

**Астрономия**

**Сурдин В.Г.**

**Лекция 23**

**Планеты земной группы**

Меркурий

Венера

Земля

Марс

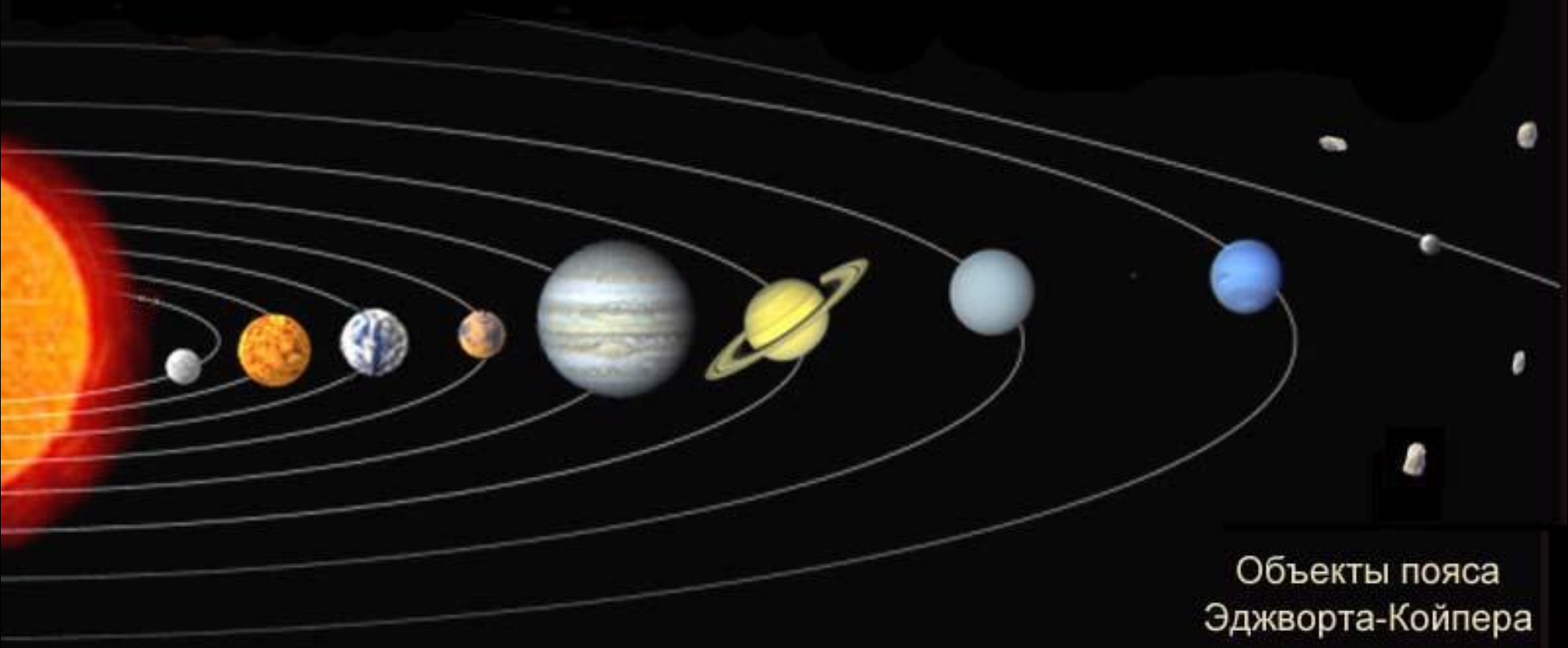
Юпитер

Сатурн

Уран

Нептун

Плутон



Объекты пояса Эдворта-Койпера



Кометы

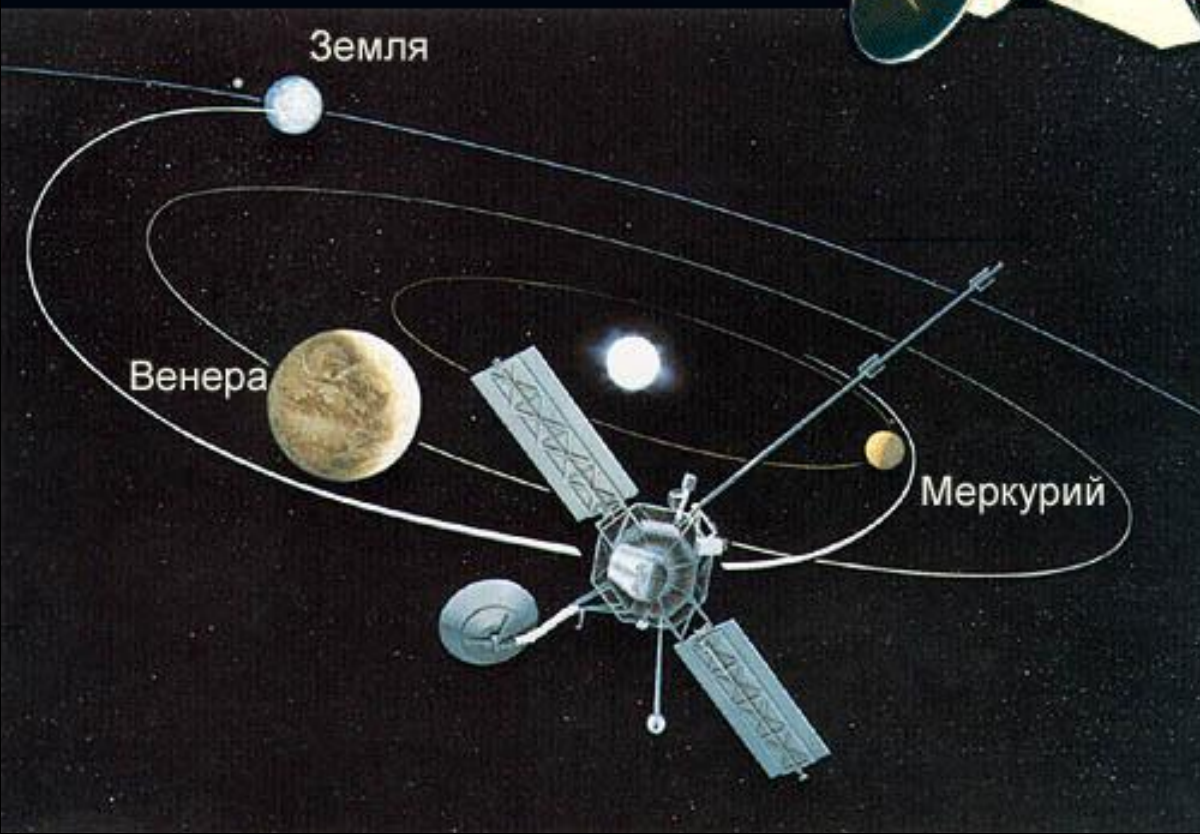
Астероиды



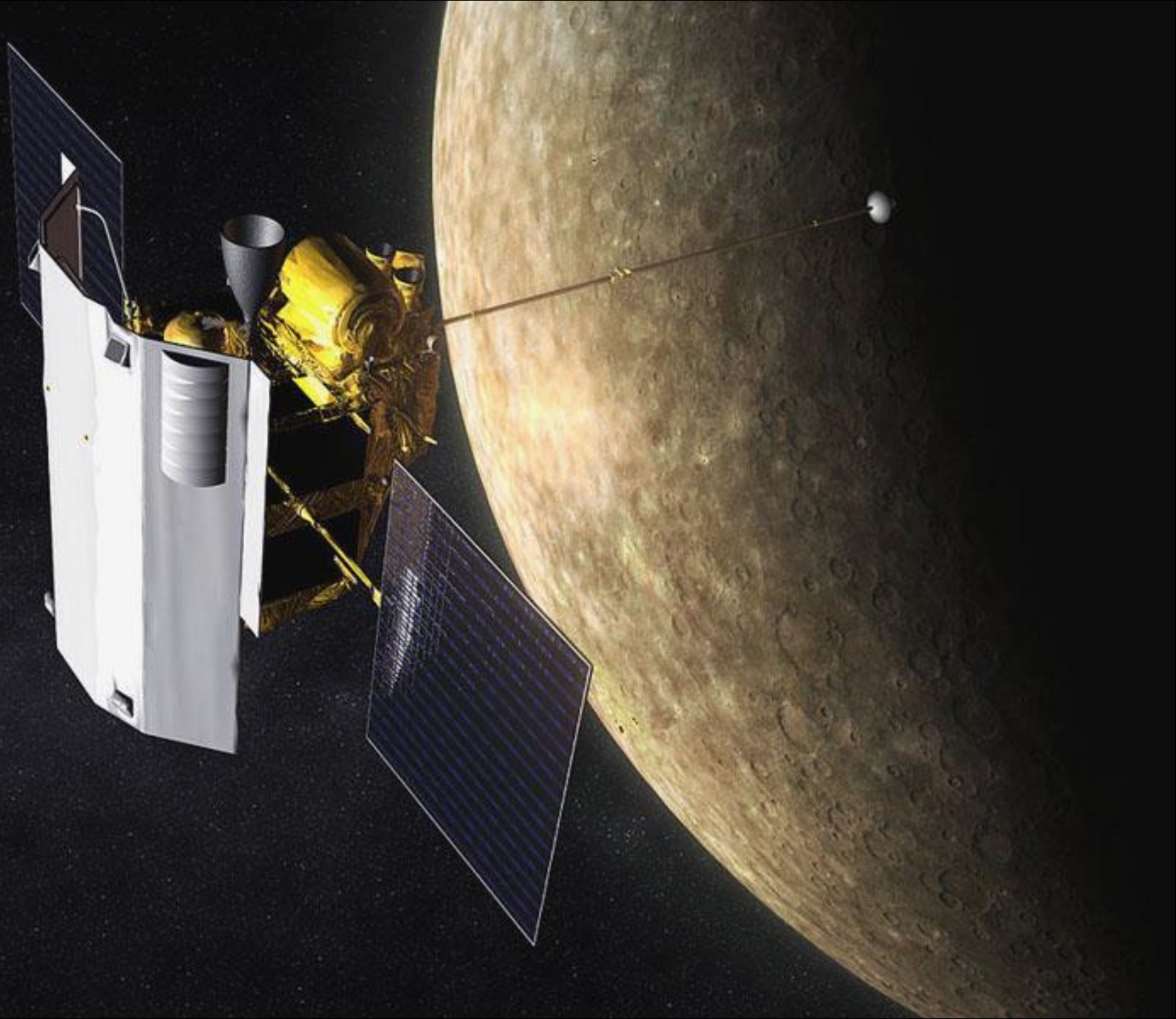
**Mariner 10 (NASA)**

1973 - 1975

Первая экспедиция  
к Меркурию



Пролет мимо Венеры  
с гравитационным маневром  
и затем три пролета  
вблизи Меркурия



**MESSENGER**  
NASA

Запущен  
3 августа 2004



Вышел на орбиту  
вокруг Меркурия  
18 марта 2011 г.

Масса 1 т, W = 450 Вт

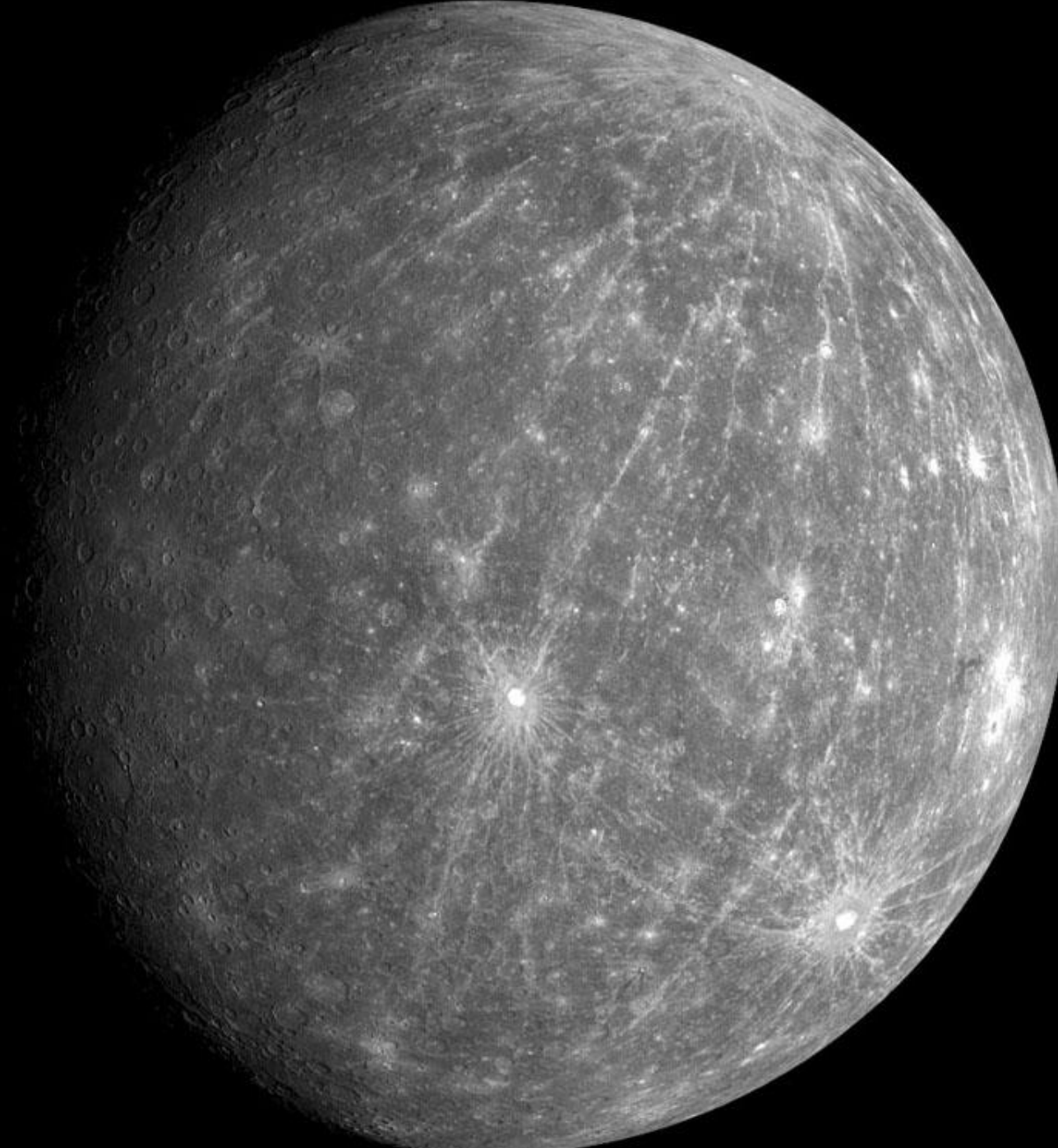
# Меркурий

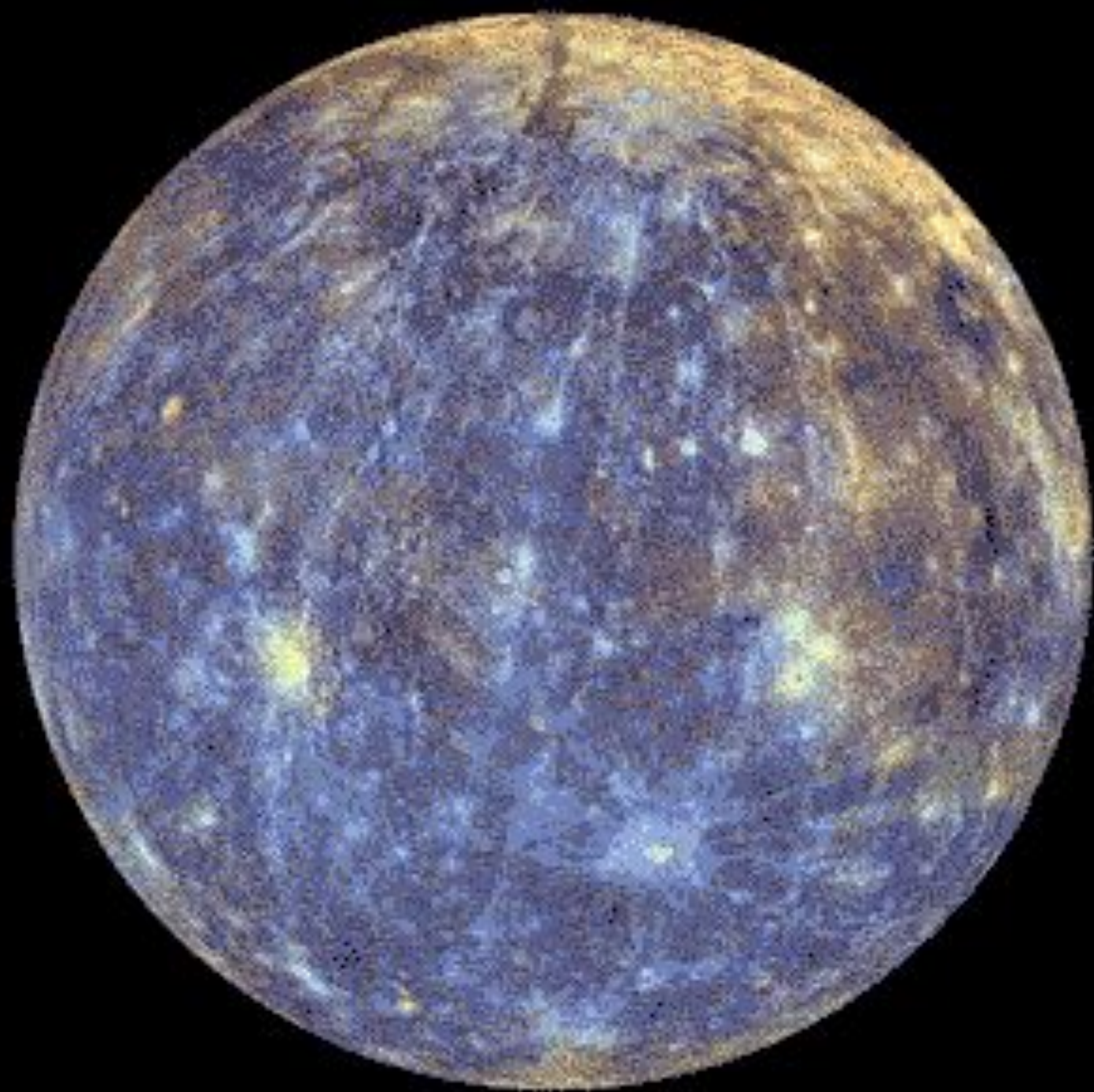
-173 °C

+430 °C

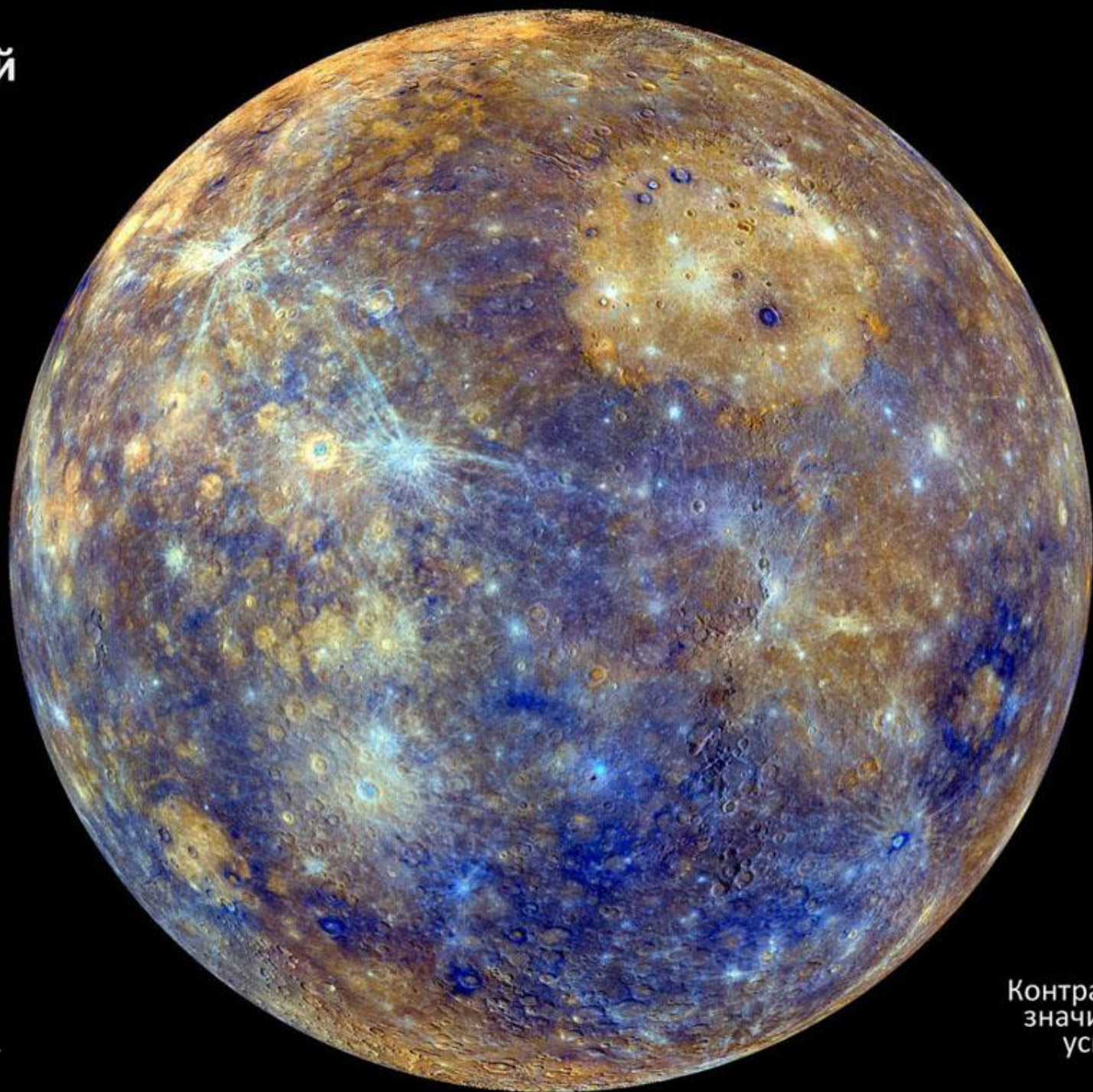
Messenger (NASA)

Oct 2008





Меркурий

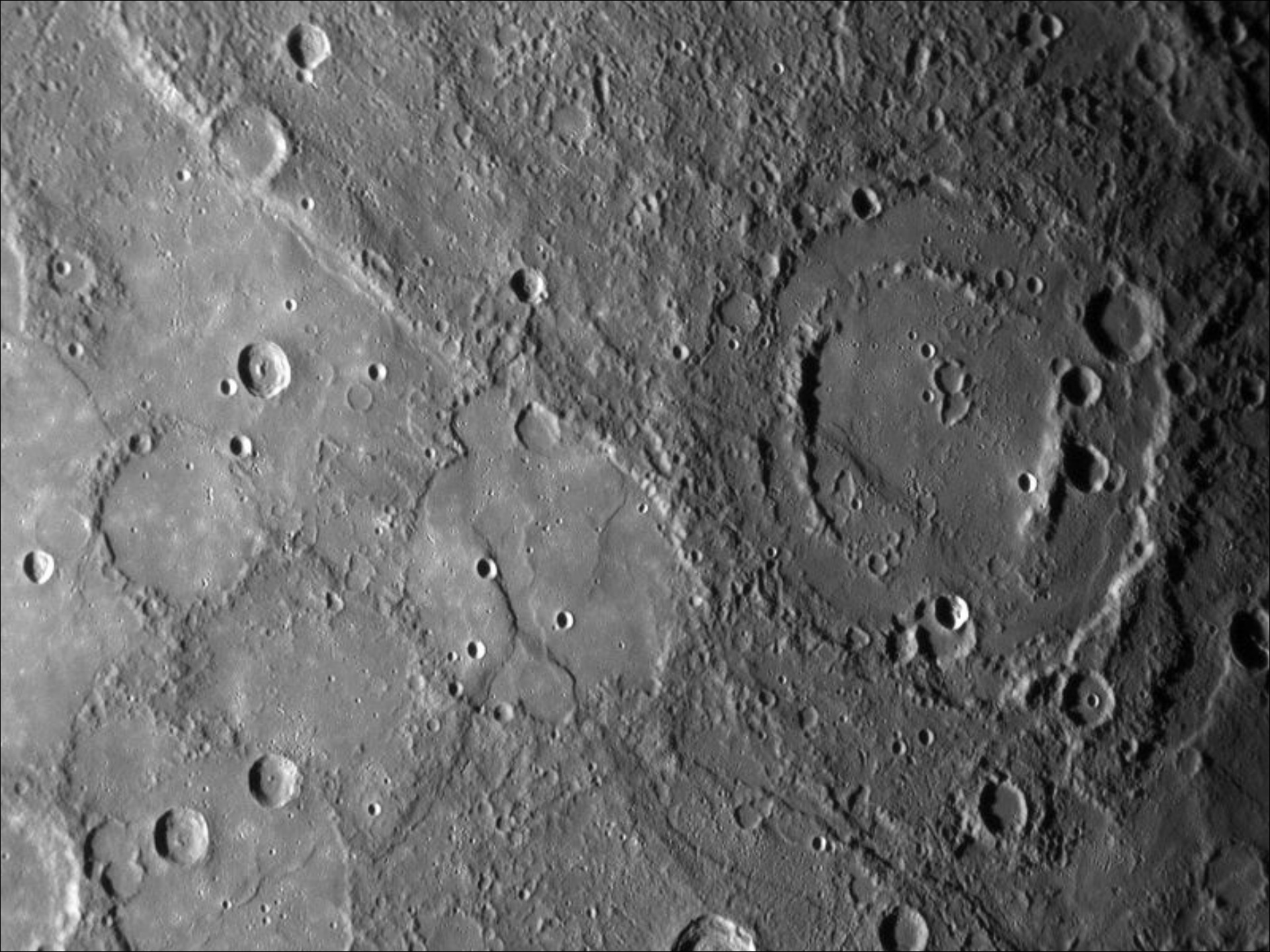


Messenger  
NASA, 2011

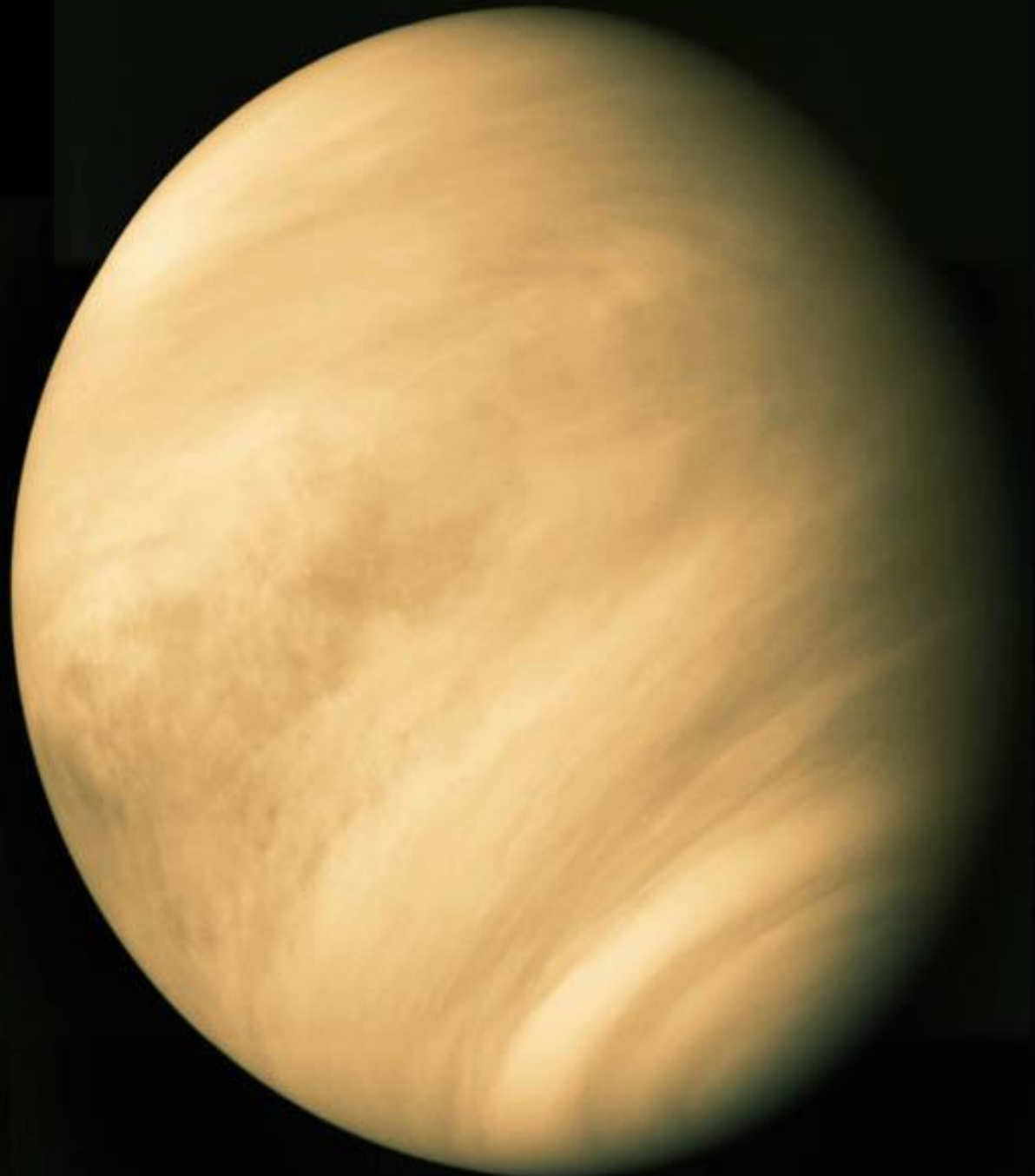
Контраст цвета  
значительно  
усилен







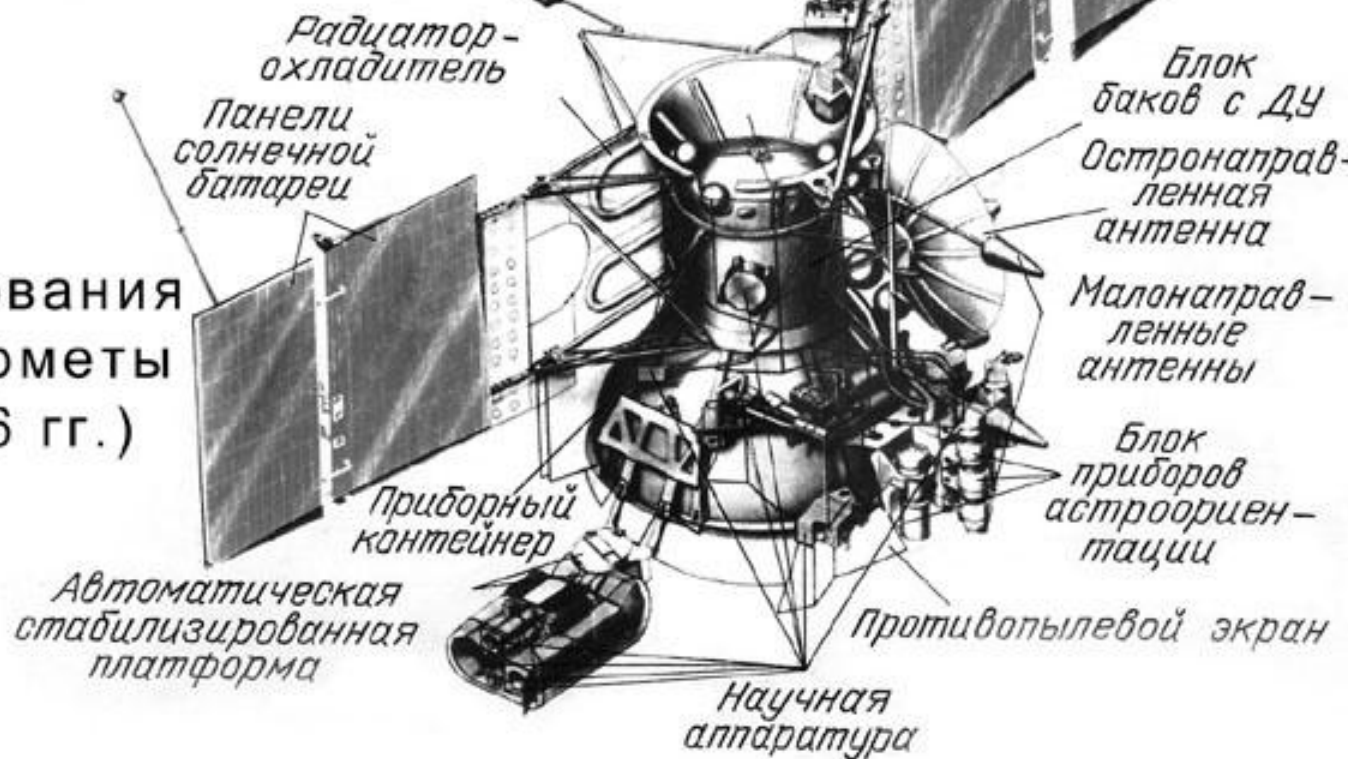
Венера



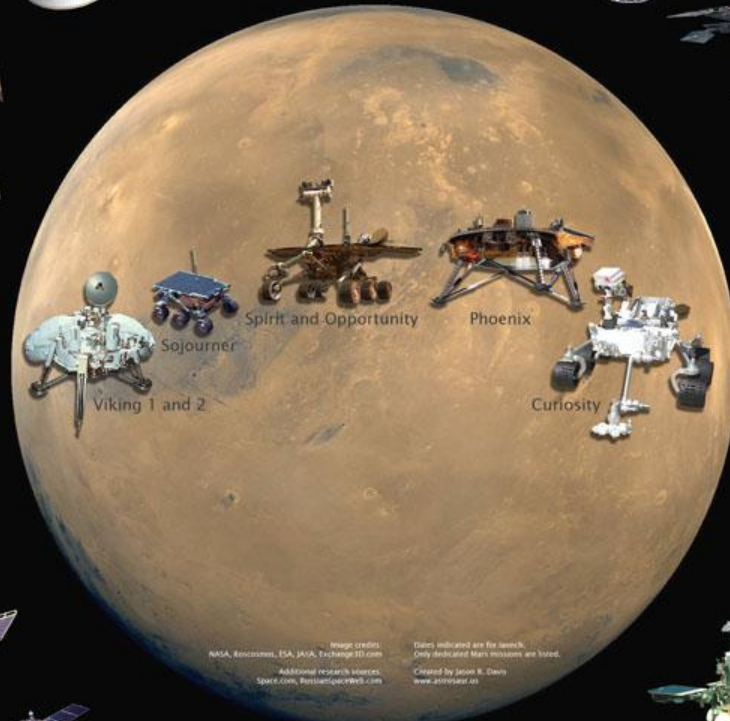
Спускаемый аппарат  
для посадки  
на Венеру

**Вега-1, -2**  
(СССР и др.)

АМС для исследования  
Венеры и ядра кометы  
Галлея (1984-86 гг.)



# МАРСИАНСКИЕ РОБОТЫ



40: Mars Science Laboratory Curiosity  
November 26, 2011  
Mission to Gale Crater

1, 2: MARS 1M No. 1 / MARS 1M No. 2  
October 10 / October 14, 1960  
Both destroyed during launch

3, 4, 5, 8: MARS 2MV-4 No. 1 / Mars 1 / Mars 2MV-3 No. 1 / Zond 2  
October 24 / November 1 / November 4, 1962 / November 30, 1964  
Broke up in Earth orbit / Radio failure en route / Stranded in Earth orbit / Radio failure en route

6, 7: Mariner 3 / Mariner 4  
November 5 / November 28, 1964  
Payload fairing failed to open / First flyby and picture return

9, 10: Mariner 6 / Mariner 7  
February 25 / March 27, 1969  
Both flew by, returned pictures

11, 12: Mars 1969 A / Mars 1969 B  
March 27 / April 2, 1969  
Both destroyed during launch

13, 17: Mariner 8 / Mariner 9  
May 8 / May 30, 1971  
Destroyed during launch / First probe to orbit Mars

14, 15, 16: Cosmos 419 / Mars 2 / Mars 3  
May 10 / May 19 / May 28, 1971  
Failed in Earth orbit / Lander crashed / Lander failed

18, 19, 20, 21: Mars 4 / Mars 5 / Mars 6 / Mars 7  
July 21 / July 25 / August 5 / August 9, 1973  
Missed planet / Orbited planet / Lander failed (6 and 7)

22, 23: Viking 1 / Viking 2  
August 20 / September 9, 1975  
Both landed on surface, returned data

24, 25: Phobos 1 / Phobos 2  
July 7 / July 12, 1988  
Lost communication en route / Lost communication near Phobos

26: Mars Observer  
September 25, 1992  
Lost communication near Mars

27: Mars Global Surveyor  
November 7, 1996  
Orbited and returned data

28: Mars 96  
November 16, 1996  
Destroyed during launch

29: Mars Pathfinder  
December 4, 1996  
Landed on surface, deployed Sojourner rover

30: Nozomi  
July 4, 1998  
Missed planet

31: Mars Climate Orbiter  
December 11, 1998  
Crashed due to imperial/metric unit mixup

32: Mars Polar Lander  
January 3, 1999  
Crashed on surface

33: Mars Odyssey  
March 7, 2001  
Orbiting Mars

34: Mars Express / Beagle 2 lander  
June 2, 2003  
Orbiting Mars, Beagle lost after separation

35, 36: Mars Exploration Rovers Spirit and Opportunity  
June 10 / July 7, 2003  
Both landed on surface

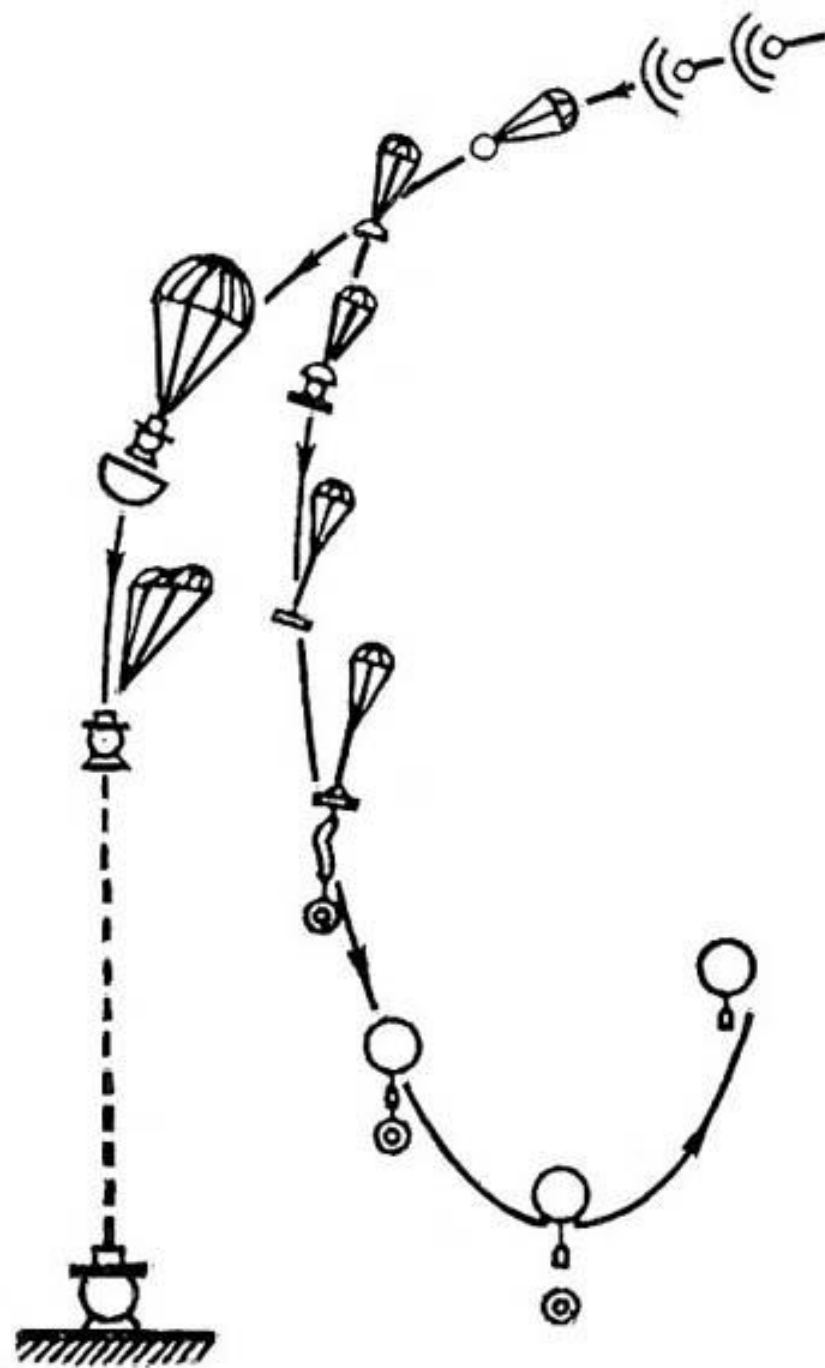
37: Mars Reconnaissance Orbiter  
August 12, 2005  
Orbiting Mars

38: Phoenix  
August 4, 2007  
Landed, dug for water

39: Phobos-Grunt  
November 8, 2011  
Stranded in Earth orbit

Image credits:  
NASA, Roscosmos, ESA, JAXA, Teleshop20.com  
Additional media: Shutterstock, Spaced.com, RenaissanceWeb.com

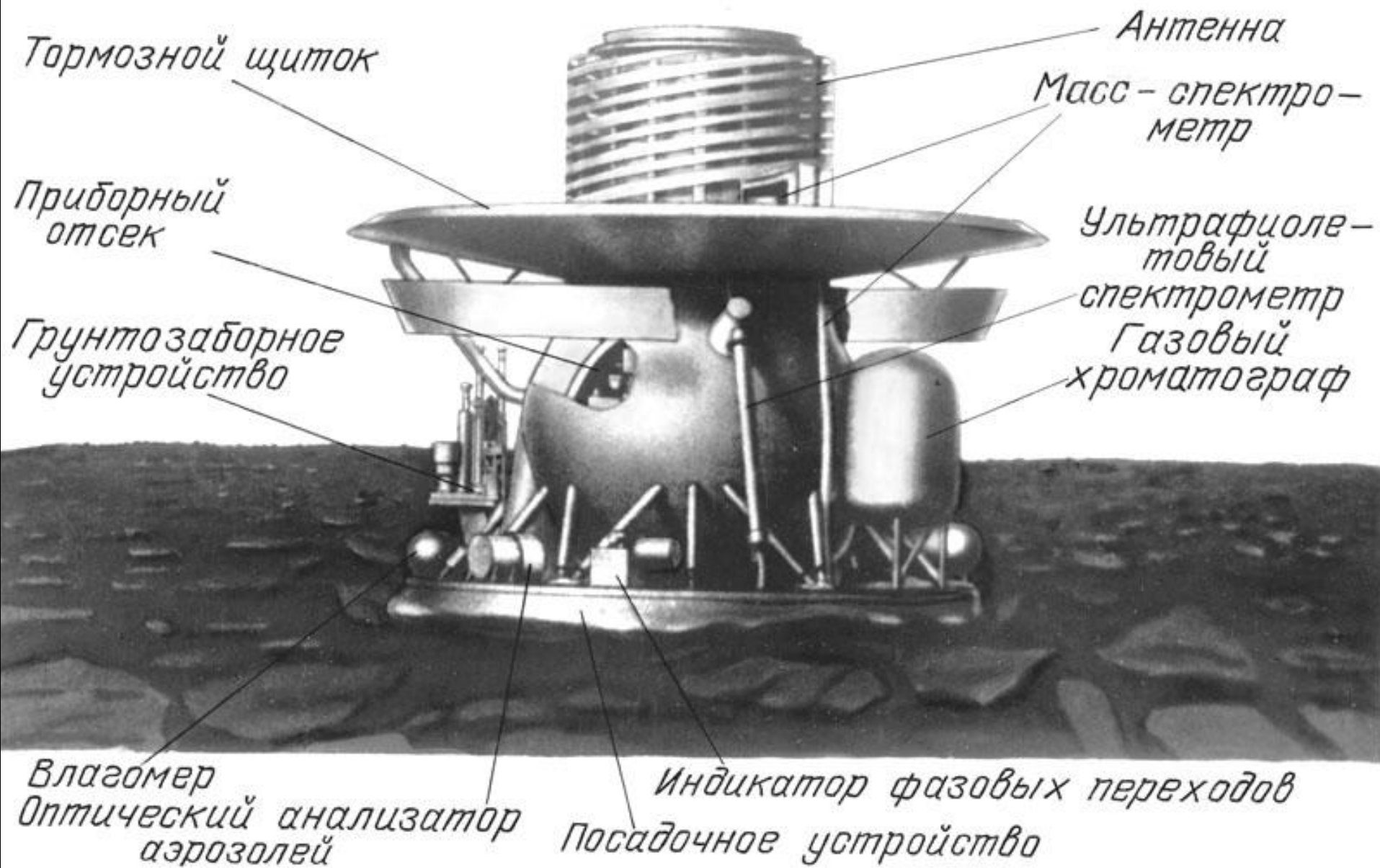
Names indicated are for launch.  
Only dedicated Mars missions are listed.  
Created by James B. Collins  
www.spacecraft.eu



Посадка  
на Венеру  
аппаратов  
серии  
“Венера”

Аэростат  
был только  
на аппаратах  
“ВеГа”  
(1986 г.)

# Посадочный аппарат зондов "Венера-9...-14" и "ВеГа-1, -2" (СССР)



Время работы на поверхности около 2 час.

Масса 660 - 760 кг

Венера, март 1982



ВЕНЕРА-14 ОБРАБОТКА ИППИ АН СССР И ЦДКС



ВЕНЕРА-14 ОБРАБОТКА ИППИ АН СССР И ЦДКС

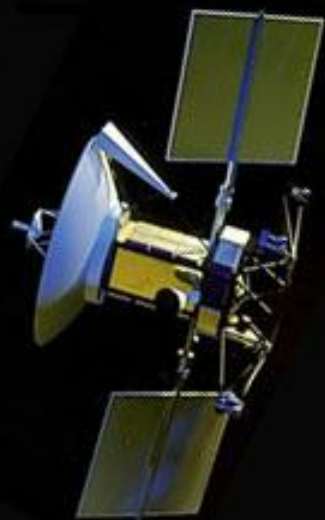
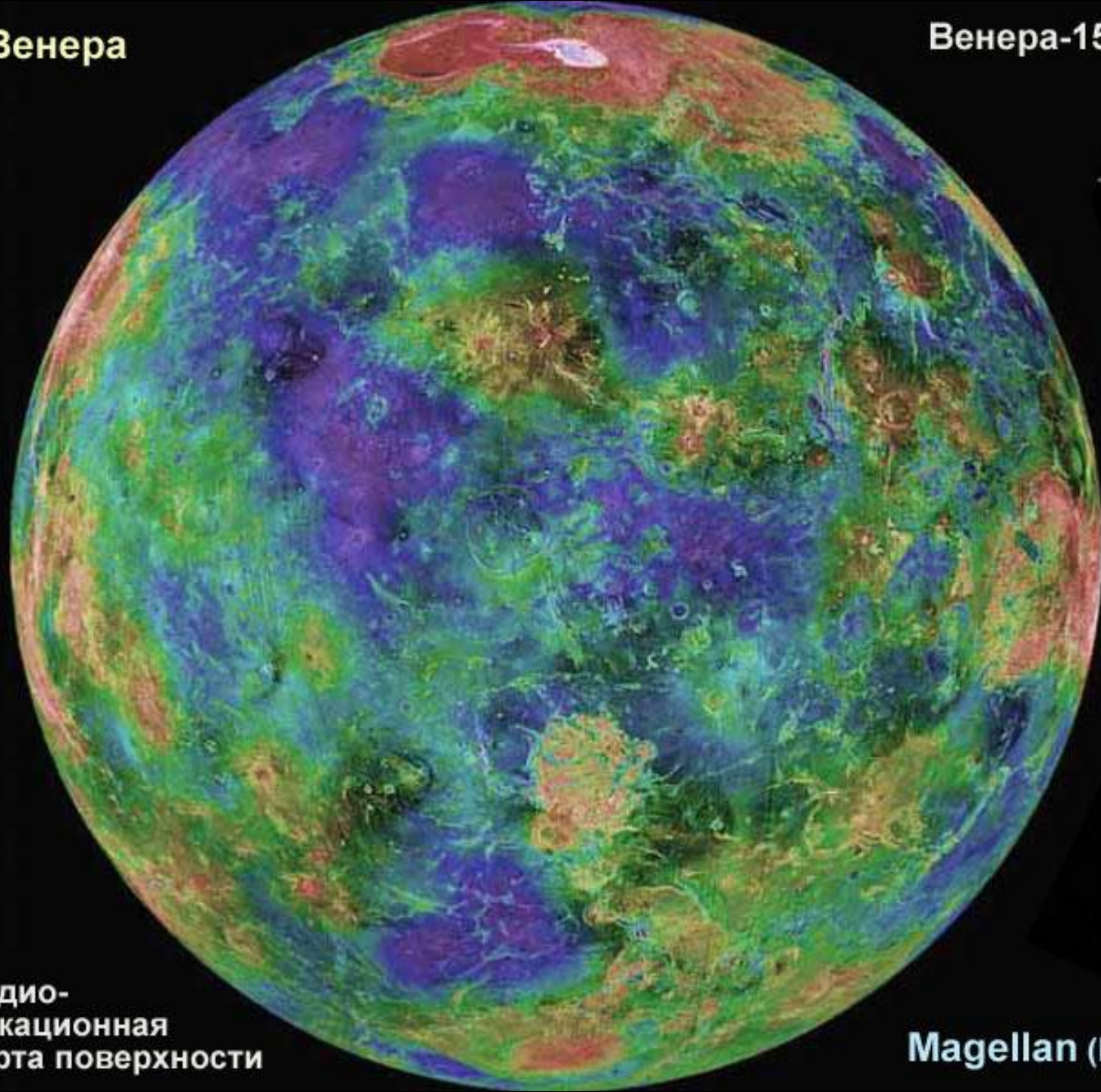




Don P. Mitchell

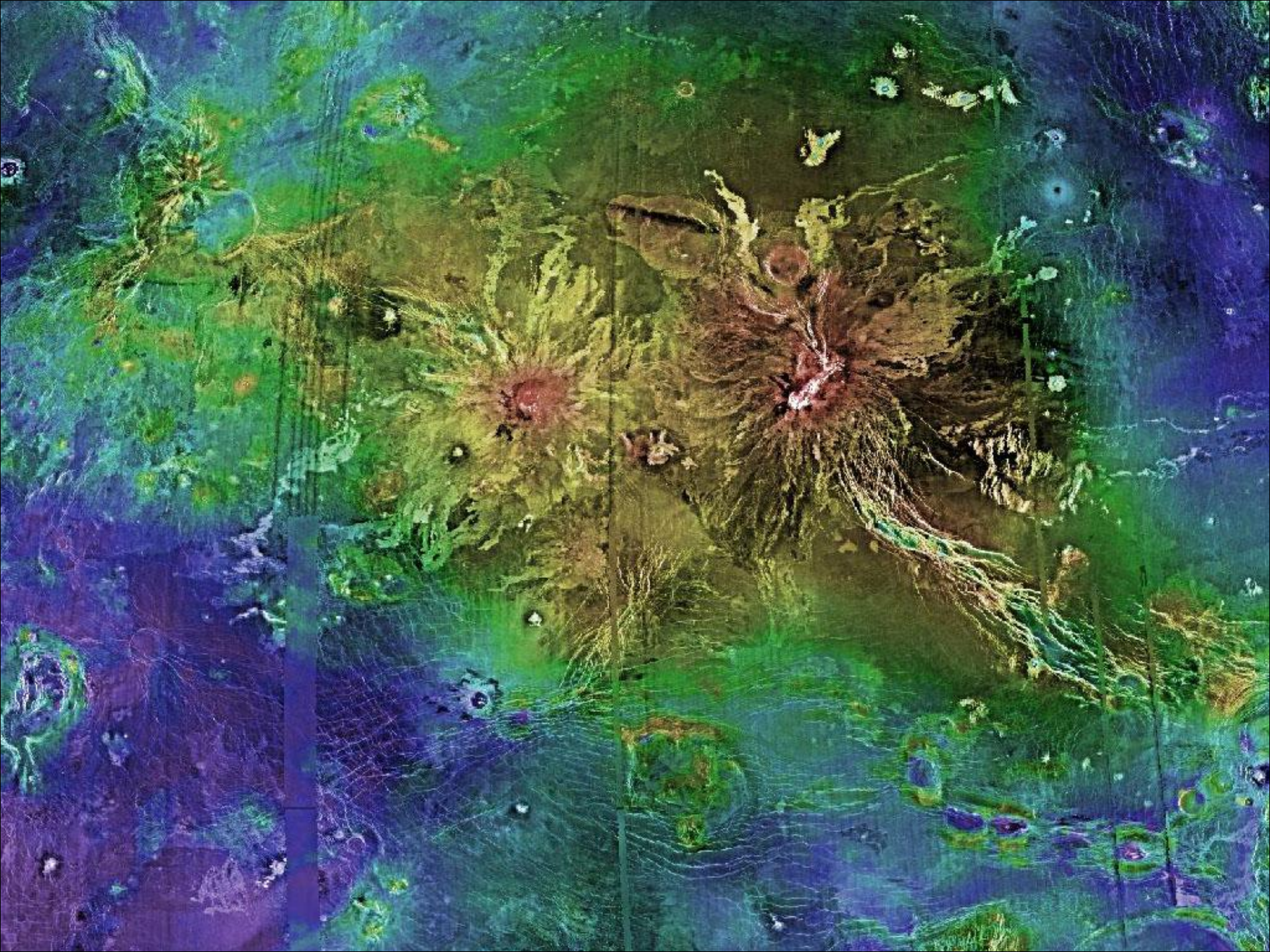
**Венера**

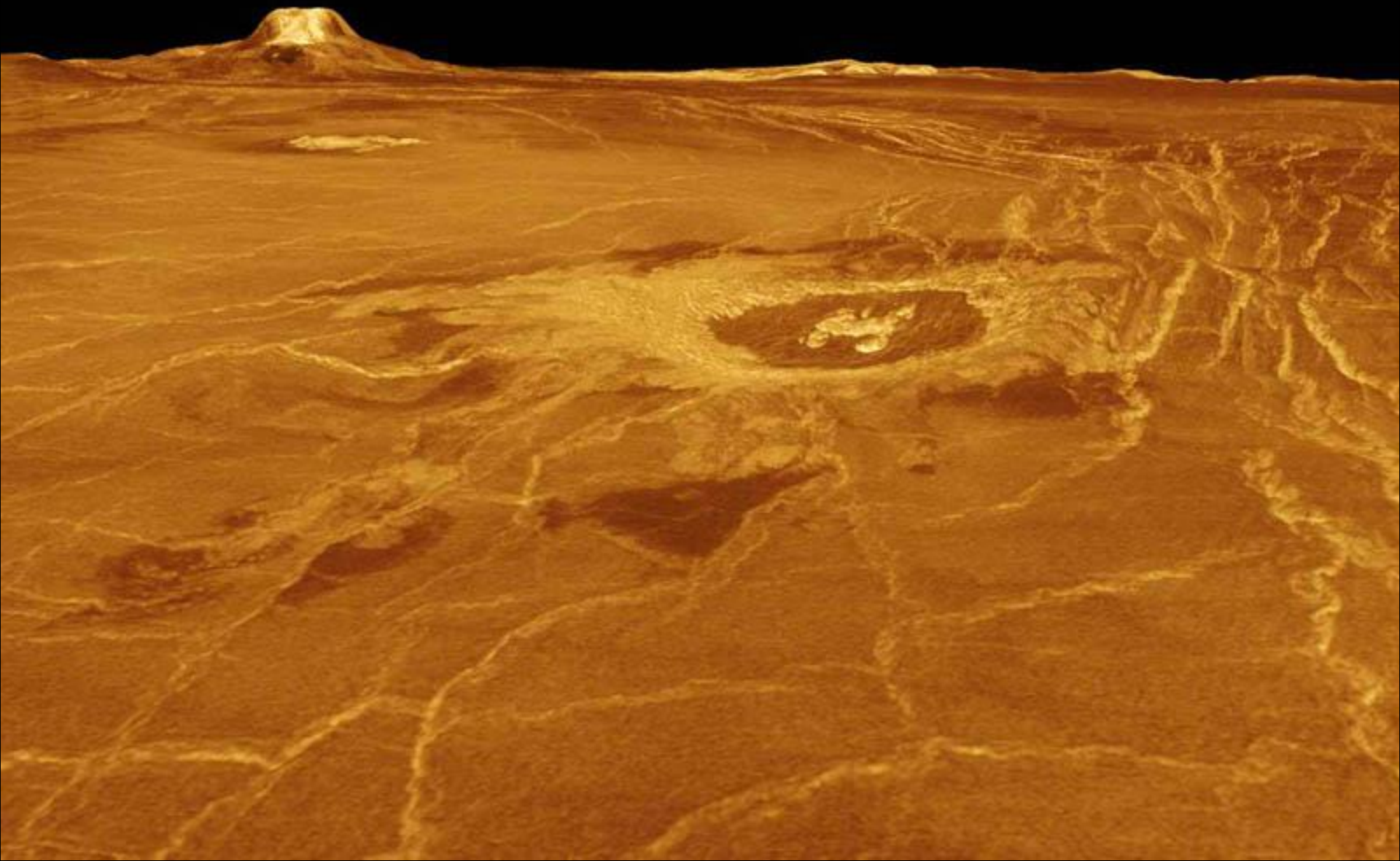
**Венера-15 и -16, 1983-1984**



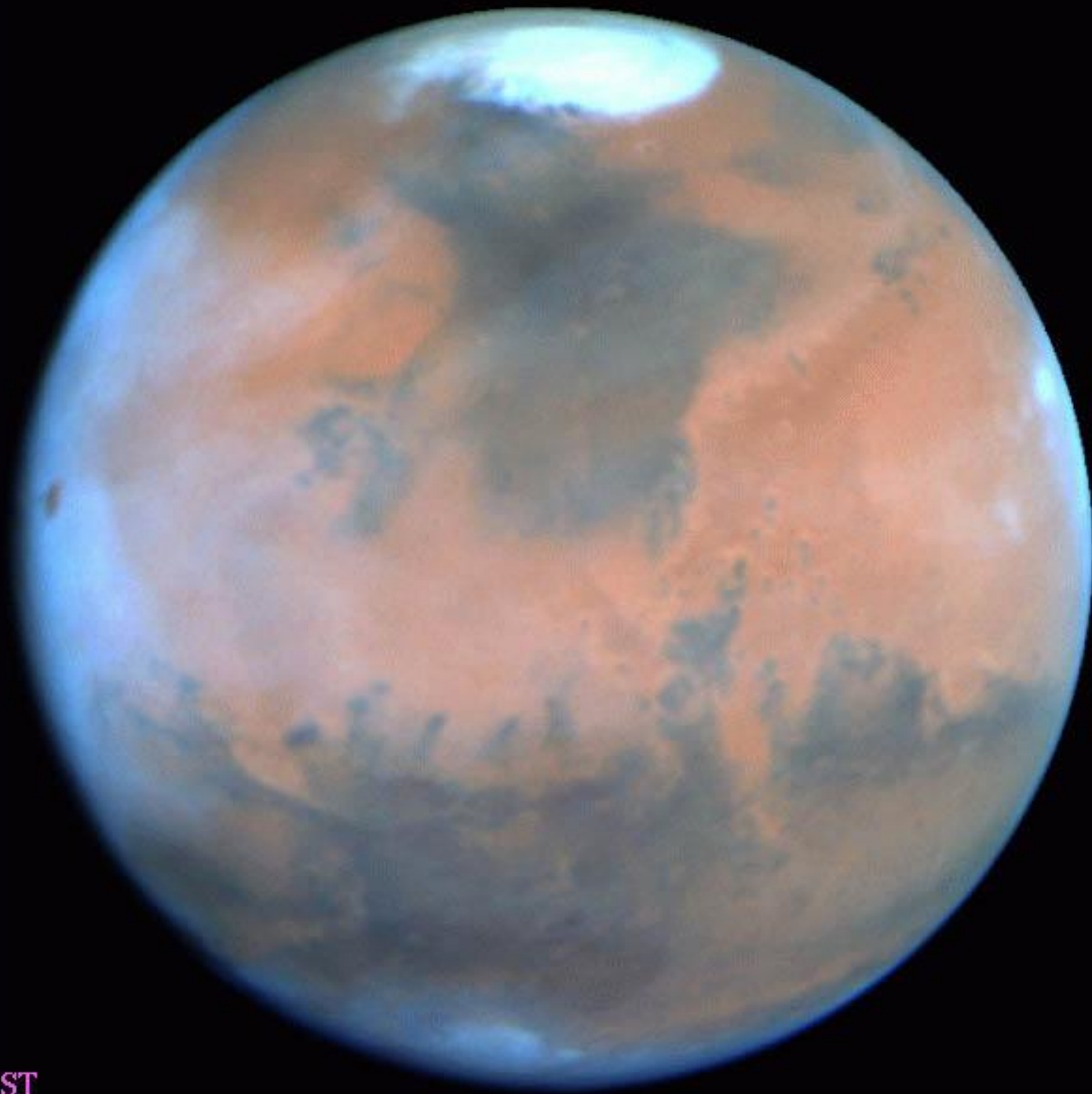
**Радио-  
локационная  
карта поверхности**

**Magellan (NASA) 1989 - 1994**

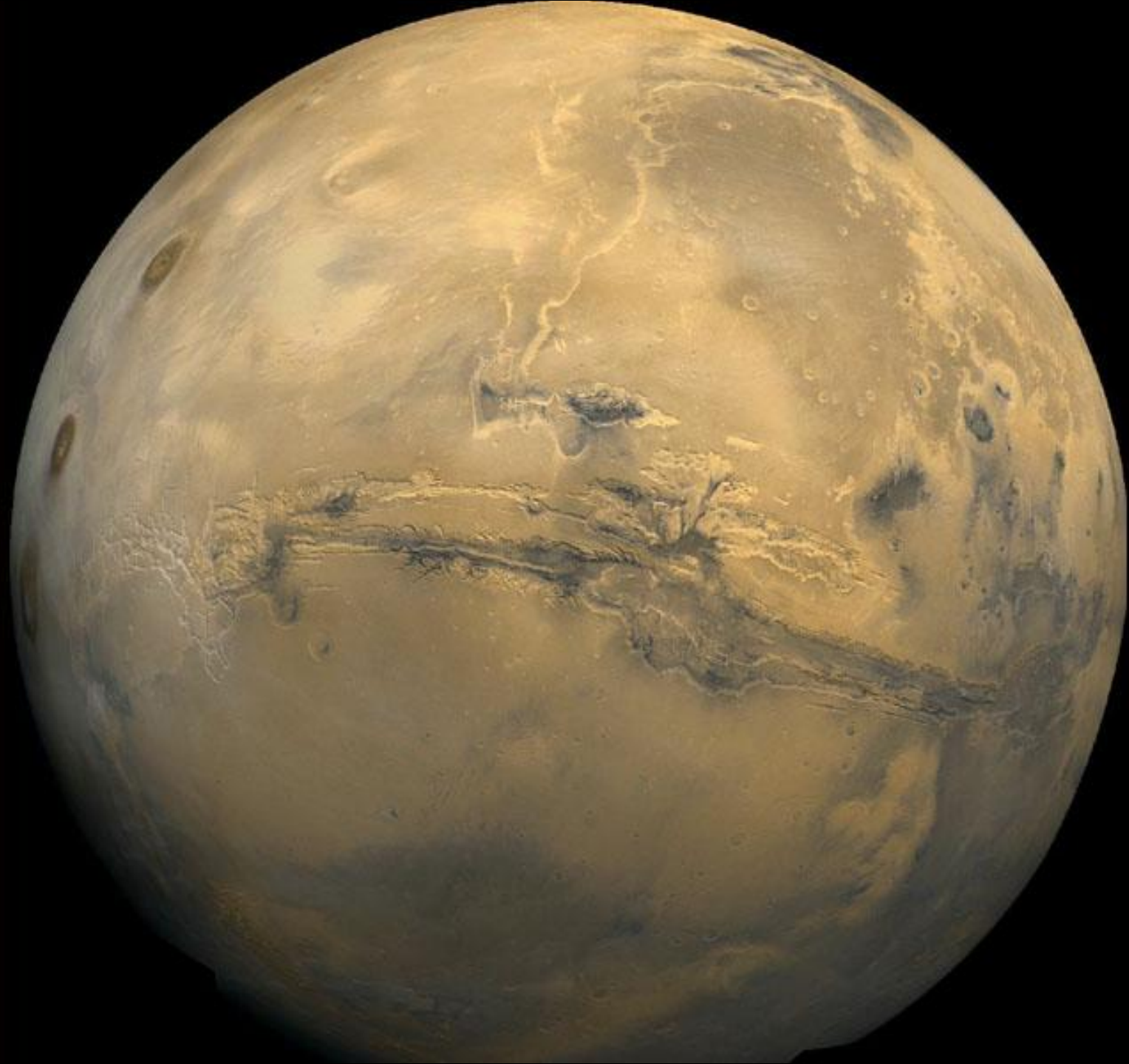


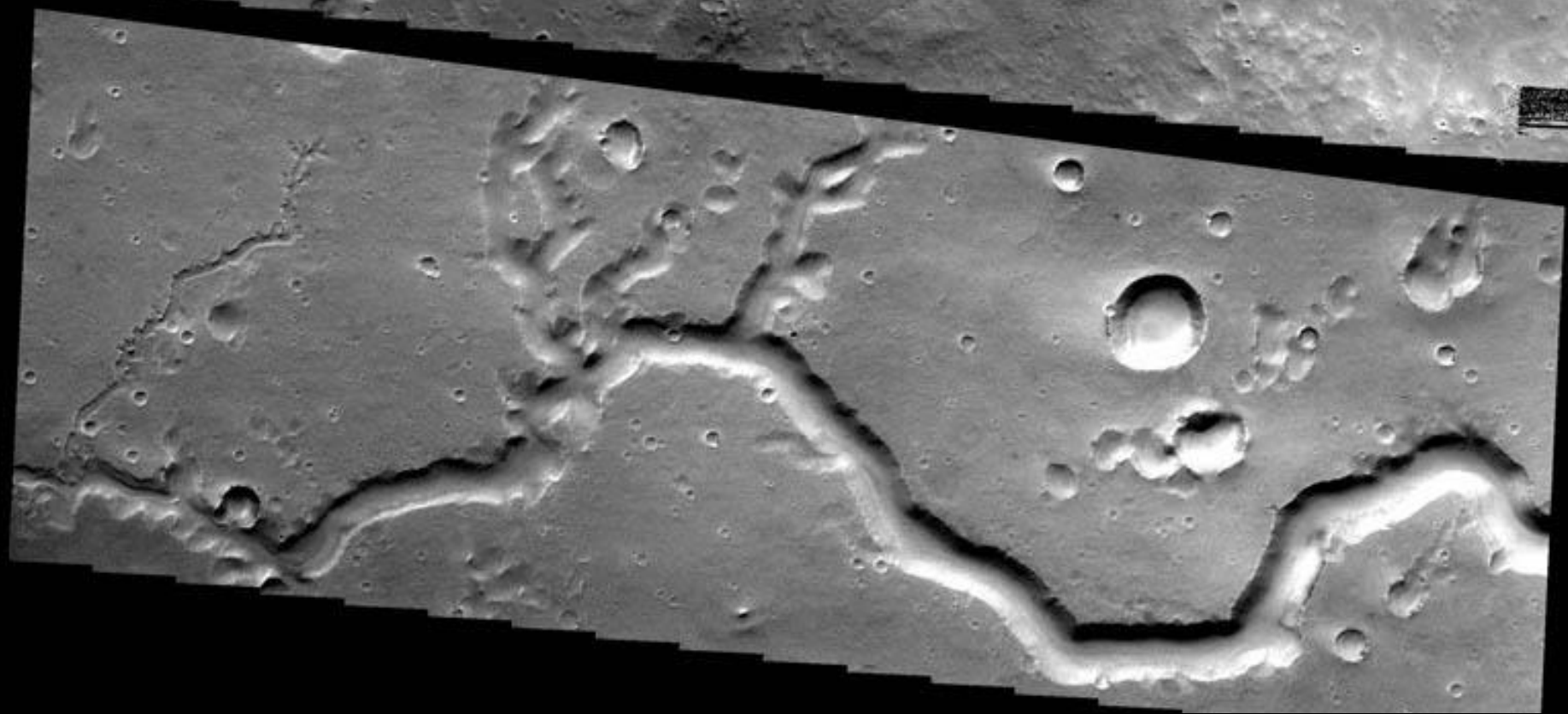
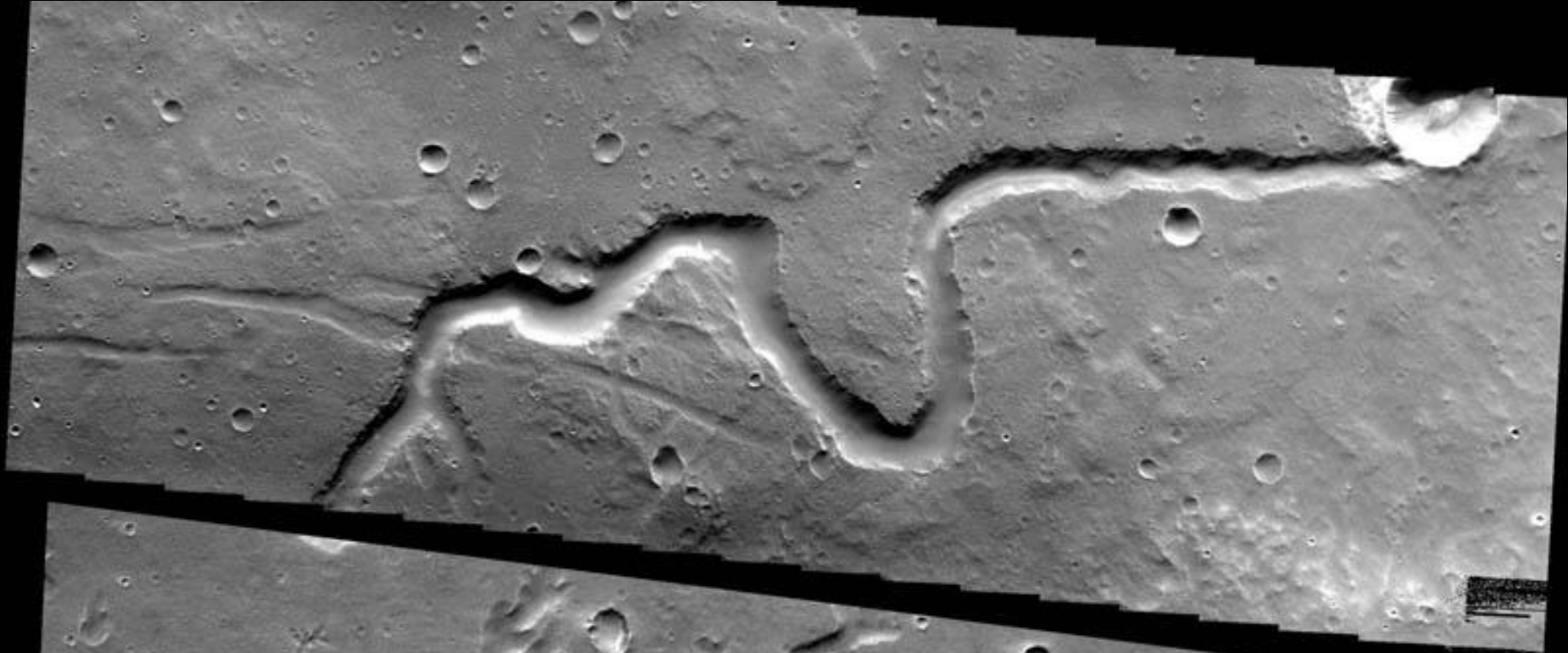


Mapc



Feb 1995 HST





Mars Reconnaissance Orbiter (MRO, NASA)

На орбите около Марса с 2006 г.





# ELECTROMAGNETIC SPECTRUM

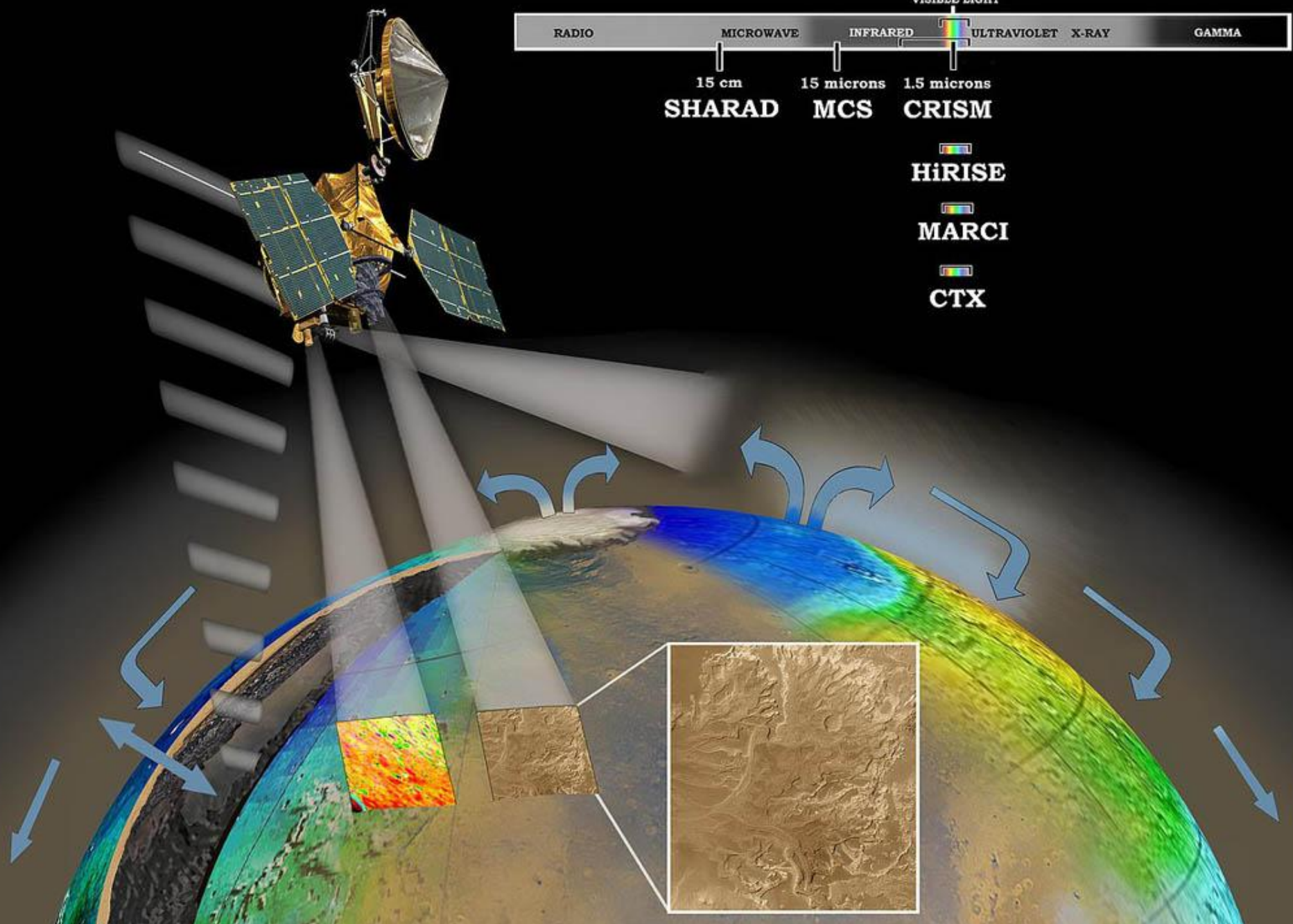


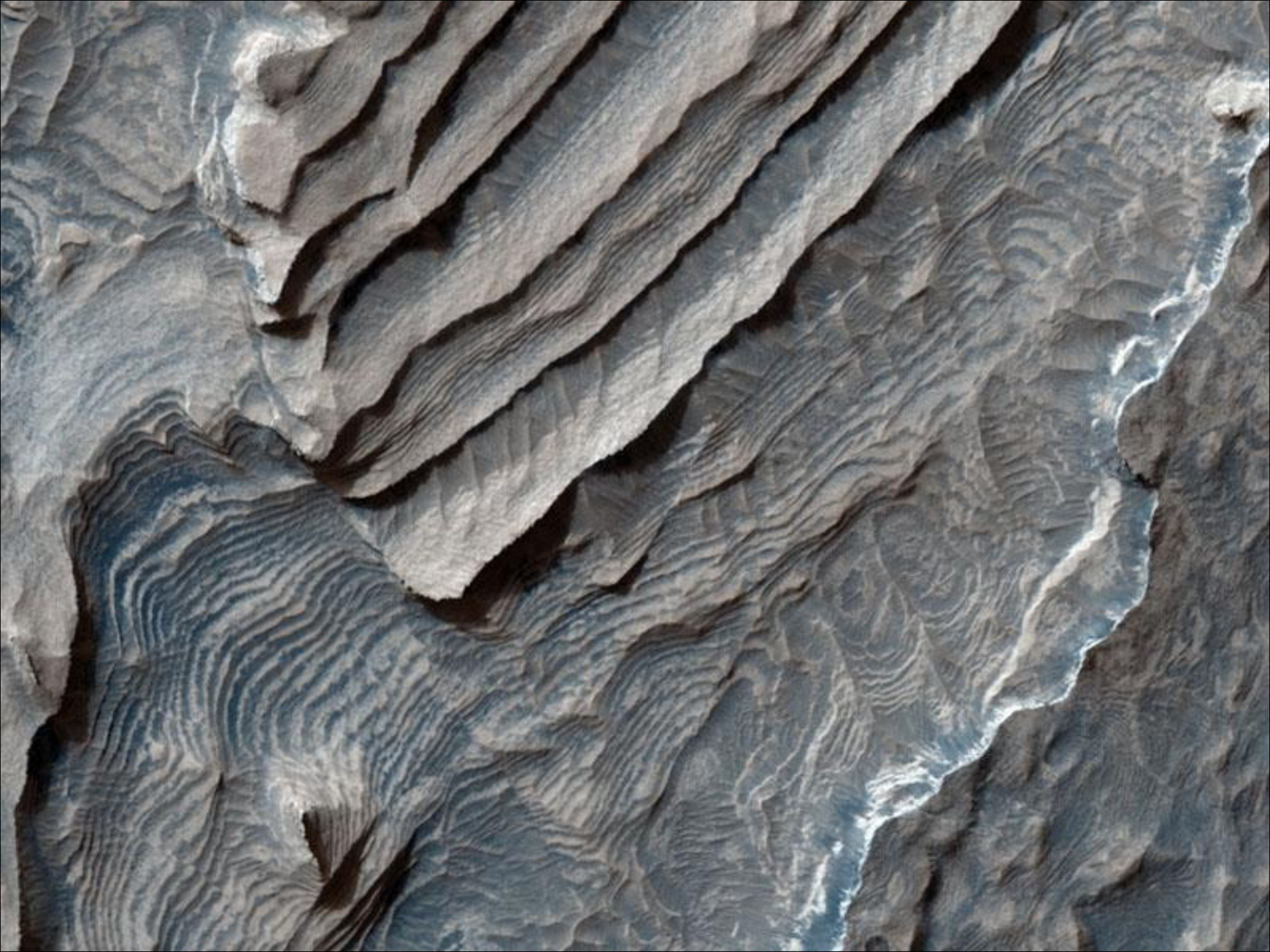
15 cm      15 microns      1.5 microns  
**SHARAD**      **MCS**      **CRISM**

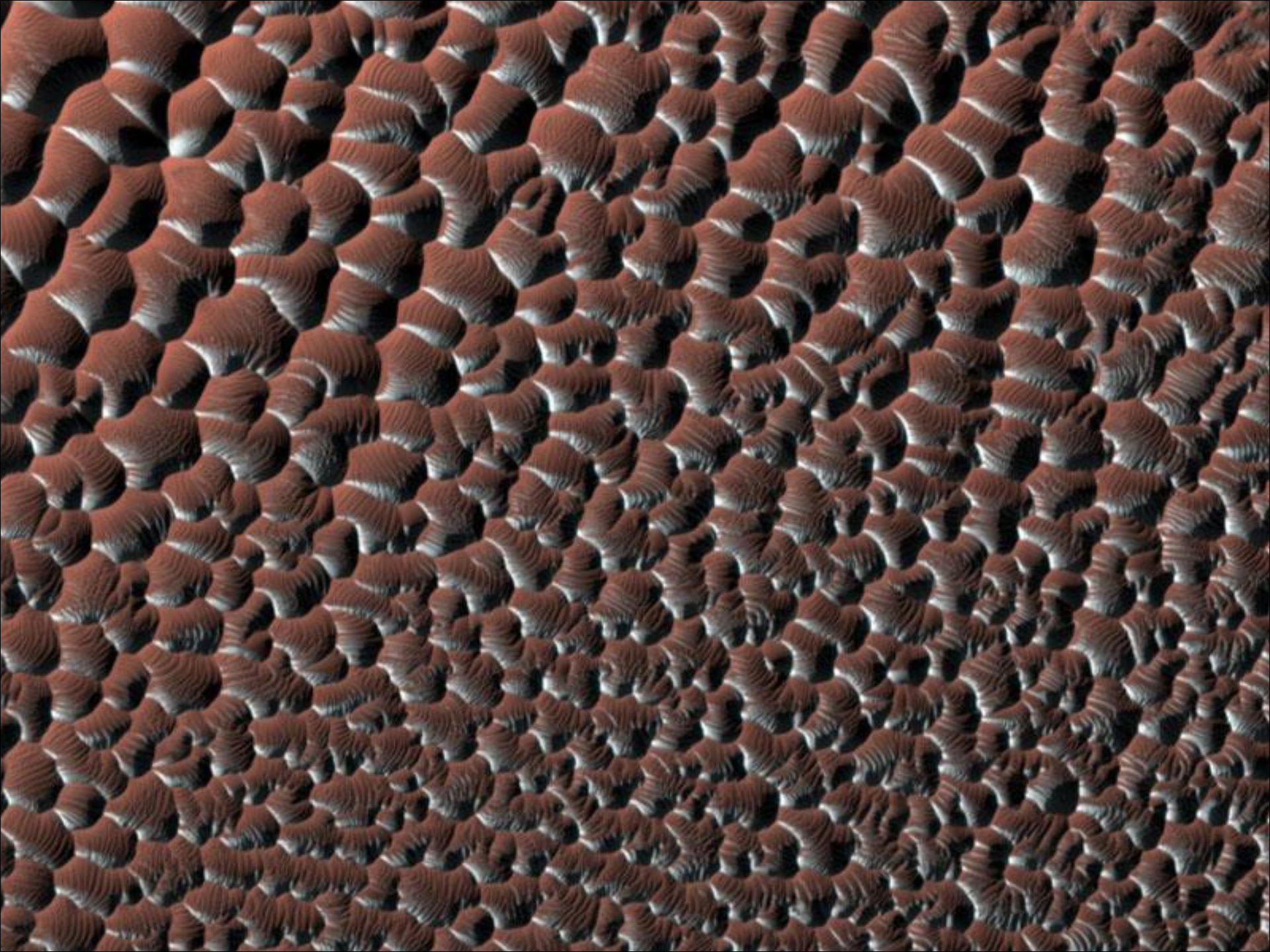
  
**HiRISE**

  
**MARCI**

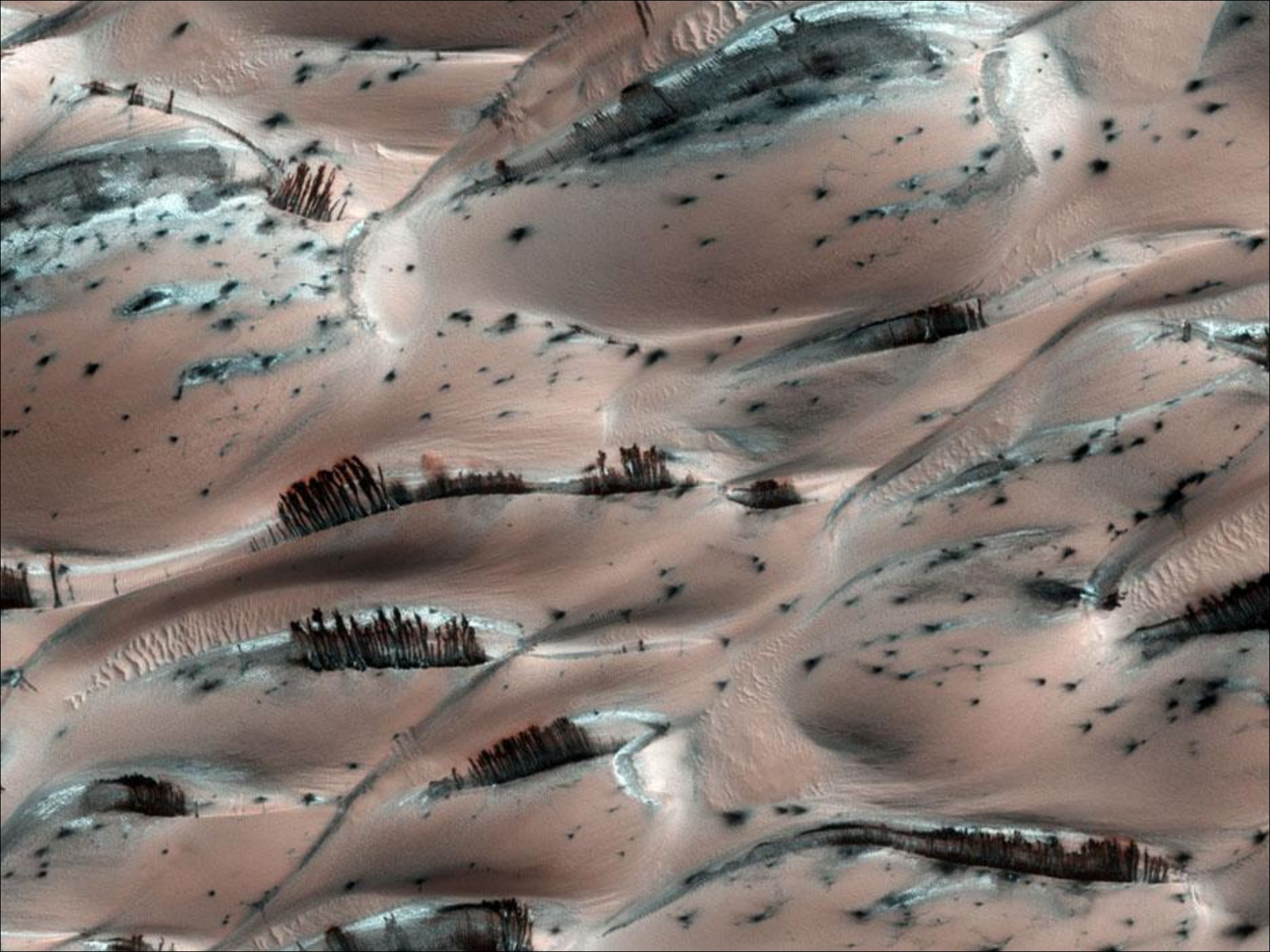
  
**CTX**



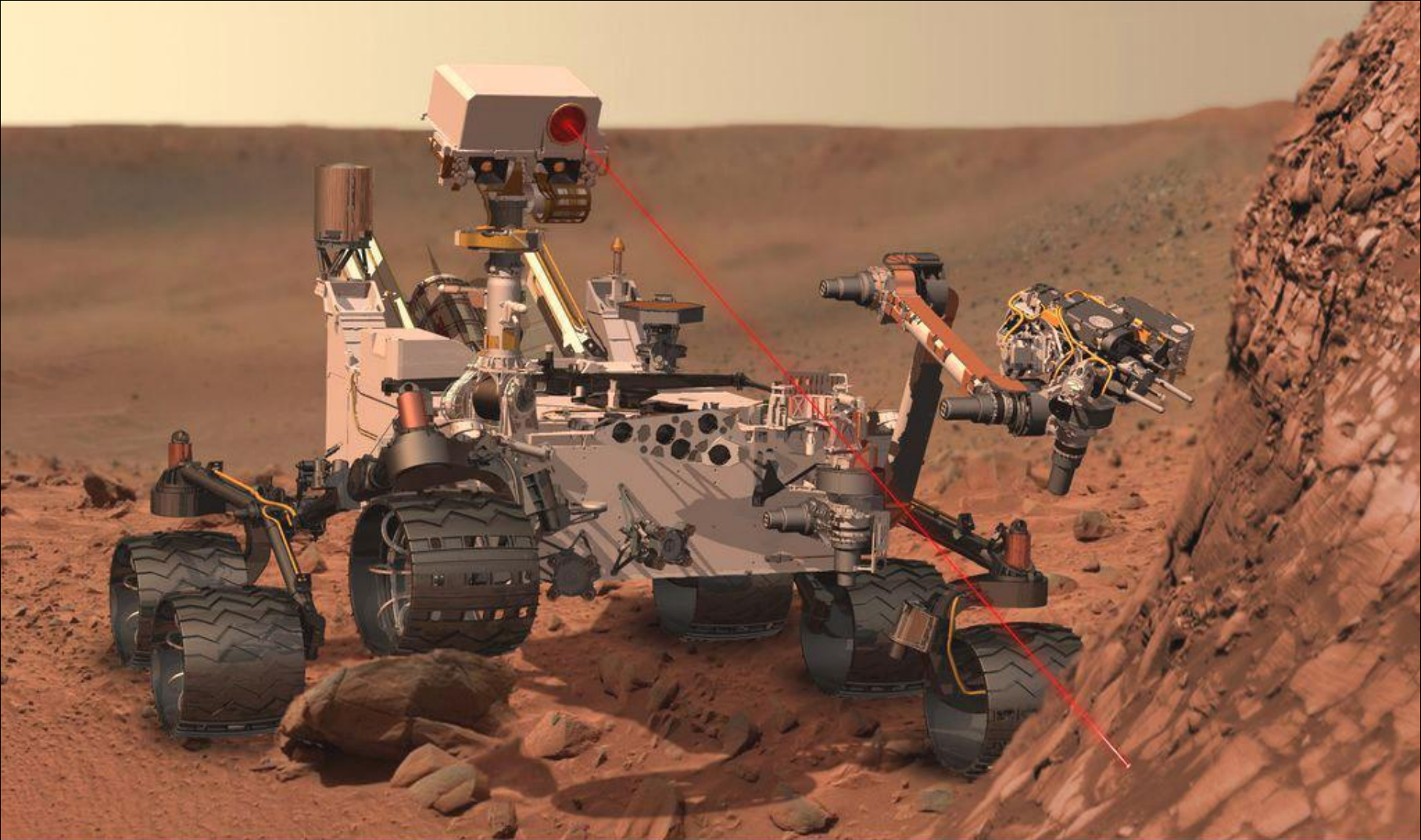












Mars Science Laboratory rover, Curiosity (NASA)

Работает на Марсе с 6 августа 2012 г.

# Проект научной базы на Марсе

1987 г.

2007 г.

