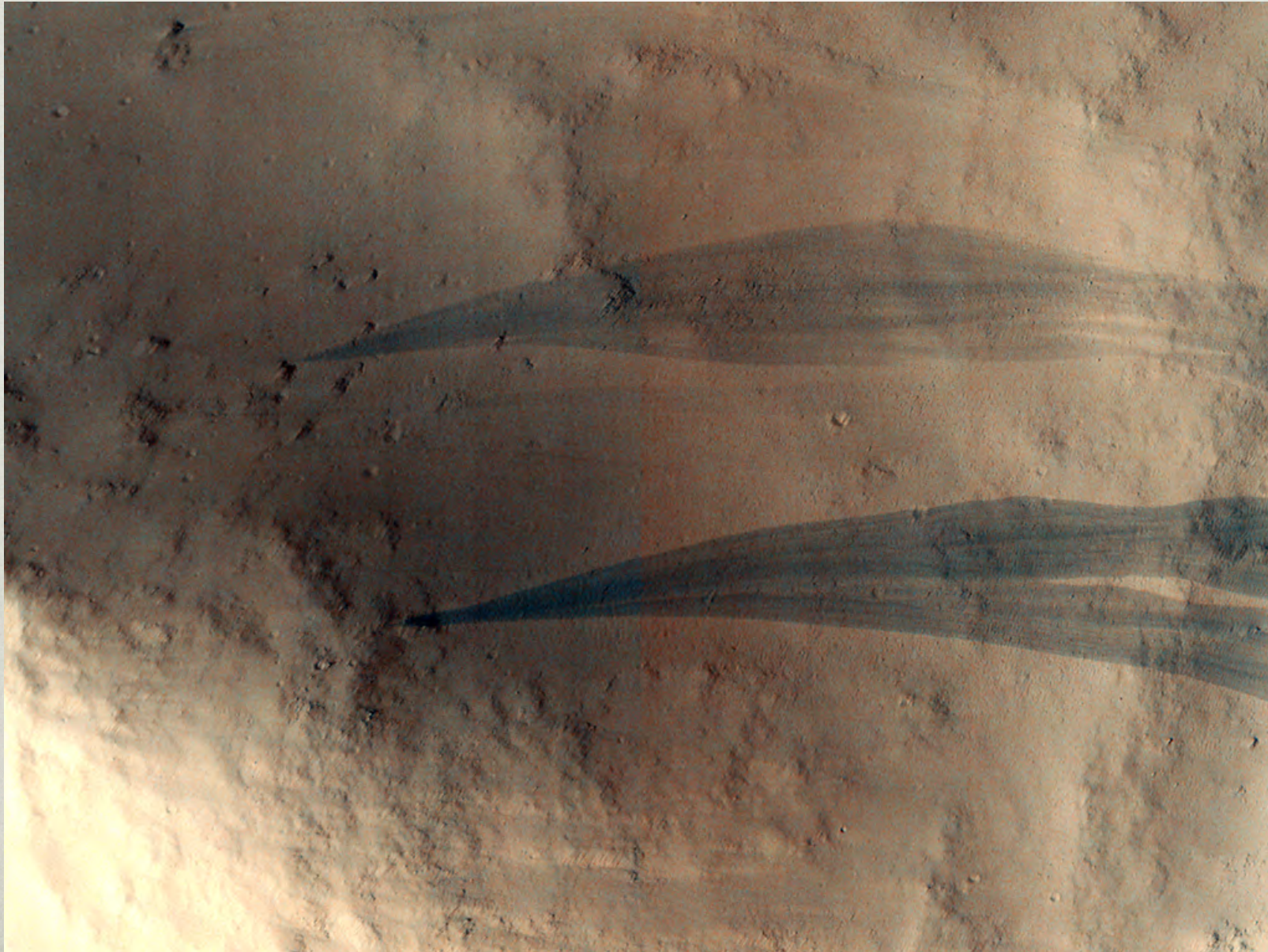
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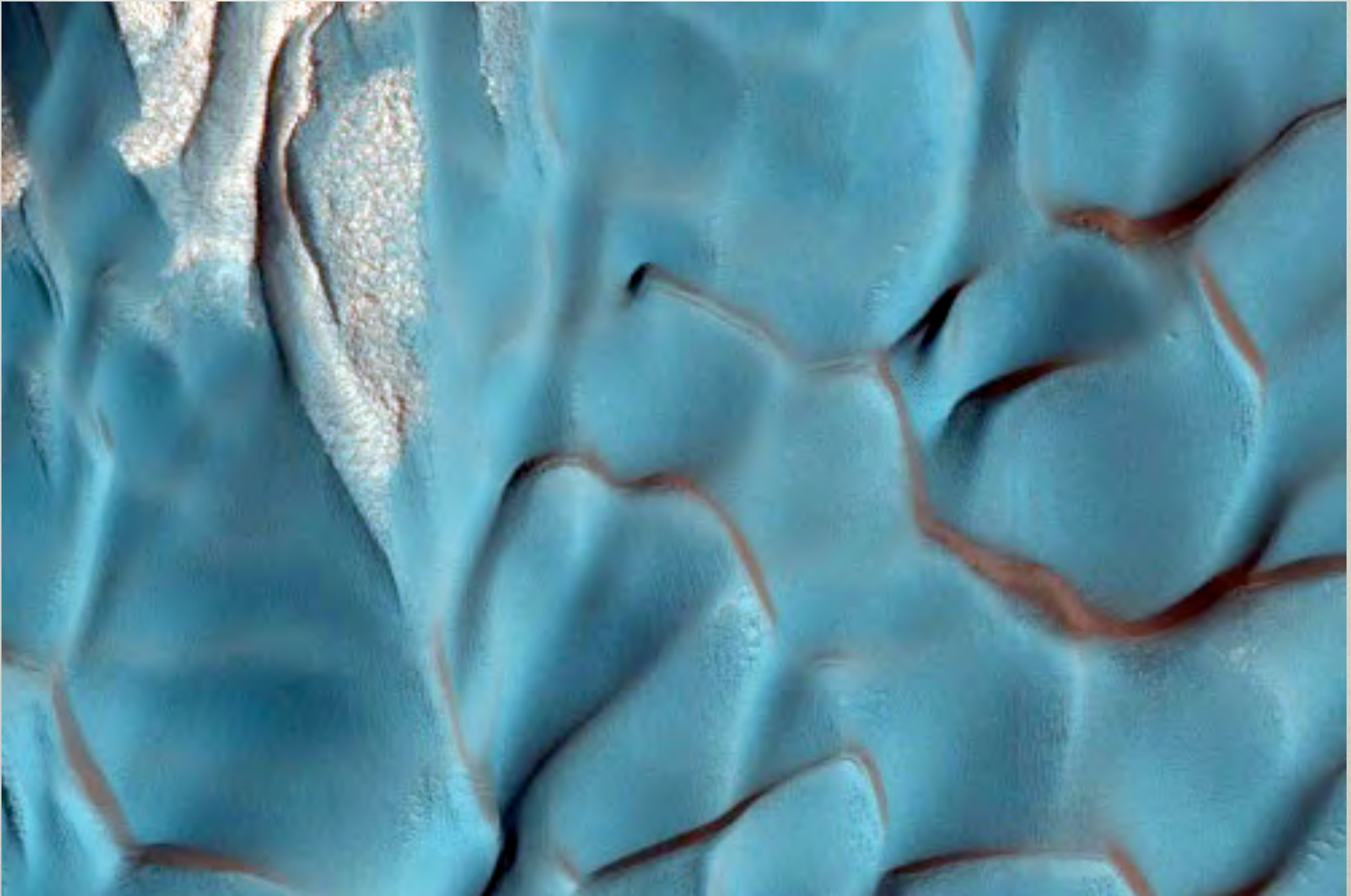


# MARS STREAKS ON SLOPES

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# MARS SLOPE STREAKS



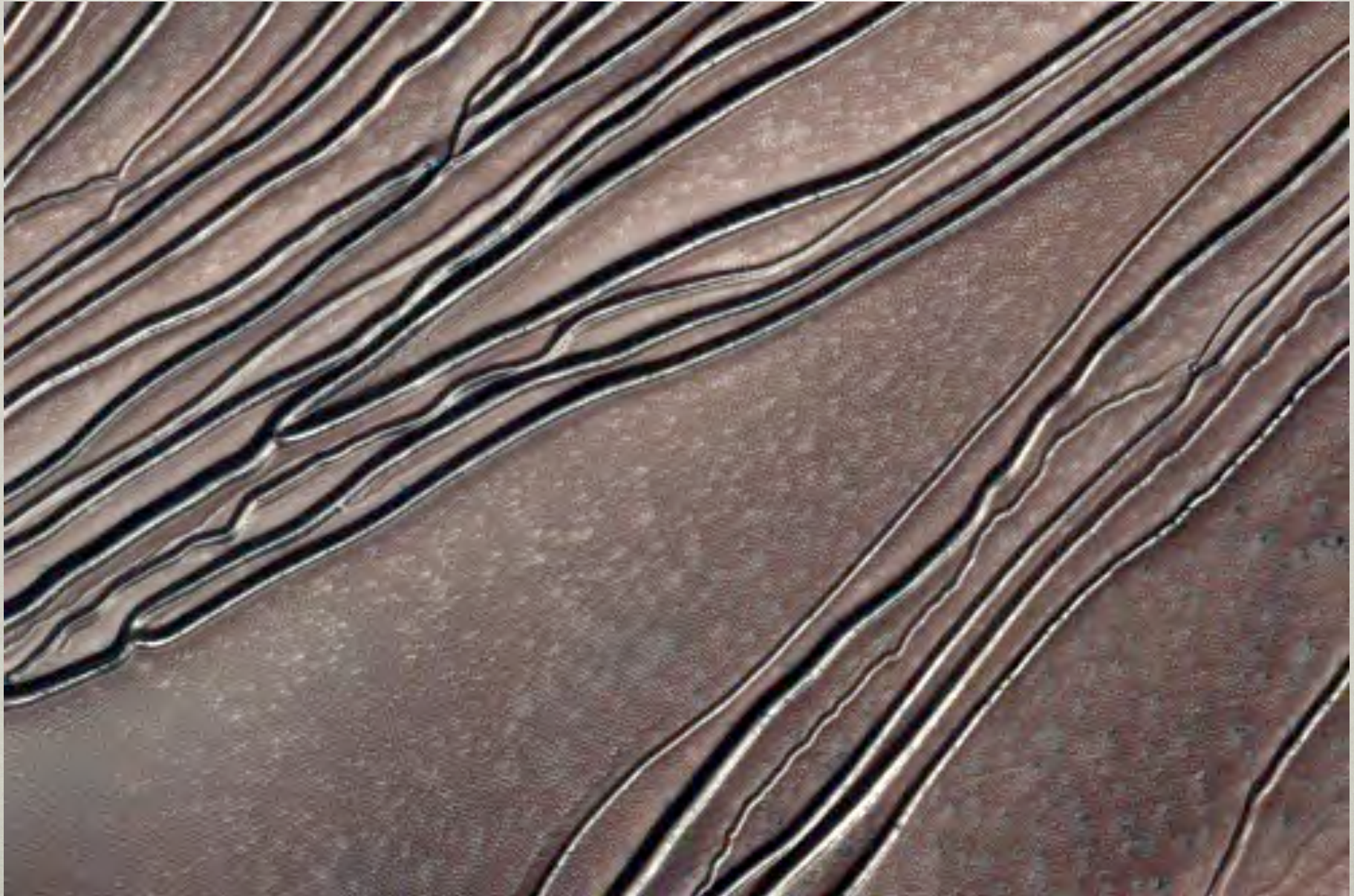
# MARS NORTH POLAR DEPOSIT



# MARS CRATER DUNES



# MARS CRATER DUNES IN WINTER

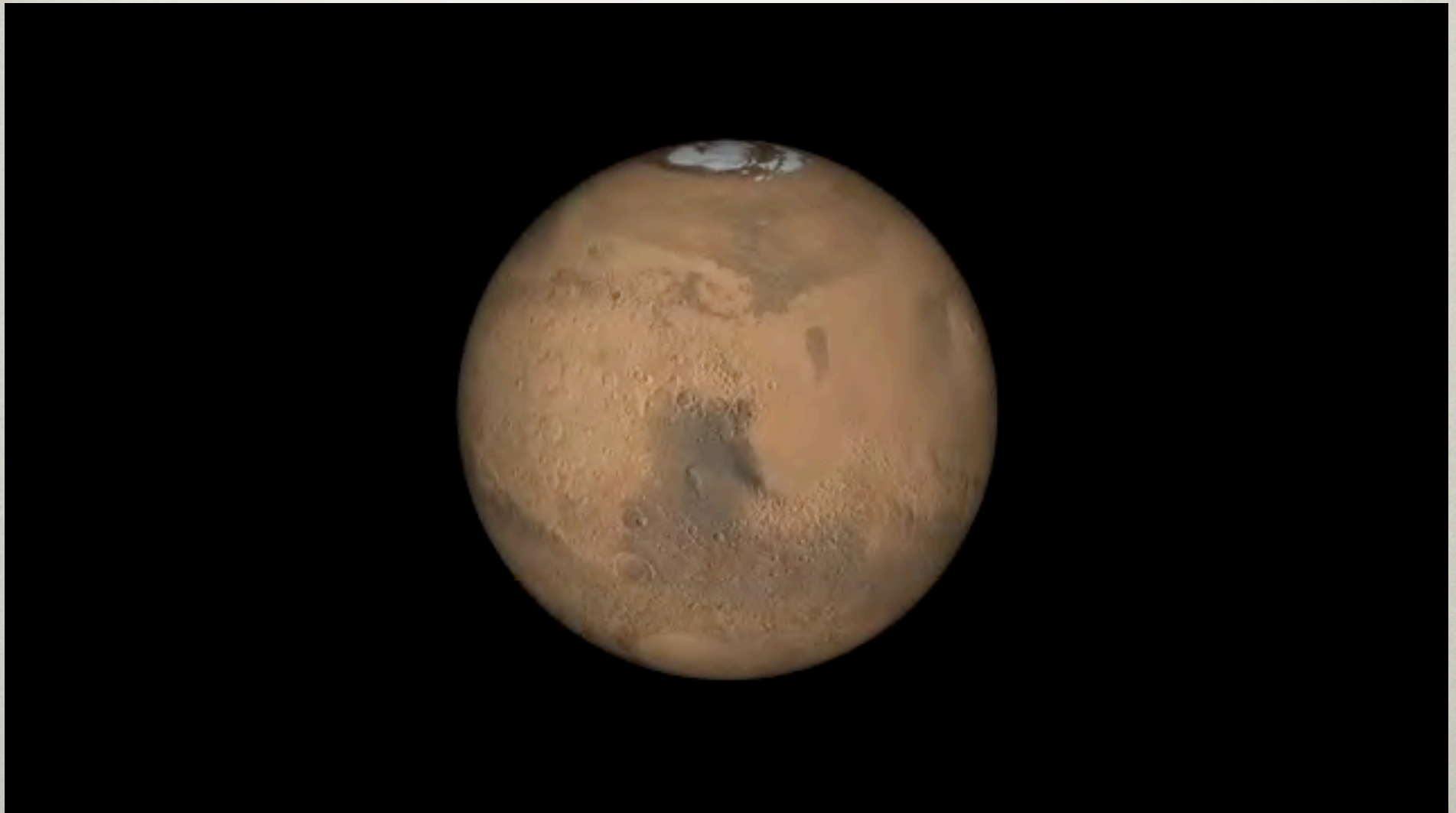


# MARS AVALANCHE



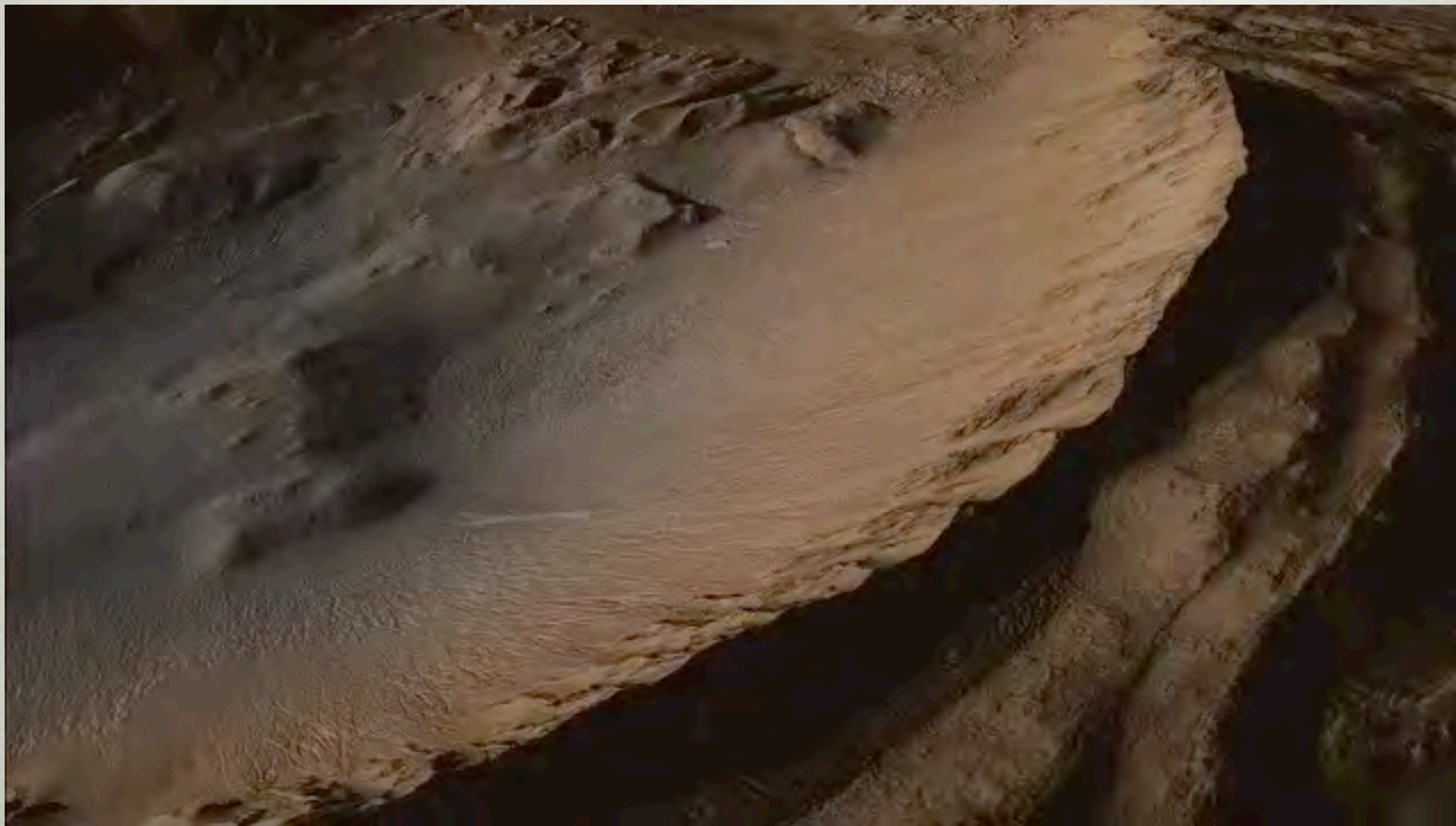
# FLYING OVER MARS

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# MARS CLOSEUP

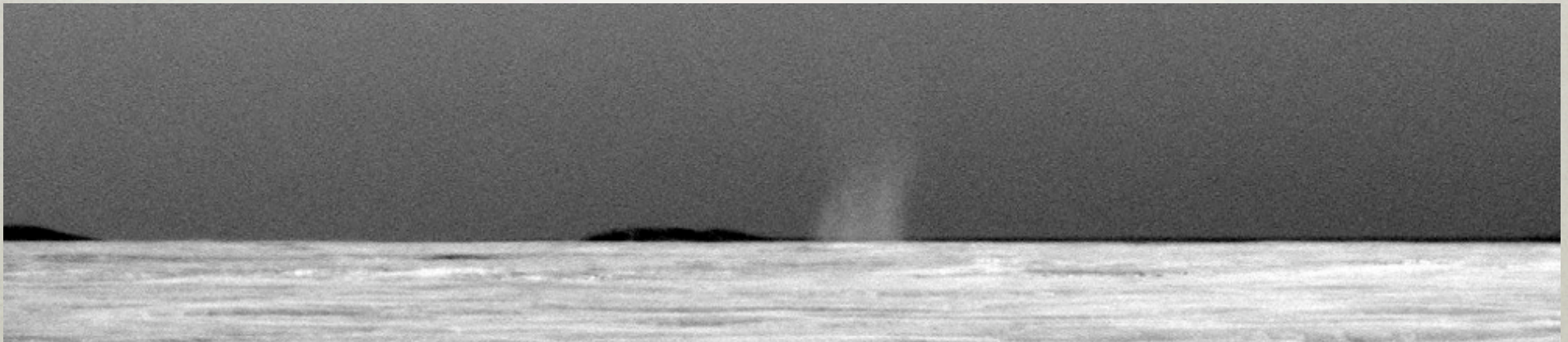
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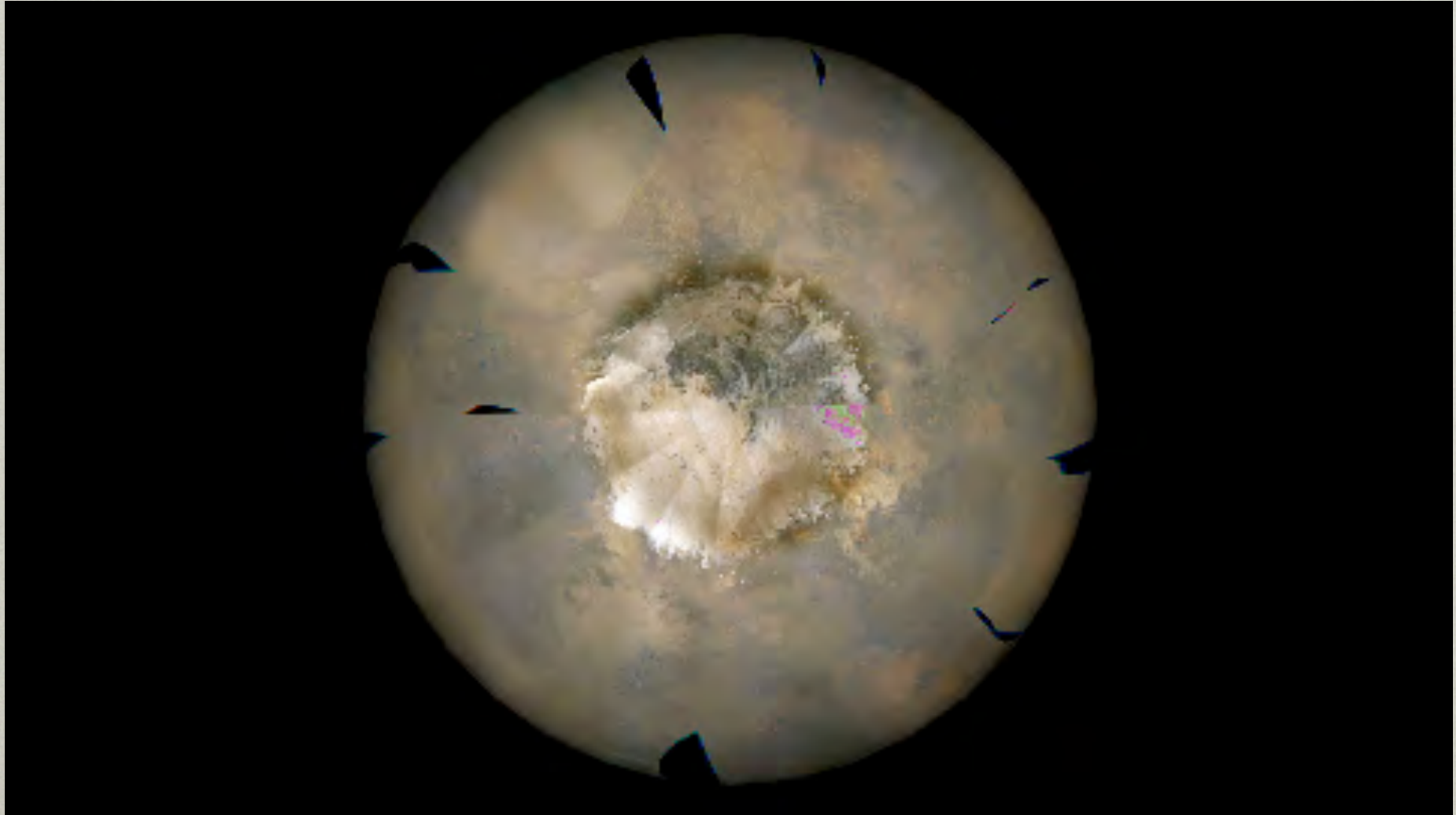
# MARS DUST DEVIL

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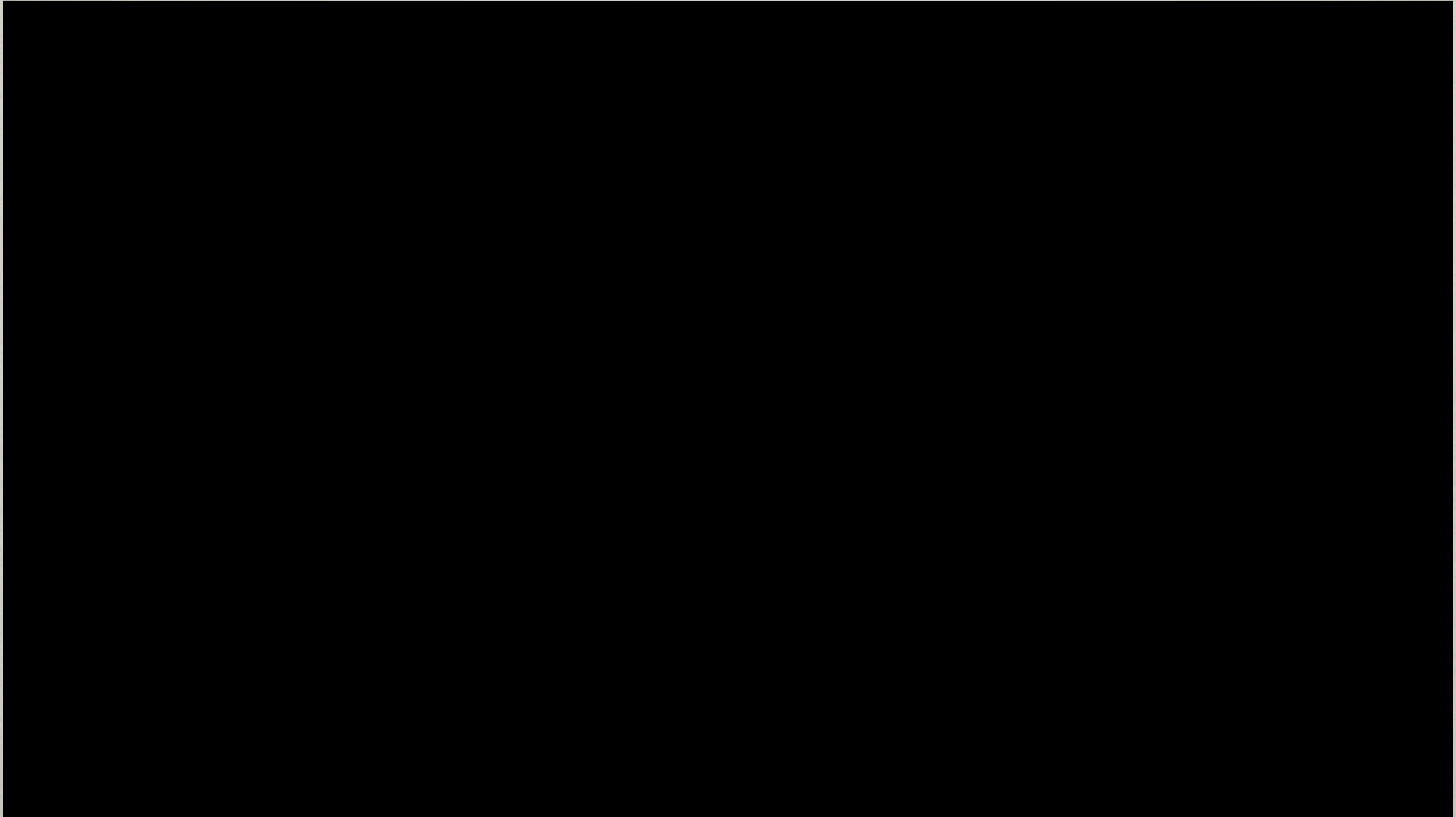
# MARS WEATHER

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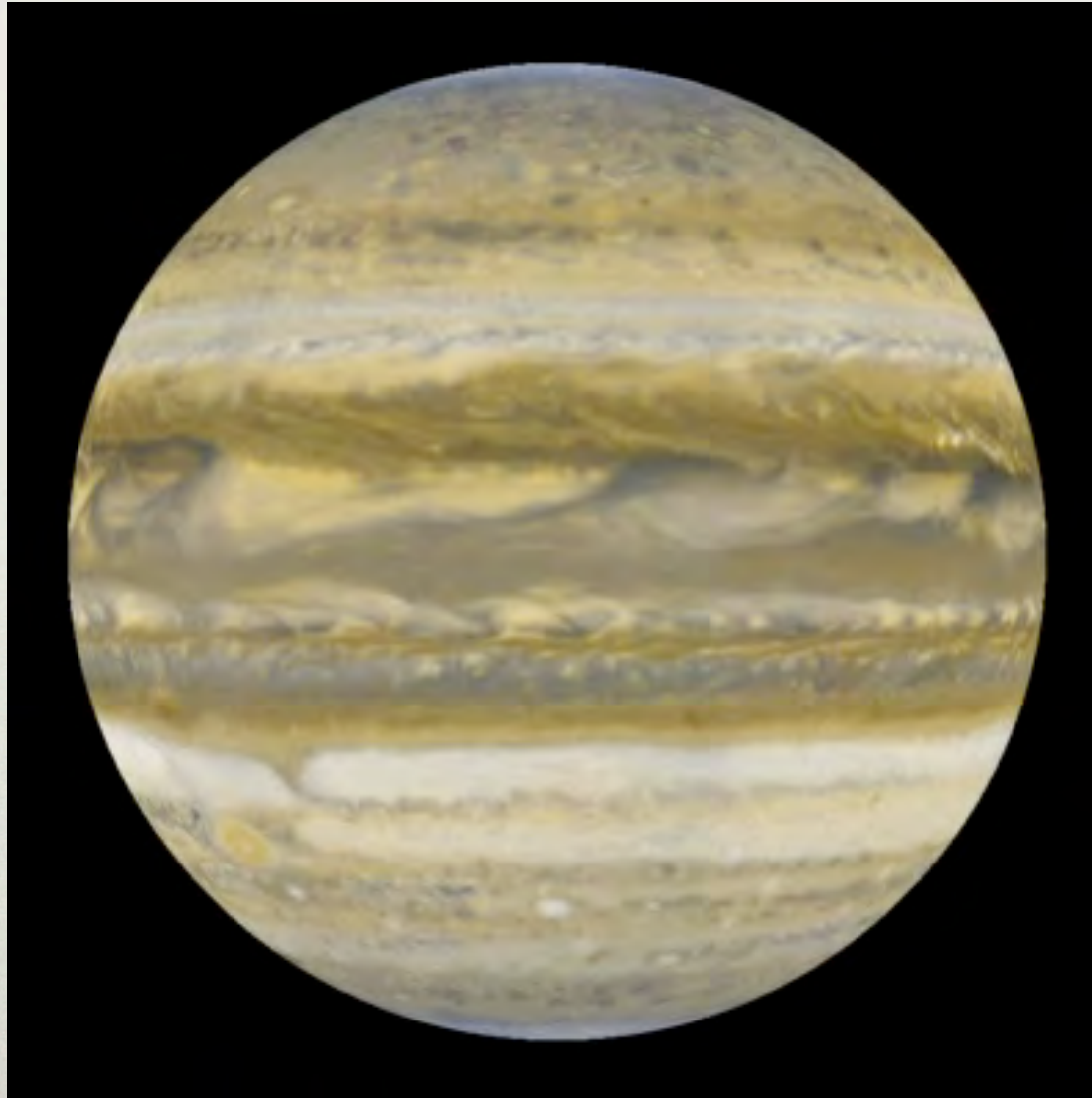
# MARS ROVER

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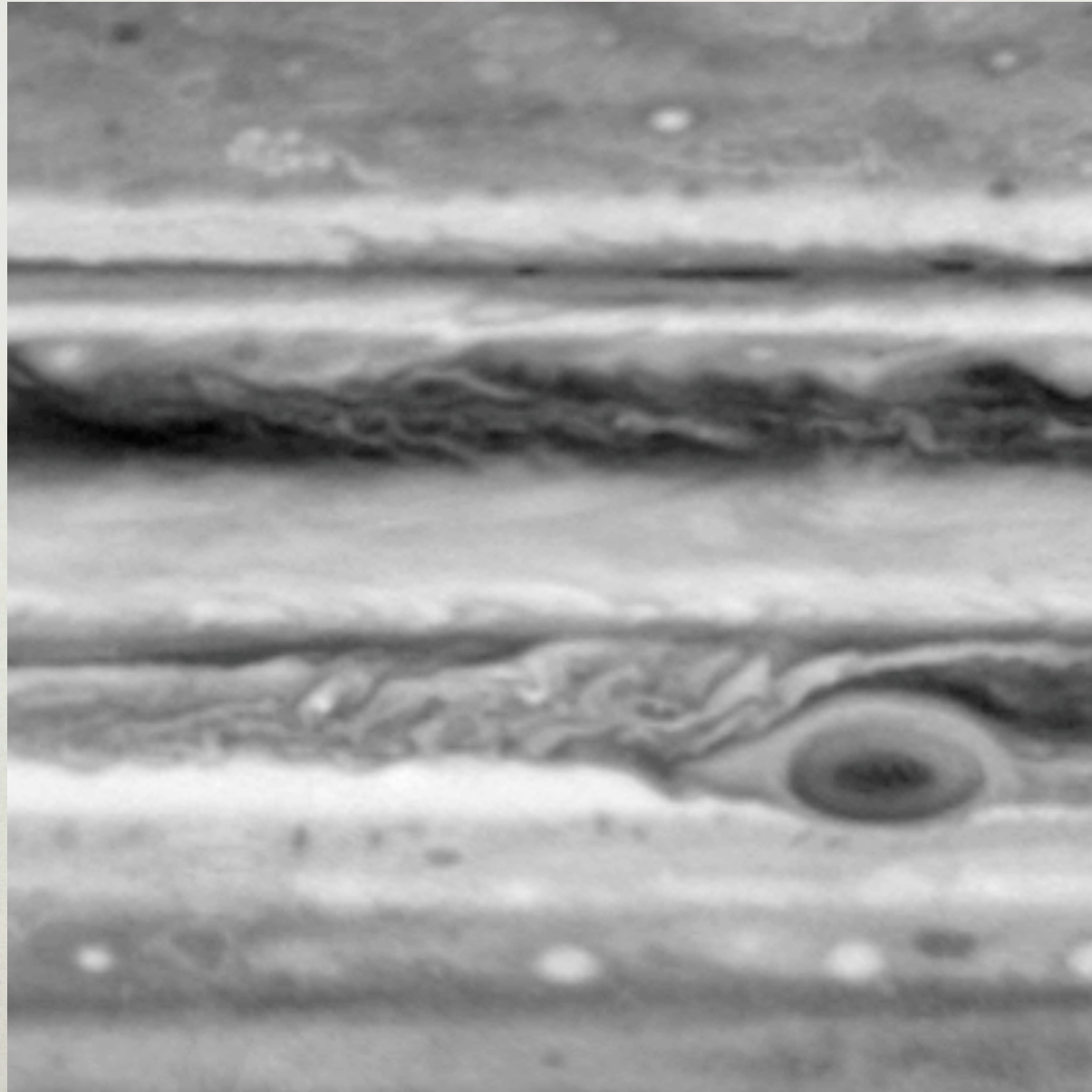
# JUPITER FROM HST

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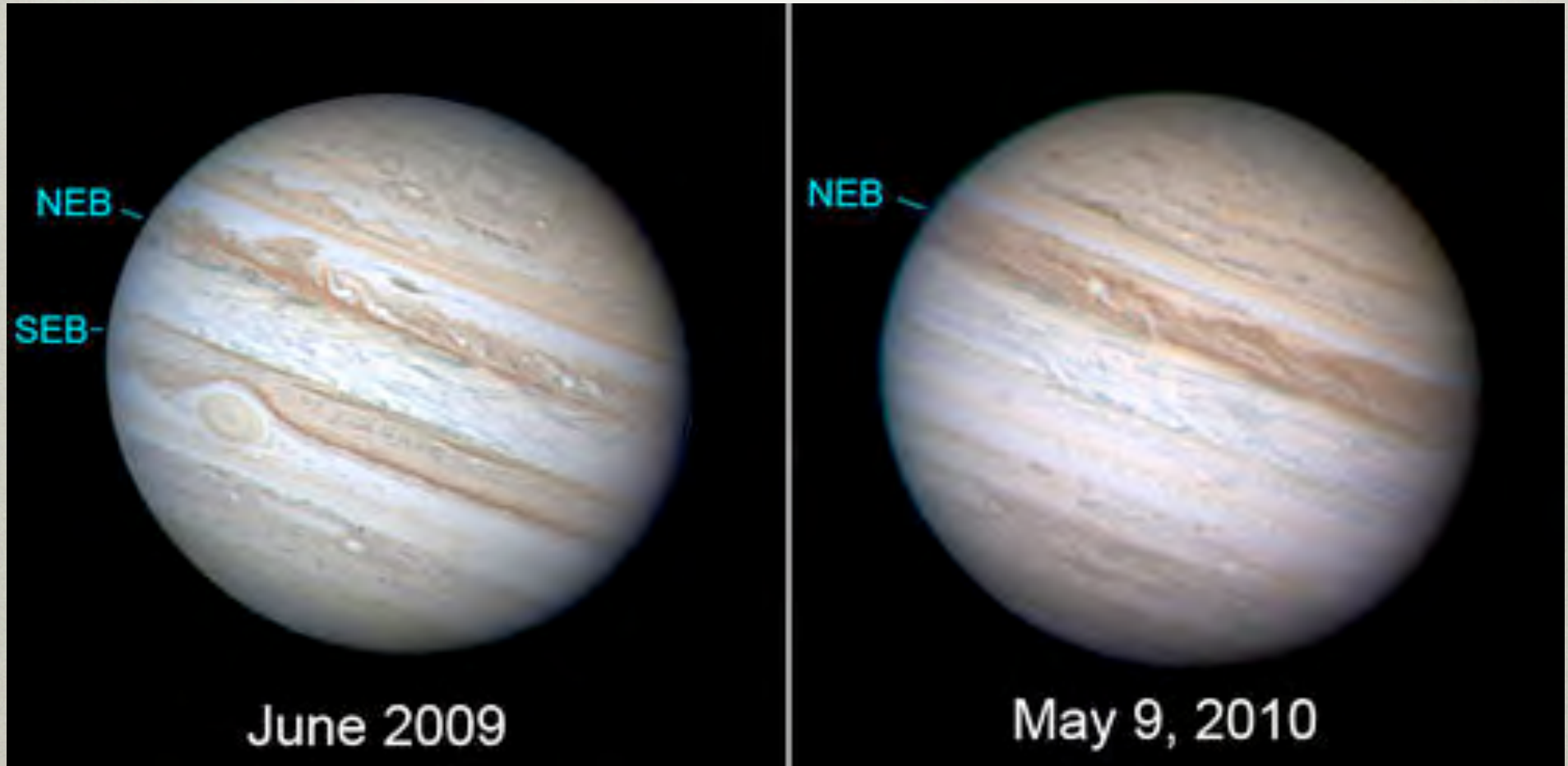
# JUPITER ATMOSPHERE EVOLUTION

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# JUPITER CLOUD BAND CHANGES

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# JUPITER FIREBALL


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Jupiter + Fireball

Anthony Wesley, Broken Hill Australia

3 Jun 2010 20:31.6 Z CMI 299 CMII 33 CMIII 20

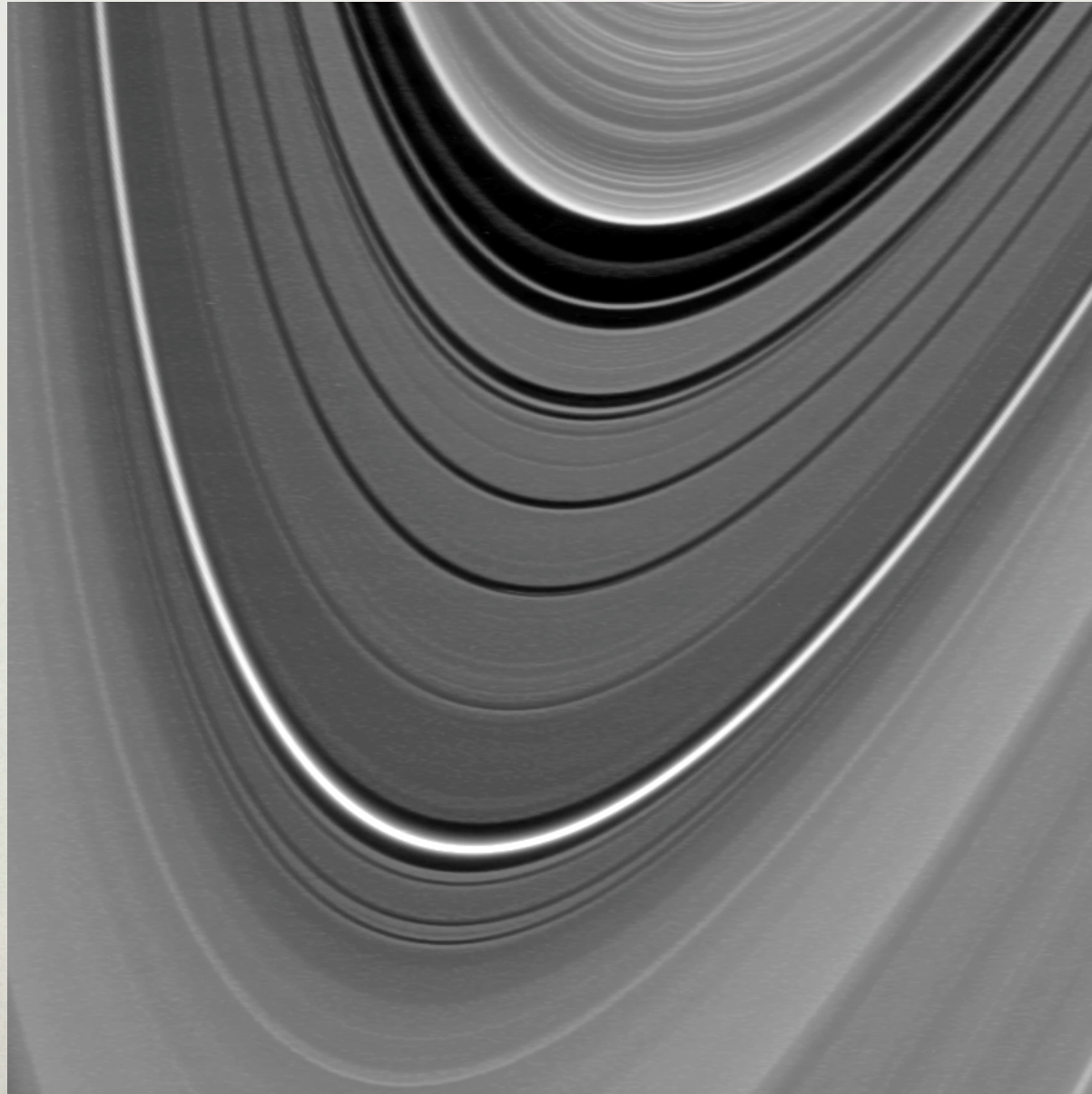
A composite image showing Saturn's aurora. The top half is a dark space with a bright, glowing orange and yellow auroral arc on the left. The bottom half shows the white and grey rings of Saturn. The text "SATURN'S AURORA IN A NEW LIGHT" is overlaid in the center in a yellow, 3D-style font.

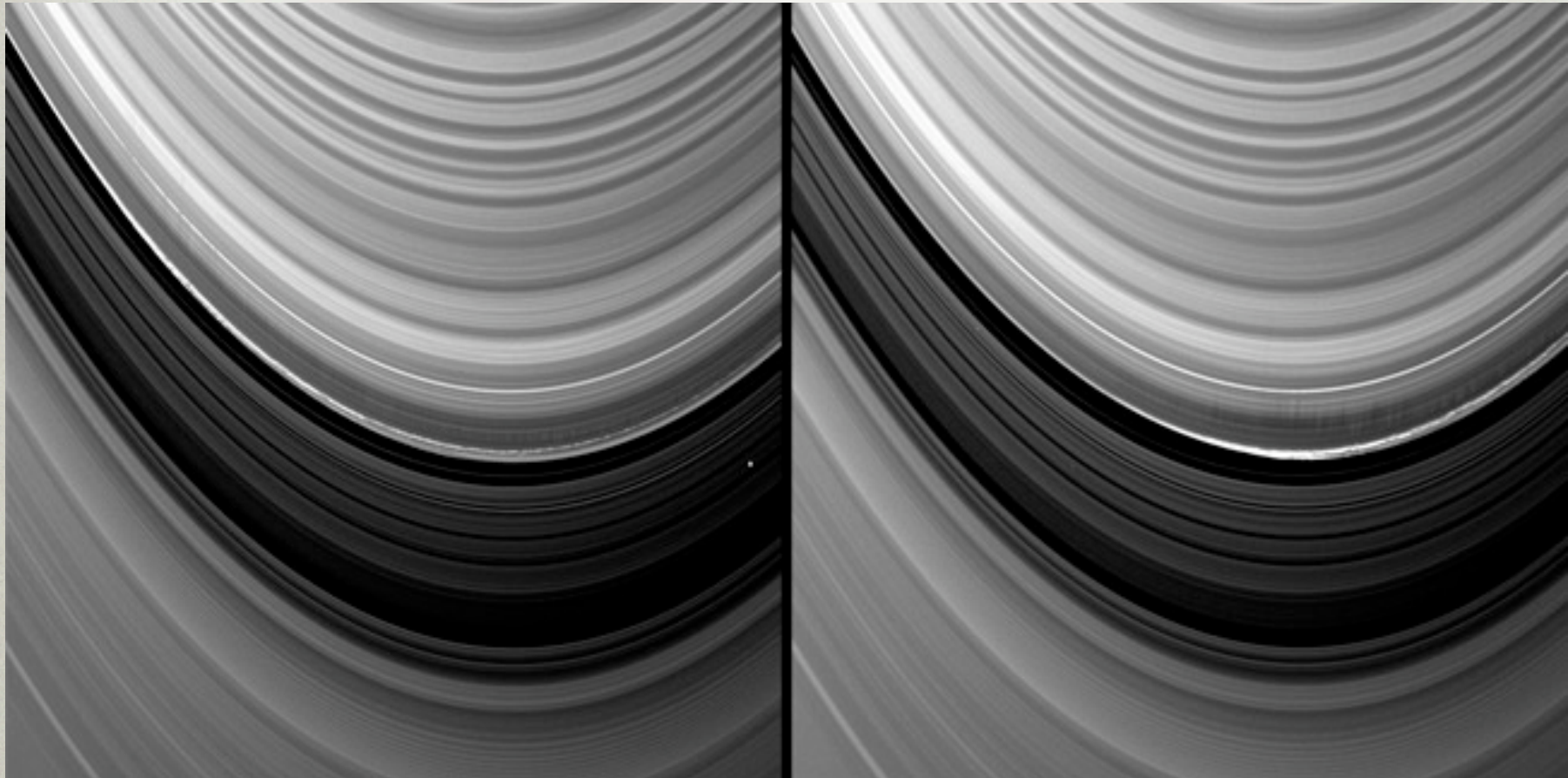
# SATURN'S AURORA IN A NEW LIGHT



# SATURN RING EDGE VARIATION

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Researchers think this behavior is common in other disk systems, such as spiral galaxies including our own Milky Way, and in protoplanetary disks found around nearby stars.

While the phenomenon has been modeled in computer simulations, it had never been observed in nature — until now.

"We have found what we hoped we'd find when we set out on this journey with Cassini nearly 13 years ago: visibility into the mechanisms that have sculpted not only Saturn's rings, but orbital disks of a far grander scale, from solar systems, like our own, all the way to the giant spiral galaxies," said Carolyn Porco of the Space Science Institute in Boulder, Colo., a study co-author and leader of the Cassini imaging team.

The new observations could help explain the bewildering variety of structures seen throughout the distant regions of Saturn's rings, according to the study appearing today (Nov. 1) in the online version of *Astronomical Journal*.

Saturn's enigmatic oscillations

Scientists have known since the early 1980s, when NASA's Voyager spacecraft flew by Saturn, that the outer edge of the planet's B ring was sculpted into a rotating, flattened oval-like shape. The strongest gravitational resonance in Saturn's rings is caused by the planet's moon Mimas.

Resonances in Saturn's rings occur when the relative orbital positions between ring particles and a moon continually repeat, altering the particles' orbits. In the case of the Mimas resonance, the particles' orbits are changed from circles to ellipses that form a two-lobed pattern rotating with Mimas.

But it was clear, even in Voyager's findings, that the outer B ring's behavior was far more complex than anything Mimas alone could cause, researchers said.

Now, analysis of thousands of Cassini images of the B ring edges, taken over the course of four years, has revealed the source of much of the complexity: the presence of at least three additional, independently rotating wave patterns, or oscillations.

"These oscillations have spontaneously arisen as a result of the B ring's density and its ring edges, which allow wave patterns to form and bounce around," researchers said.

"These oscillations exist for the same reason that guitar strings have natural modes of oscillation, which can be excited when plucked or otherwise disturbed," said Joseph Spitale of the Space Science Institute, the study's lead author and a member of the Cassini imaging team. "The ring, too, has its own natural oscillative frequencies, and that's what we're observing."

Just like a spiral galaxy

Astronomers believe that such self-excited oscillations exist in other, distant disk systems. However, because within these remote systems cannot be directly observed, and researchers have instead resorted to computer simulations to study them.

Now that has changed.

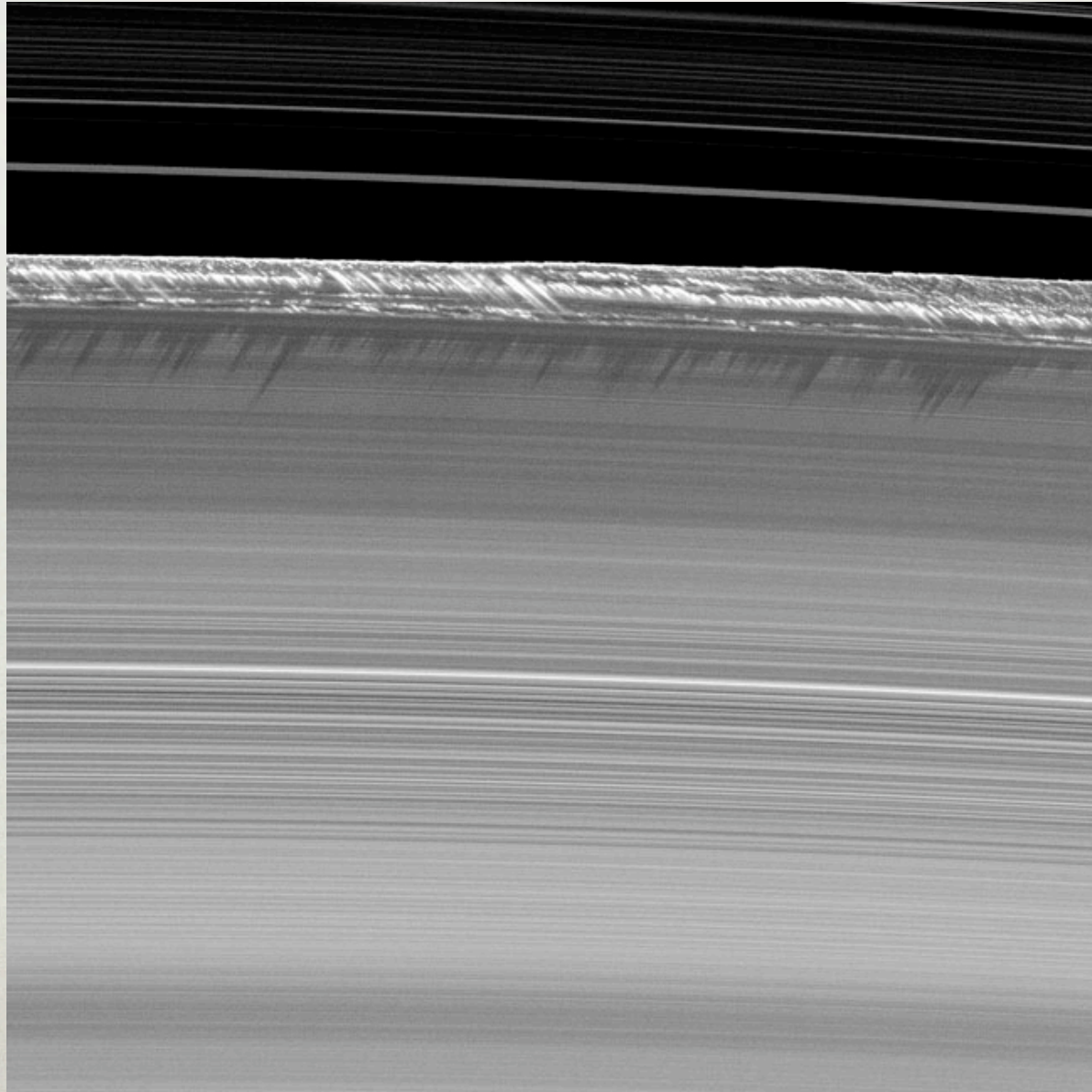
The new observations confirm the first large-scale wave oscillations of this type in a broad disk of material anywhere in nature, researchers said.

This same process might explain all the puzzling chaotic waveforms found in Saturn's distant rings, from tens of meters up to hundreds of kilometers wide.

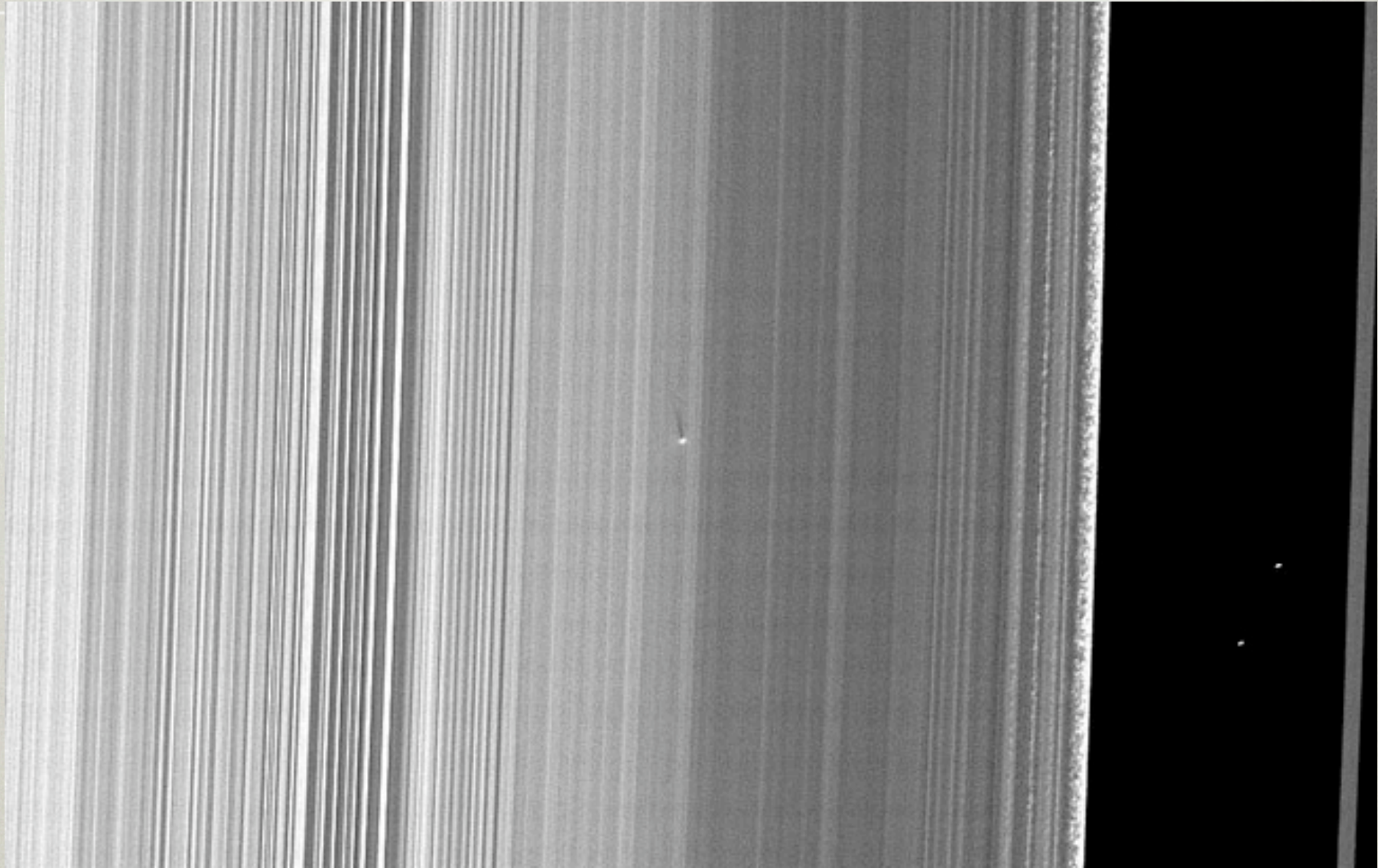
"Normally viscosity, or resistance to flow, damps waves, the way sound waves traveling through the air would die out," said Peter Goldreich, a planetary ring theorist at the California Institute of Technology in Pasadena, who was not involved in the study.

# SATURN RING ELEVATED STRUCTURES

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# SMALL OBJECT ABOVE RINGS

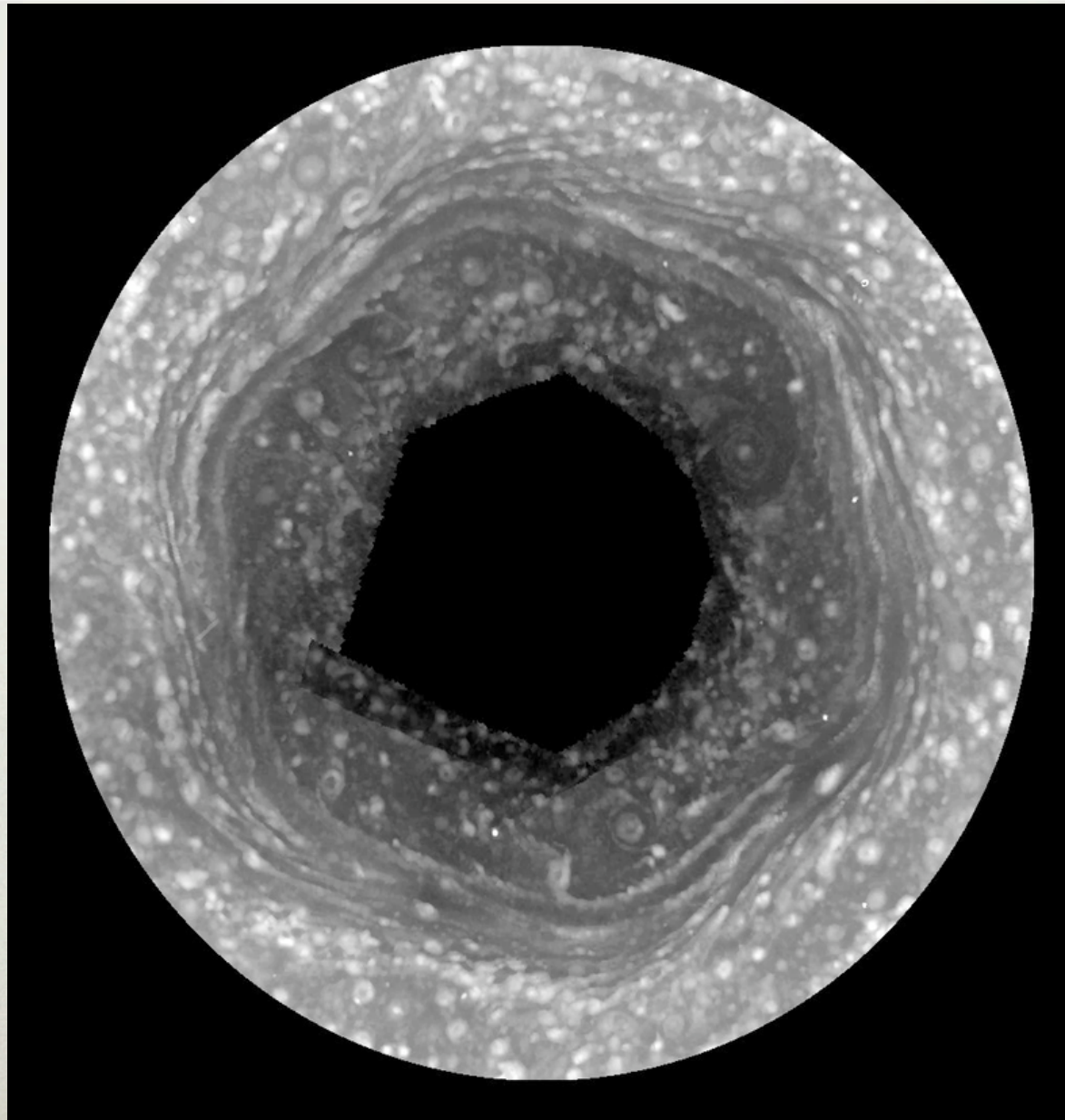


# RING EQUINOX

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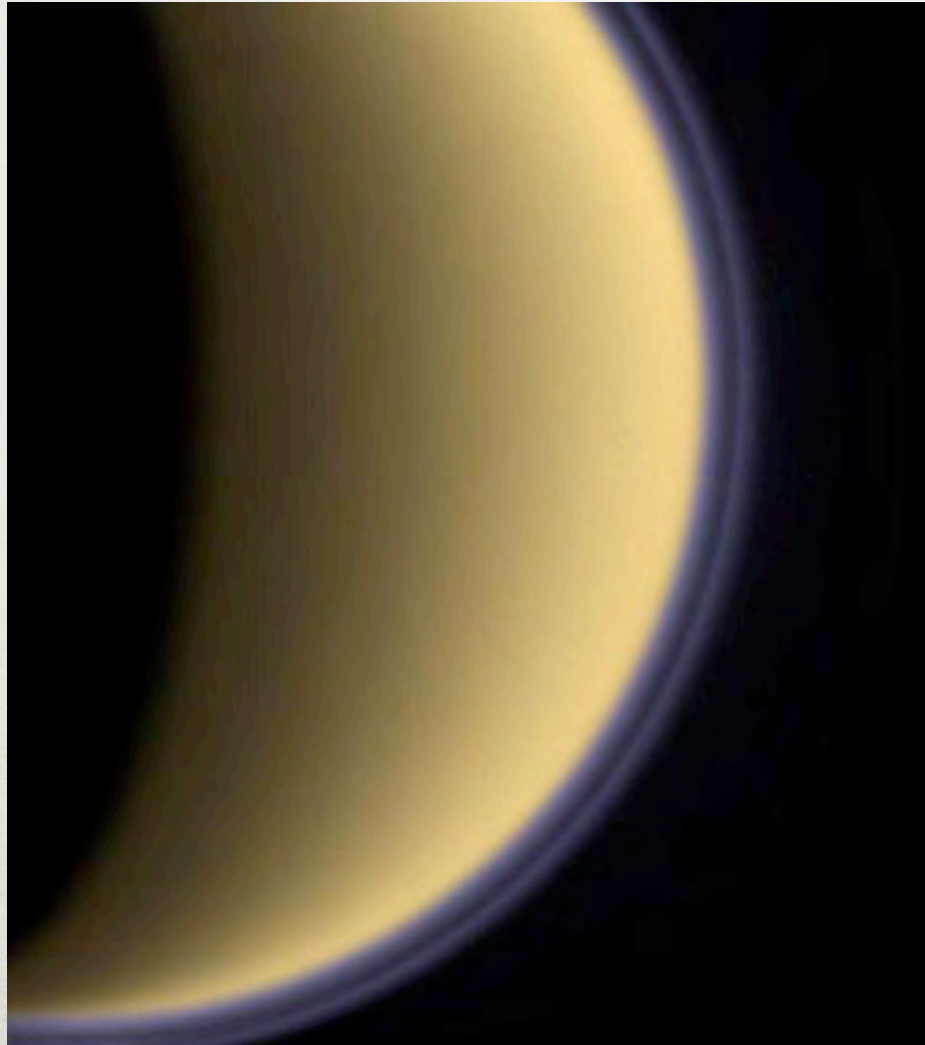


# SATURN HEXAGON JET STREAM



# TITAN ATMOSPHERE

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# HUYGENS

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The  
Descent Imager / Spectral Radiometer  
During the Descent of Huygens  
onto Titan on January 14, 2005

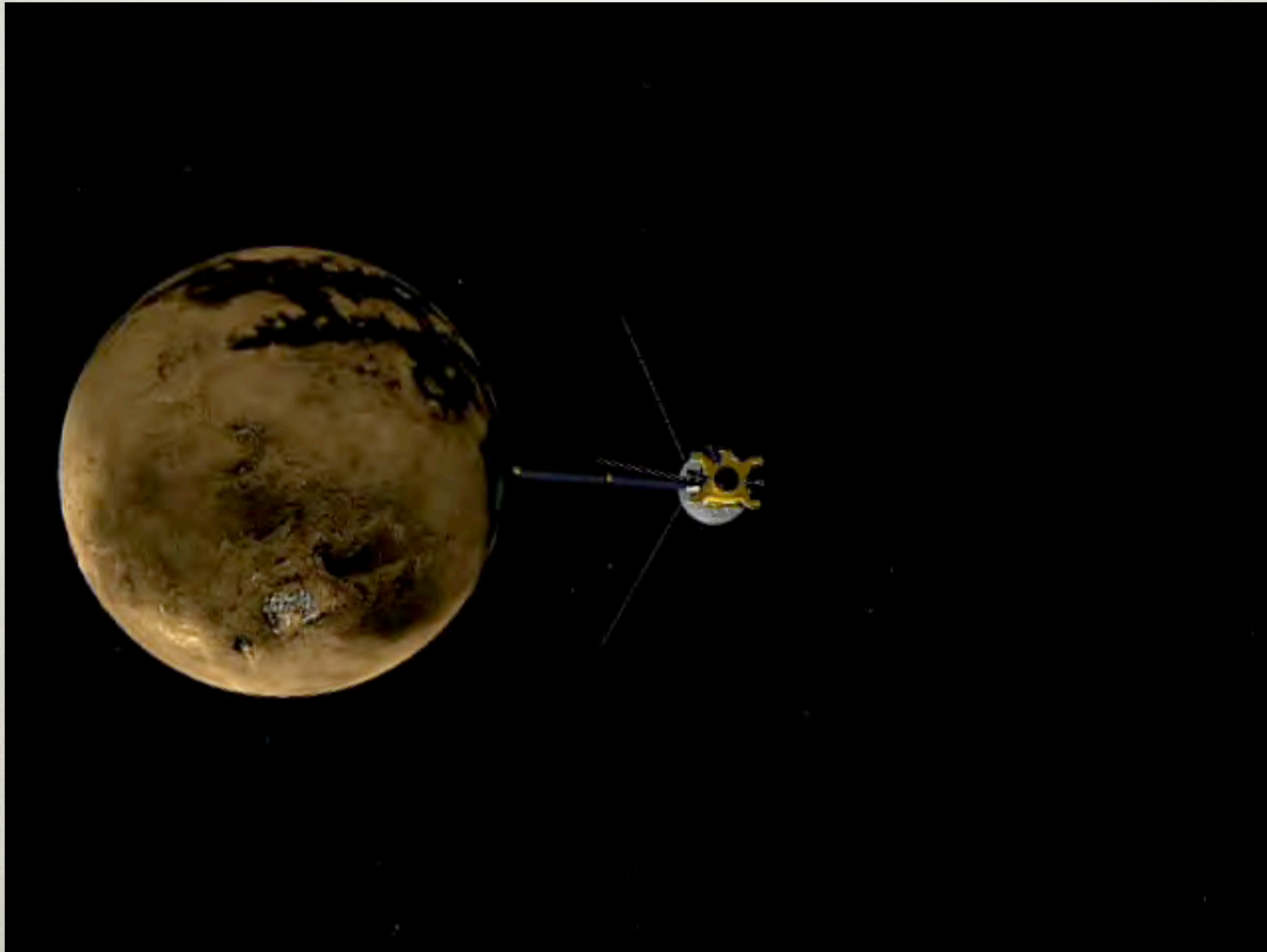
Erich Karkoschka, University of Arizona,  
the DISR Team, NASA, ESA

© 2006 University of Arizona

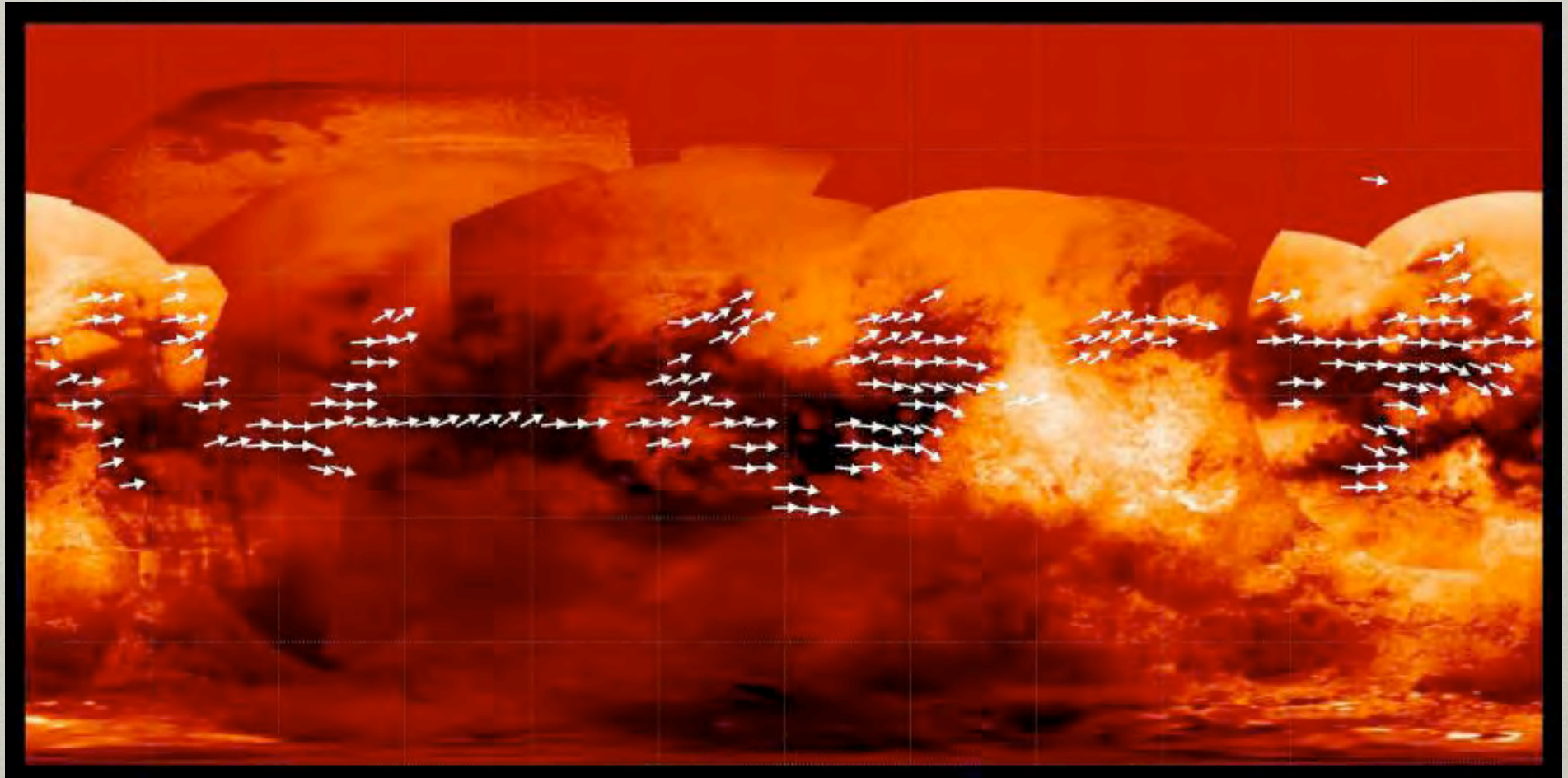
# TITAN ONTARIO LAKE



# TITAN LAKES

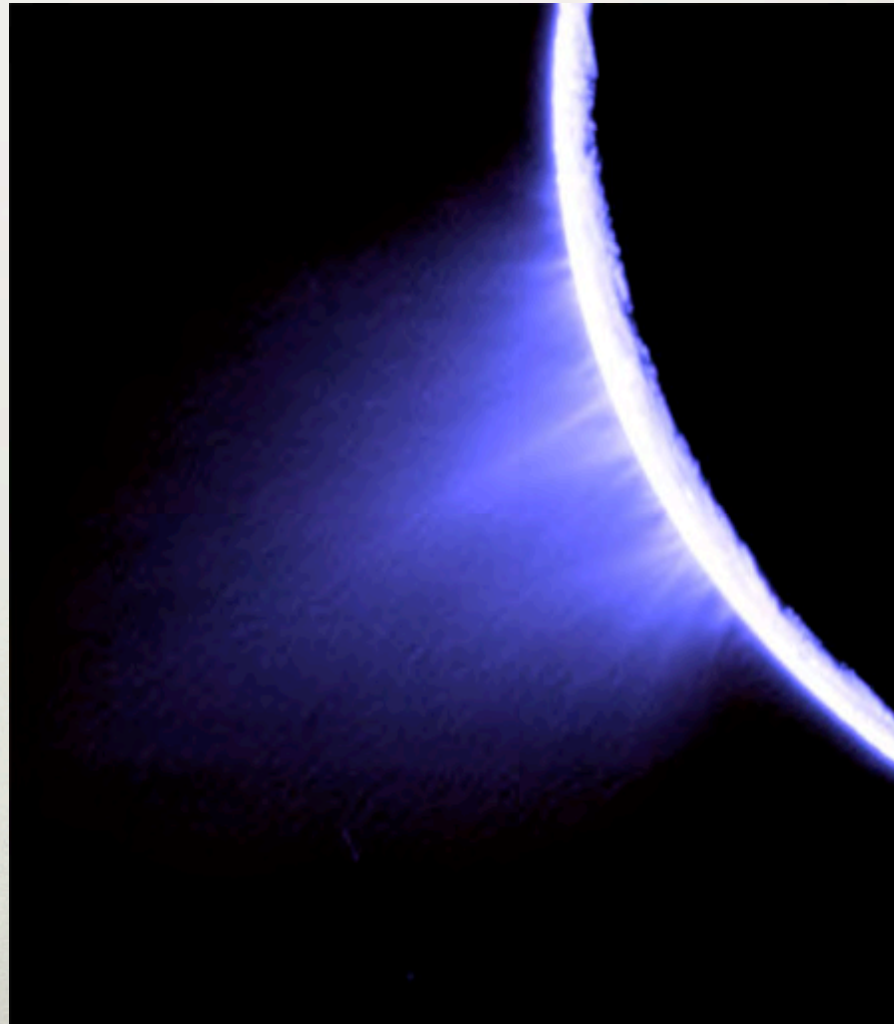


# TITAN WINDS



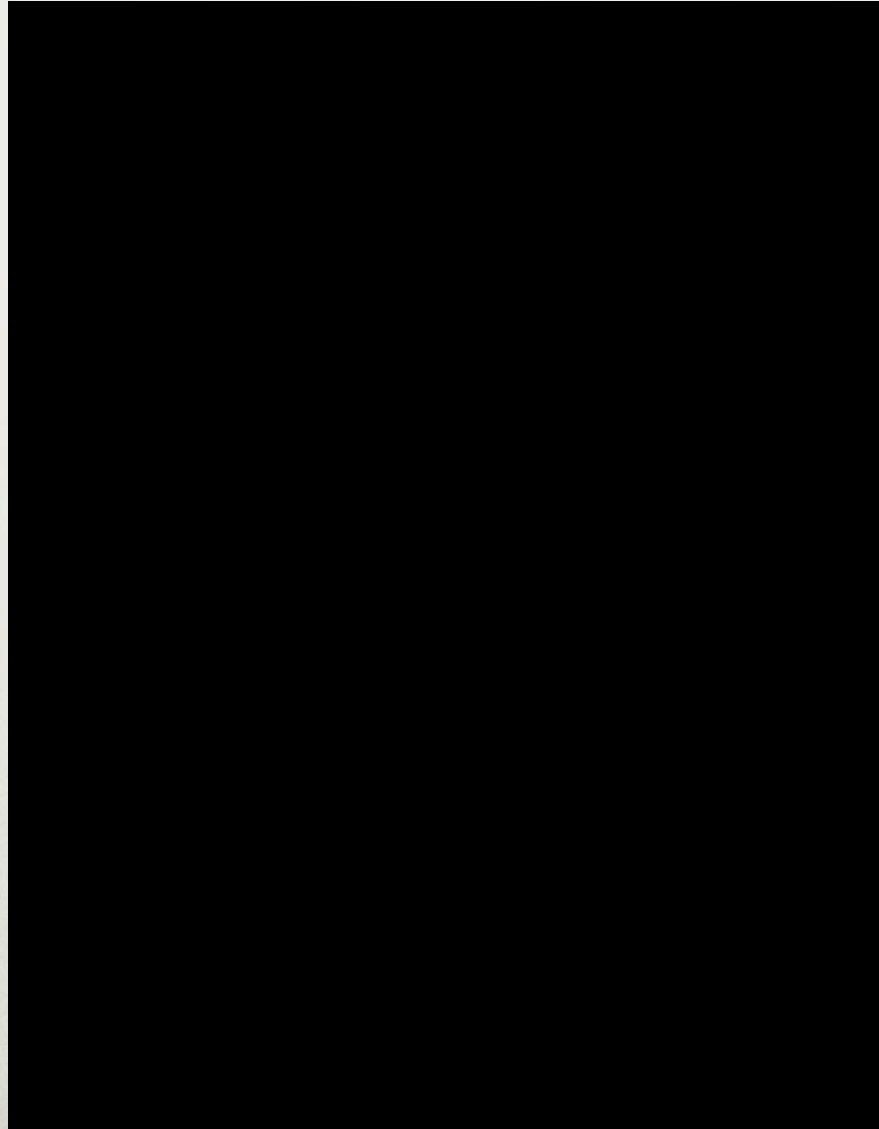
# ENCELADUS PLUMES

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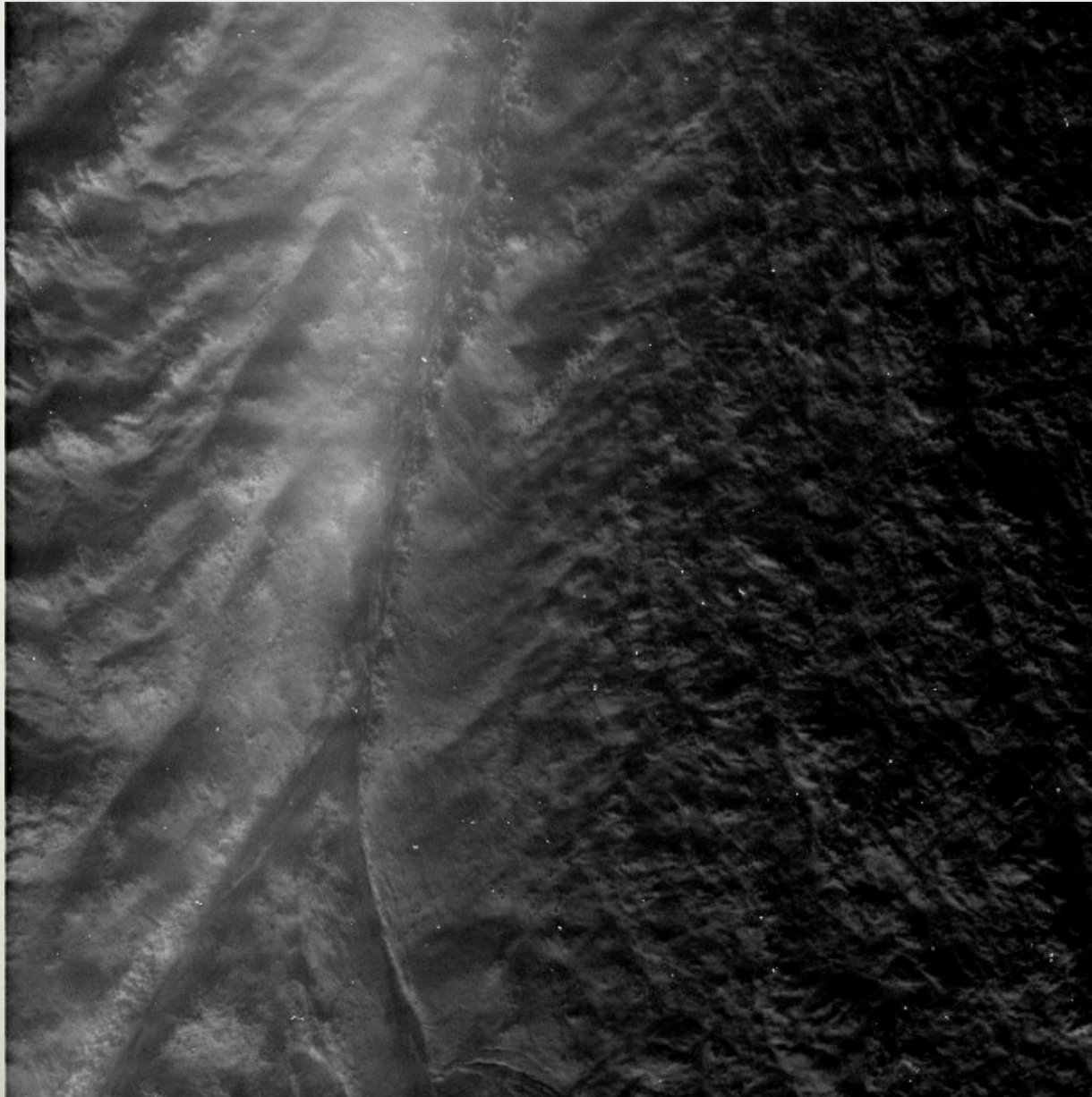
# ENCELADUS PLUMES

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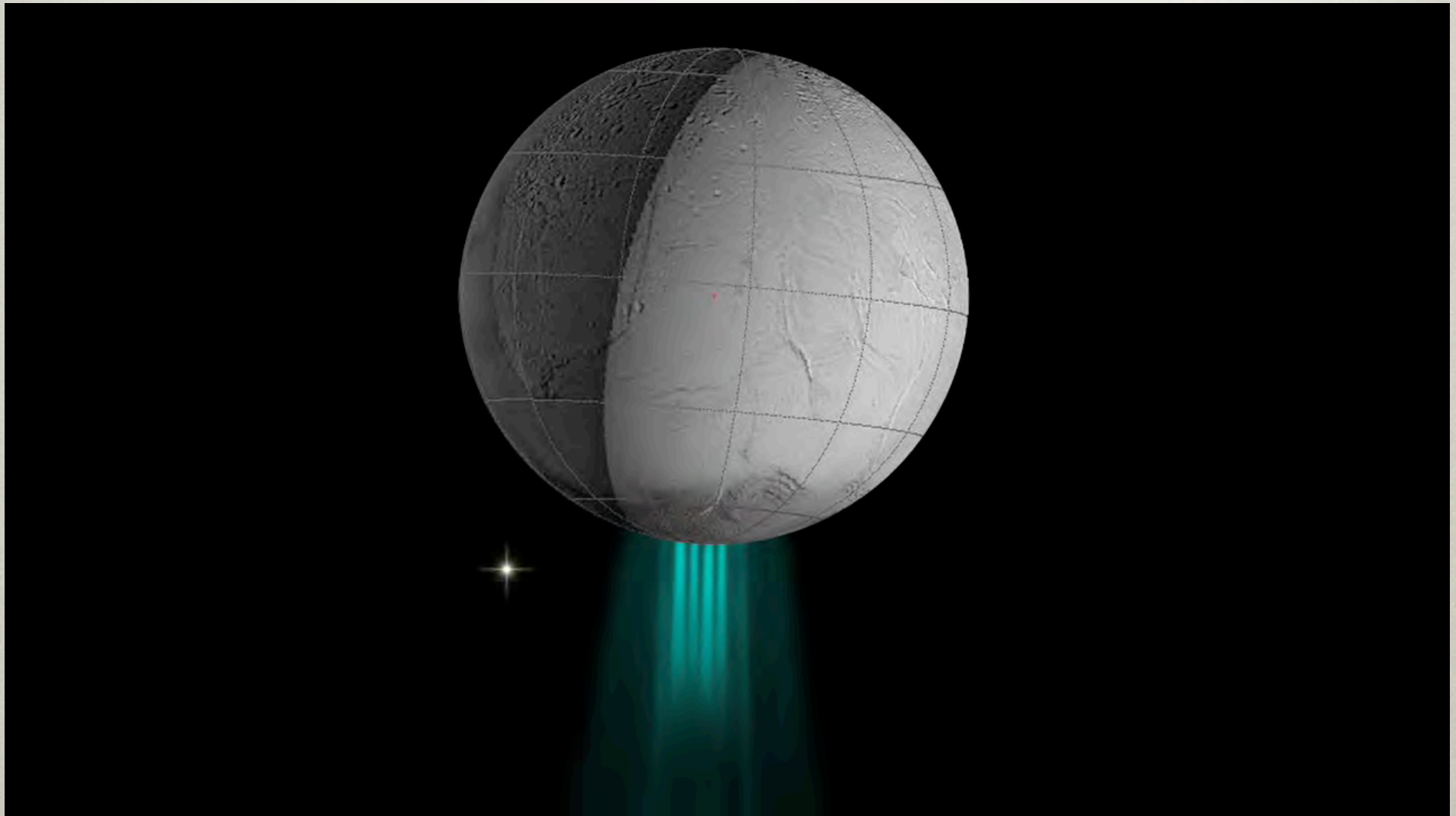
# ENCELADUS FISSURE

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# ENCELADUS PLUMES

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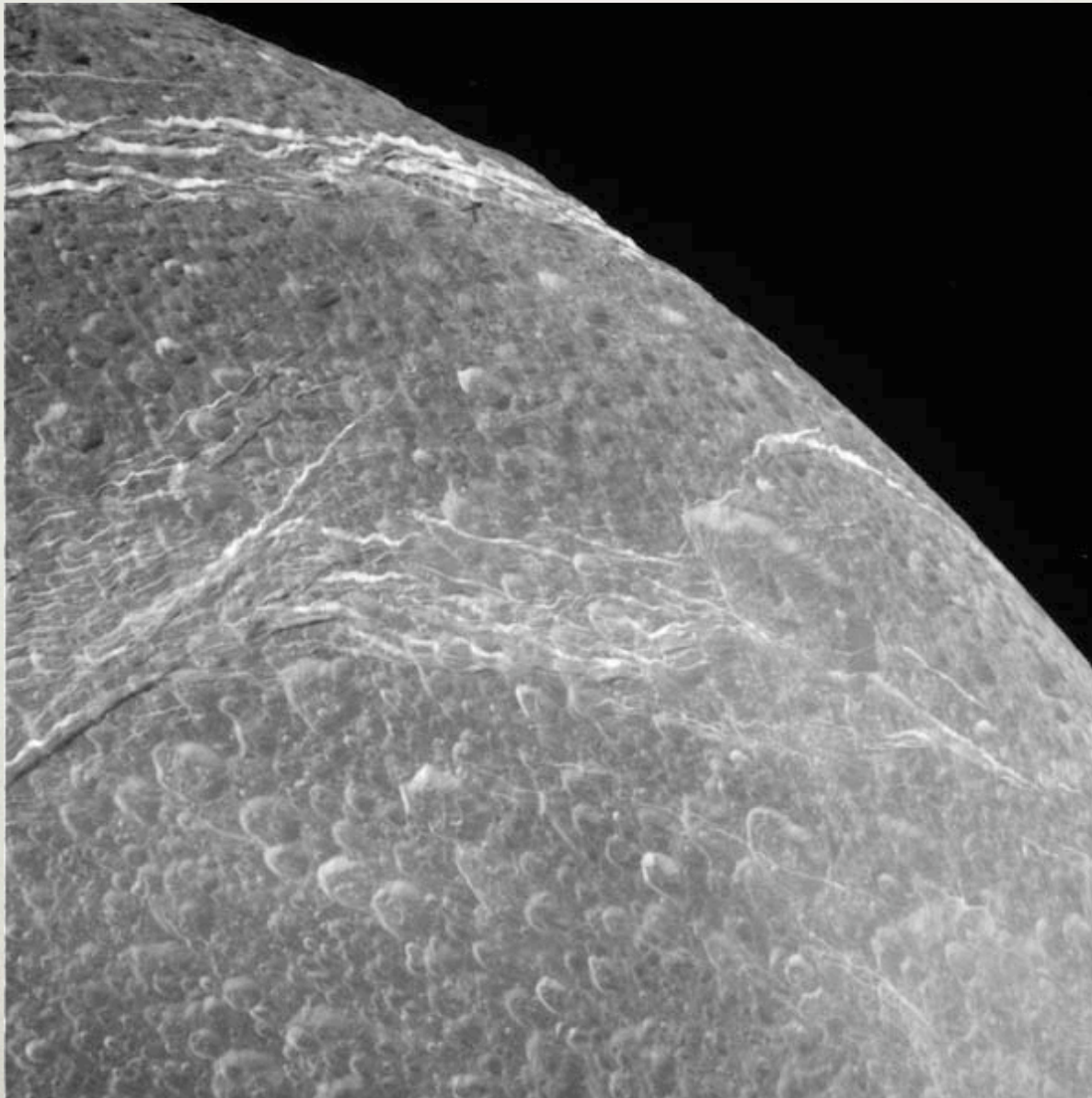
# IAPETUS

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# DIONE

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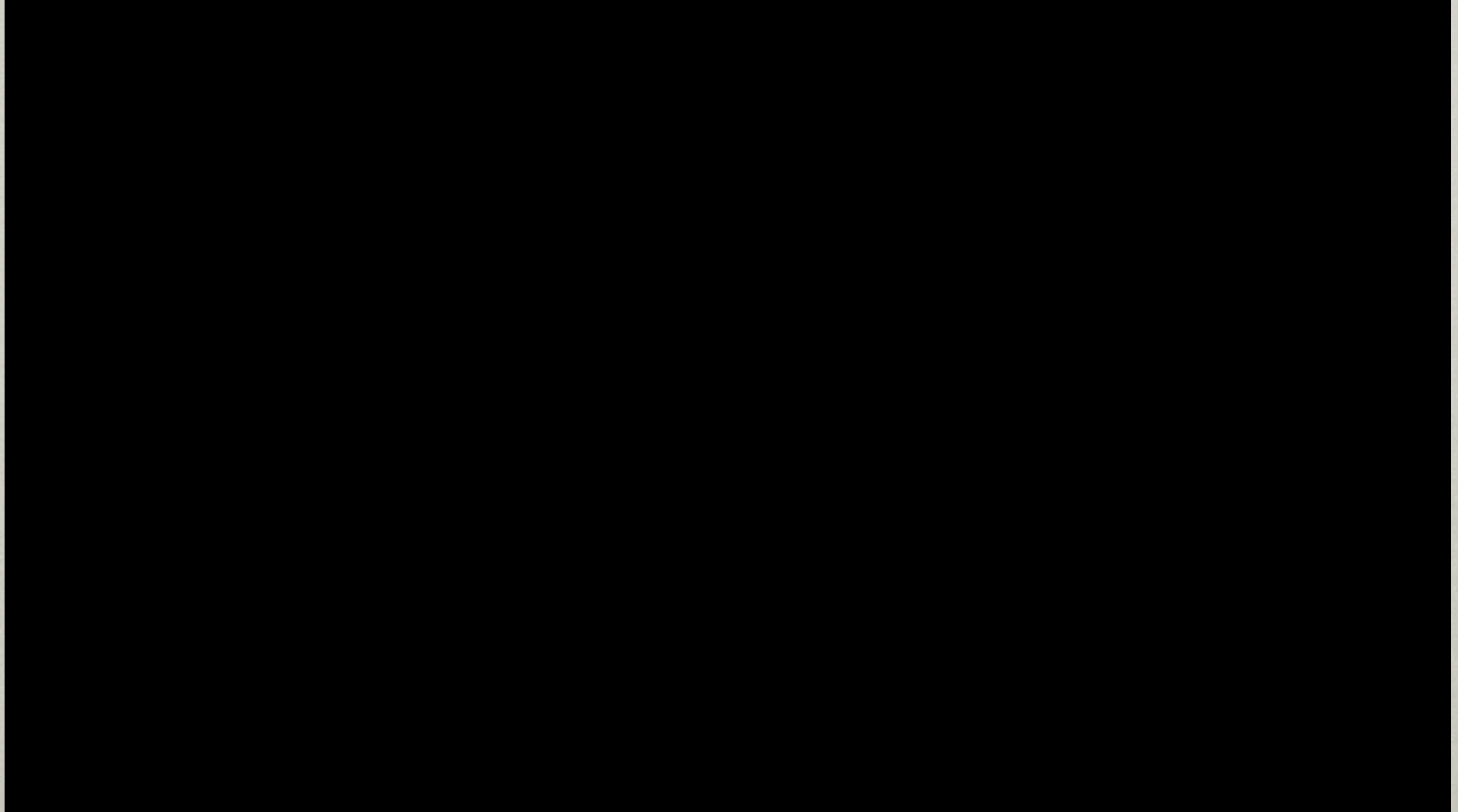


# ASTEROID LUTETIA

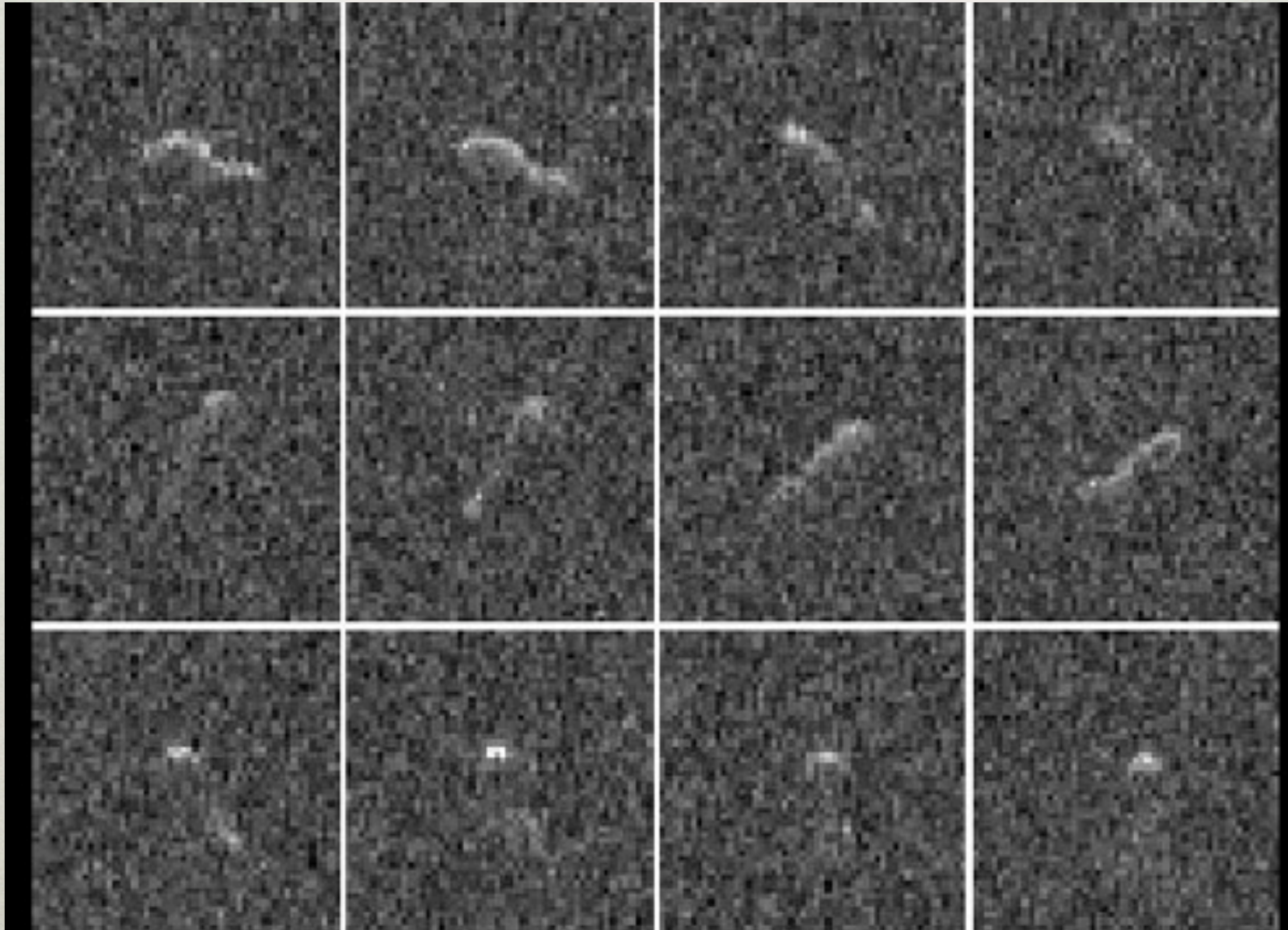


# HARTLEY 2

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# HARTLEY 2 RADAR ECHO



# HARTLEY 2 MODEL



[www.naic.edu/science/ao\\_hartley.html](http://www.naic.edu/science/ao_hartley.html)