

Ankstesnių paskaitų reziume:

- Pasaulis sudarytas iš dalelių ir spinduliuotės, kurios tarpusavyje reaguoja: skyla bei jungiasi įvairiais būdais.
 - Todėl aktualu suprasti, kaip tie procesai pasireiškia Visatos istorijoje ir kas bus ateityje.
- Visatoje aptikti įvairūs kūnai ir jų sistemos.
 - Kaip visa tai susiformavo?
 - Kaip kinta tie kūnai bei sistemos laikui bėgant?
 - Kokia jų svarba Žemei ir Žemės gyventojams?

Kodėl reikia tirti megapasaulį?

- Žemė – kosminis kūnas. Kas nutiko kitiems, gali nutkti ir Žemei.
 - Iš kur atlekia kūnai išmušantys meteoritinius kraterius?
- Kiek ir kaip toliau degs Saulė?
 - Kaip žmonija turi ruoštis pokyčiams?
 - Kokia visų tų procesų laiko skalė?
- O visa tam reikia suprasti dangaus sferoje veikiančius procesus.

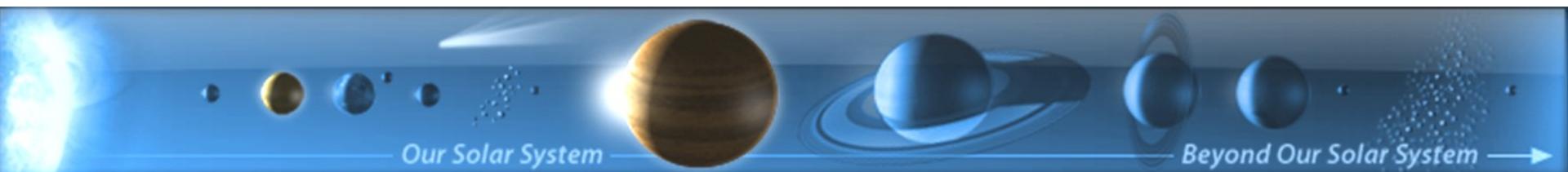
TEMA:
Saulės sistema
ir kiti dangaus kūnai – faktai ir
“veikimo” modeliai

Mokyklinis paveikslas



Kodėl įvyko toks požiūrio pasikeitimas?

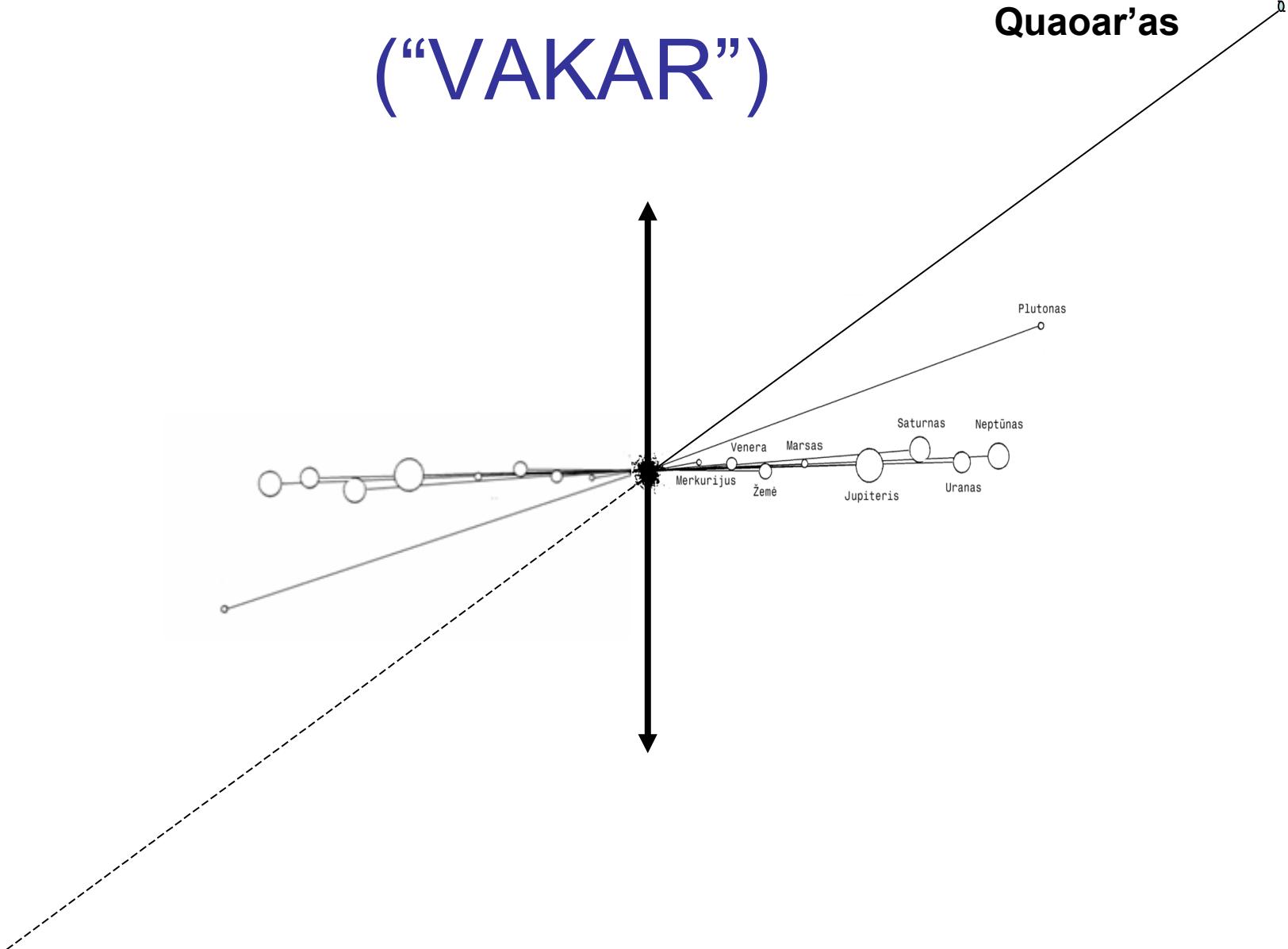
Tikslesnis vaizdas:



Saulės sistema “iš šono”

(“VAKAR”)

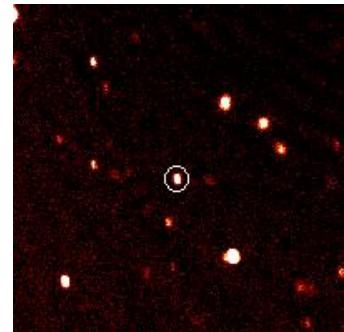
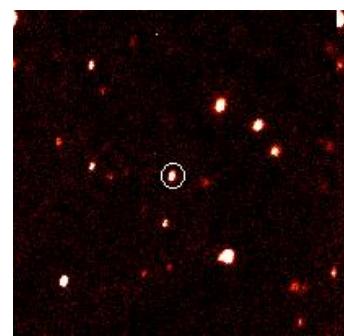
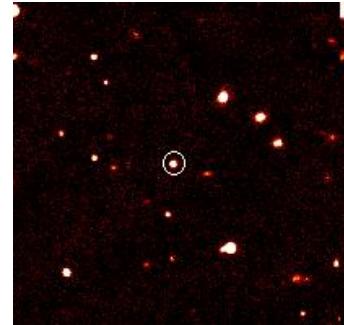
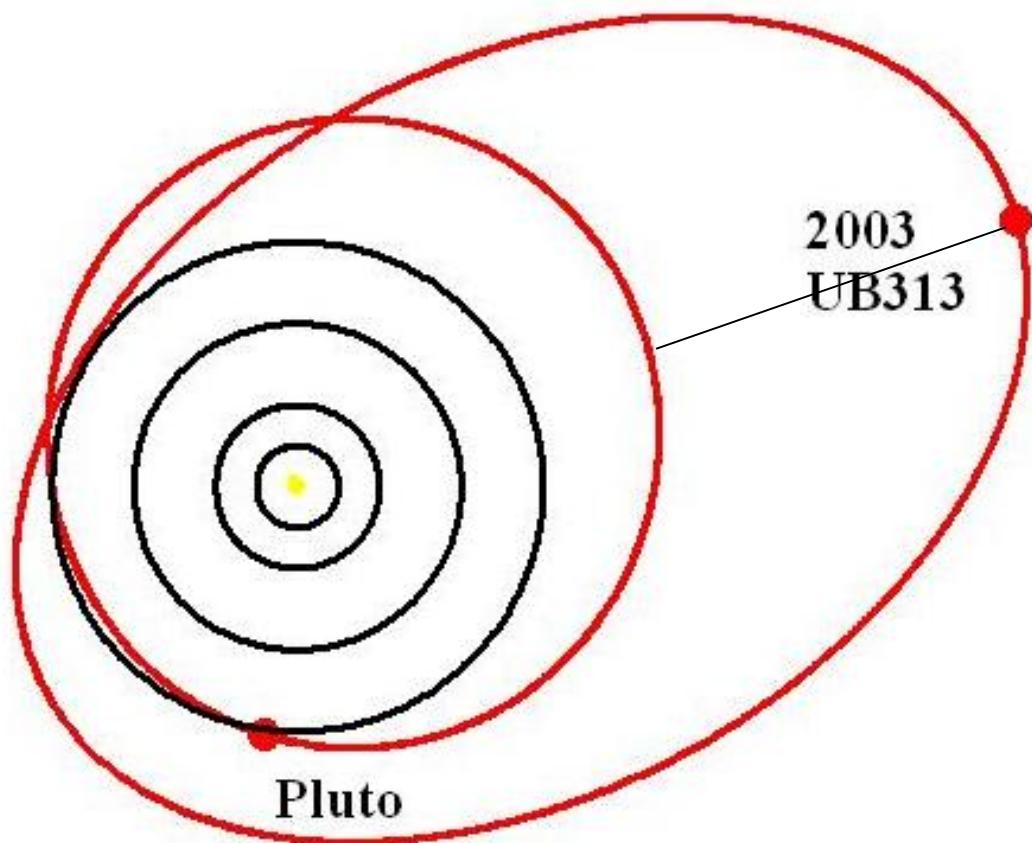
Quaoar'as



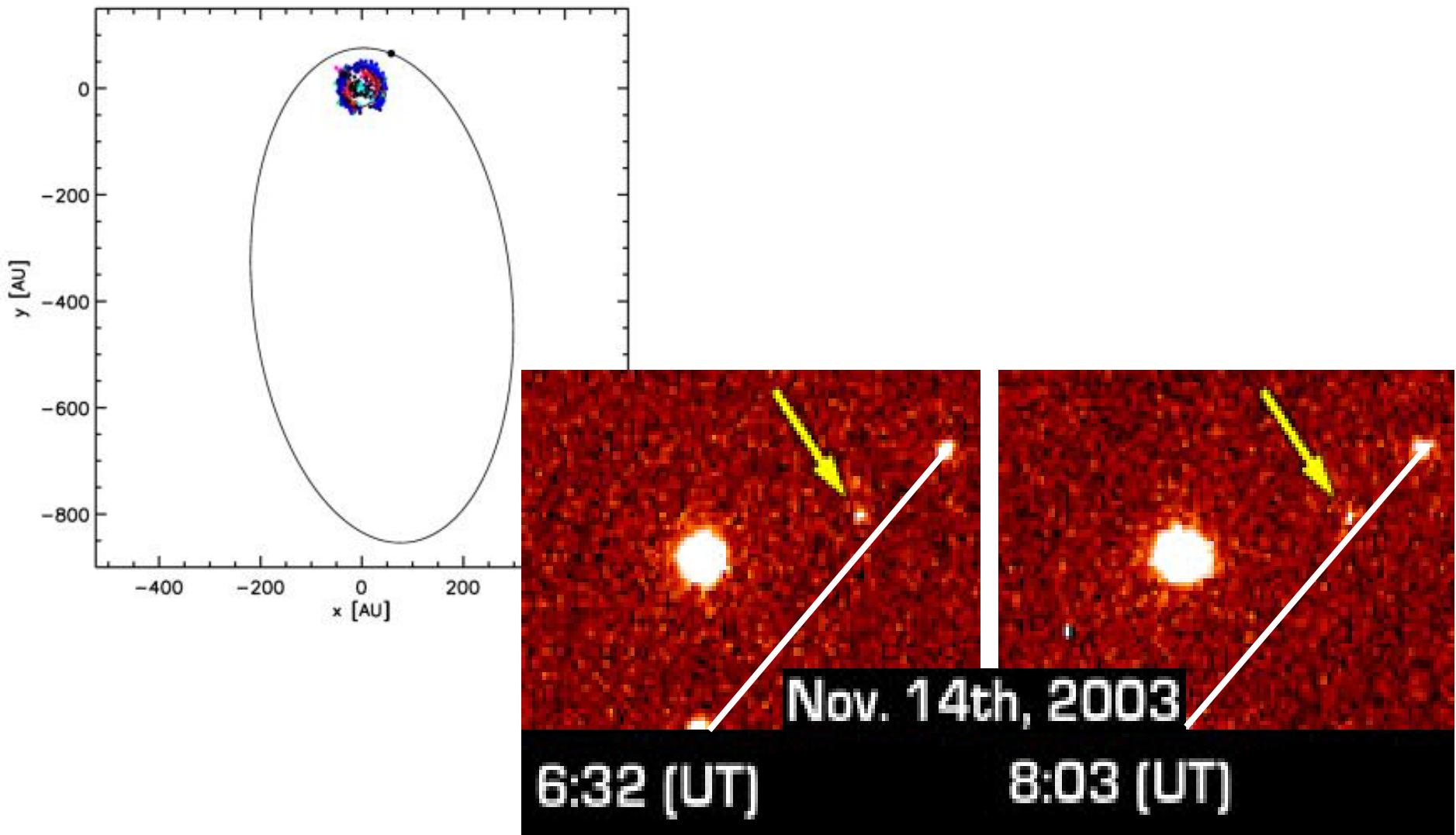


Kuperio juostoje dangaus kūnas su palydovu

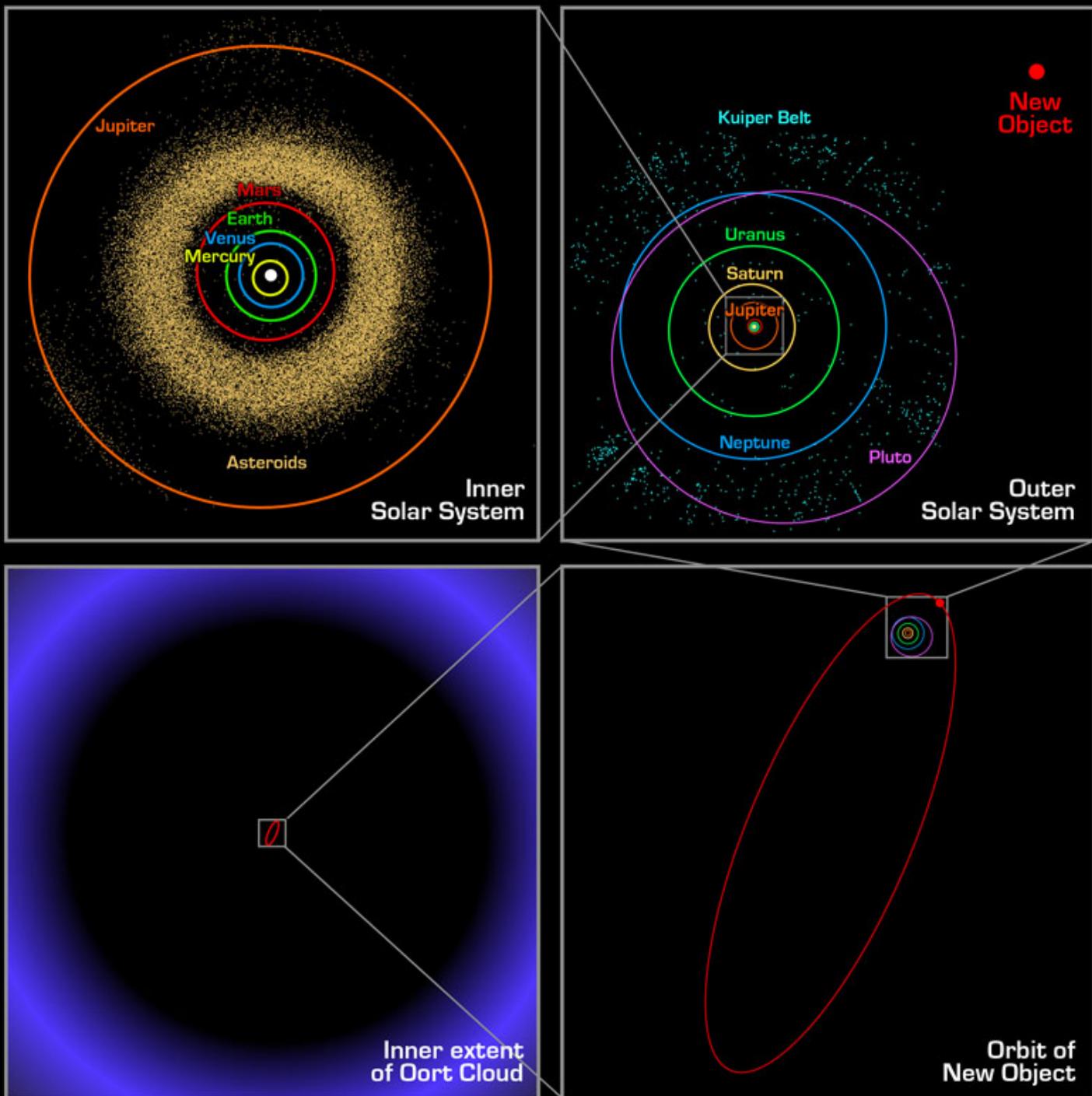
Naujas dangaus kūnas - gal planeta: $\sim 30^\circ$ kampu į ekliptikos plokštumą



Dar vienas naujas kūnas



Sedna



Sedna



**Sedna yra Šiaurės šalyse žinoma
deivė besirūpinanti visu tuo, kas
yra jūrose.**



Sedna
800-1100 miles
in diameter



Quaoar
(800 miles)



Pluto
(1400 miles)



Moon
(2100 miles)



Earth
(8000 miles)

2006 m. astronomų sprendimas:

- Plutonas ir kt. naujieji dangaus kūnai – ne planetos, o nykštukinės planetos.
- Saulės sistemą sudaro:
 - Nykštukinės planetos,
 - Vidinės planetos,
 - Didžiosios dujinės planetos
 - Asteroidų žiedas
 - Kuperio žiedas ir Oorto debesys
 - Saulė

Nykštukinės planetos



Vidinės planetos:
Merkurijus, Venera,

Žemė,

Marsas



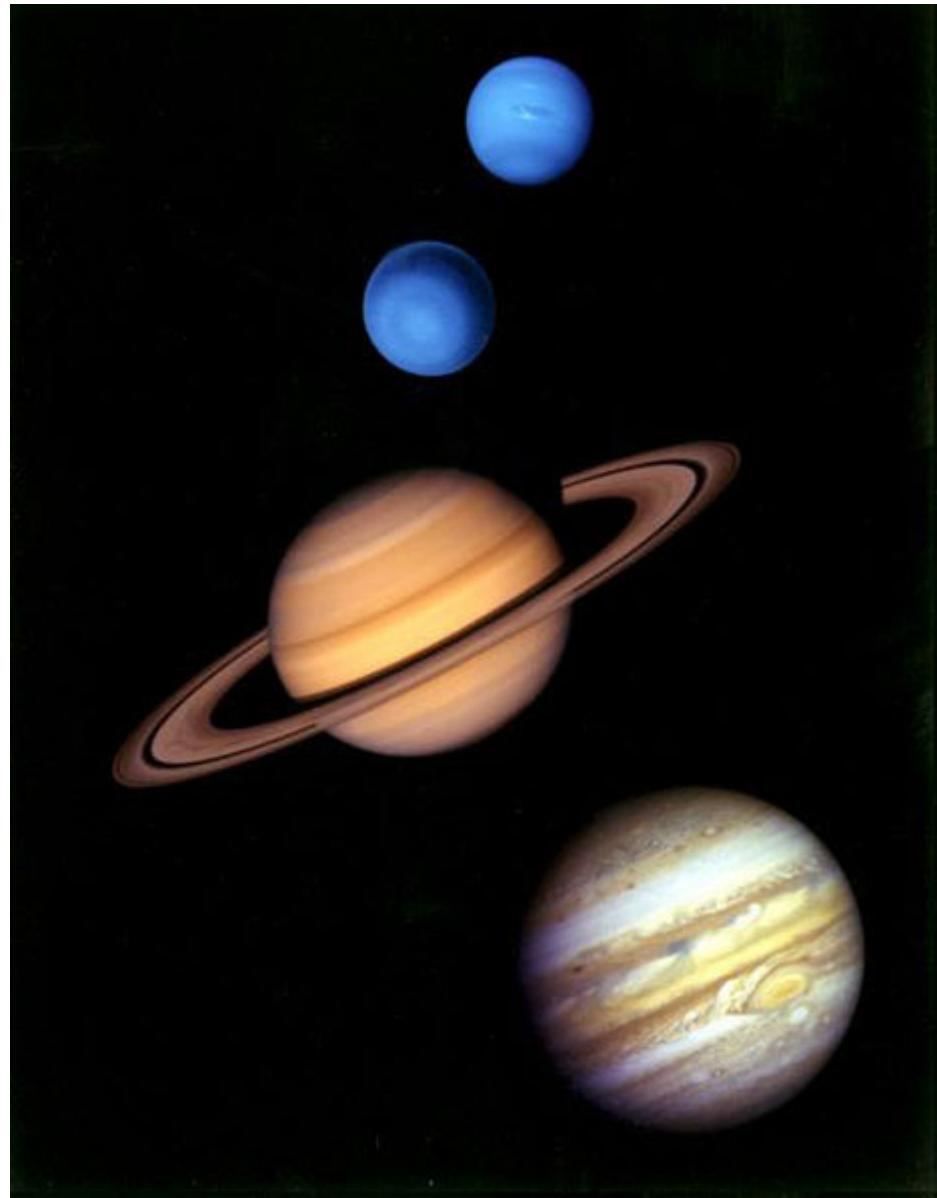
Milžinės dujinės planetos:

Neptūnas

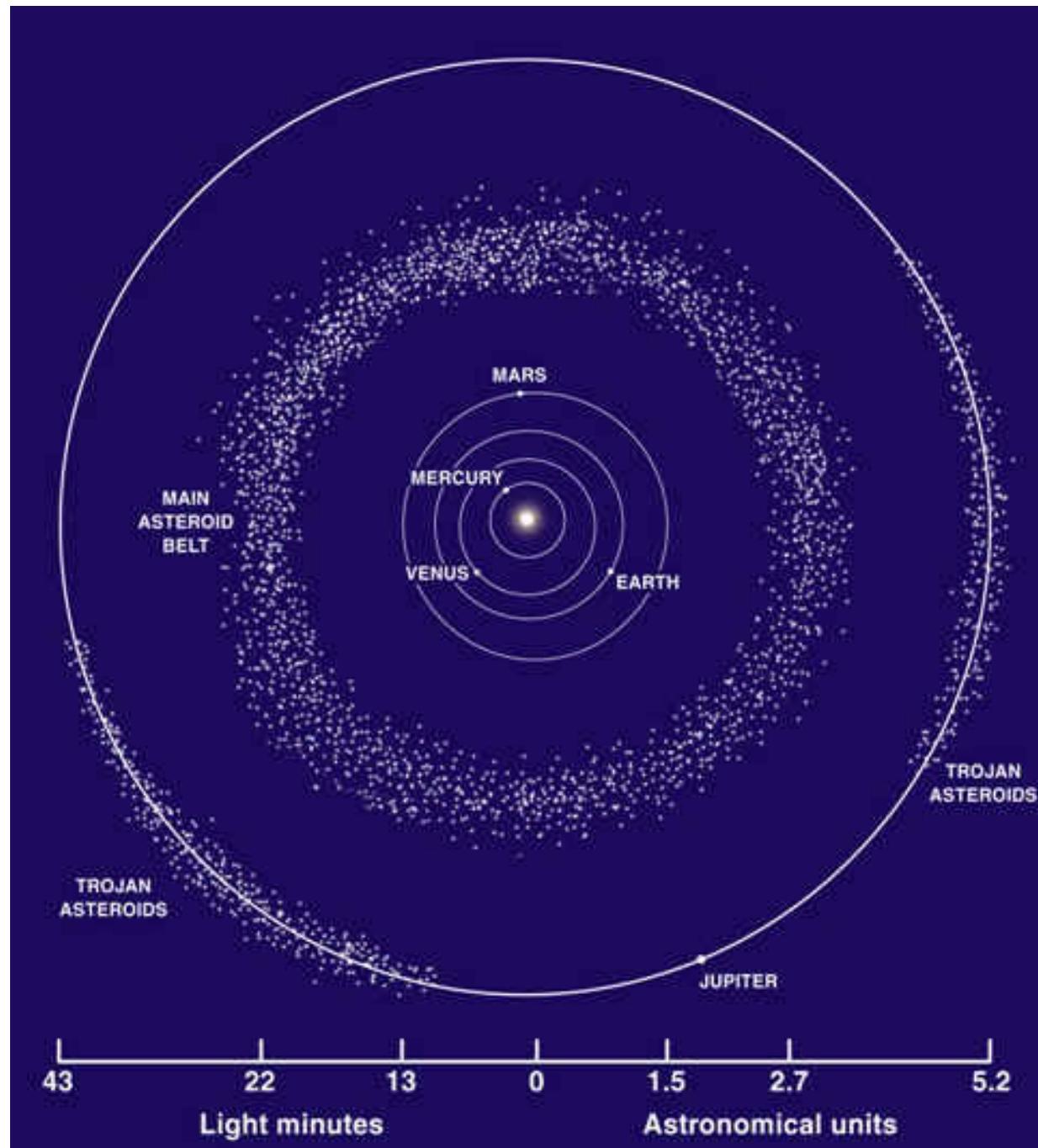
Uranas

Saturnas

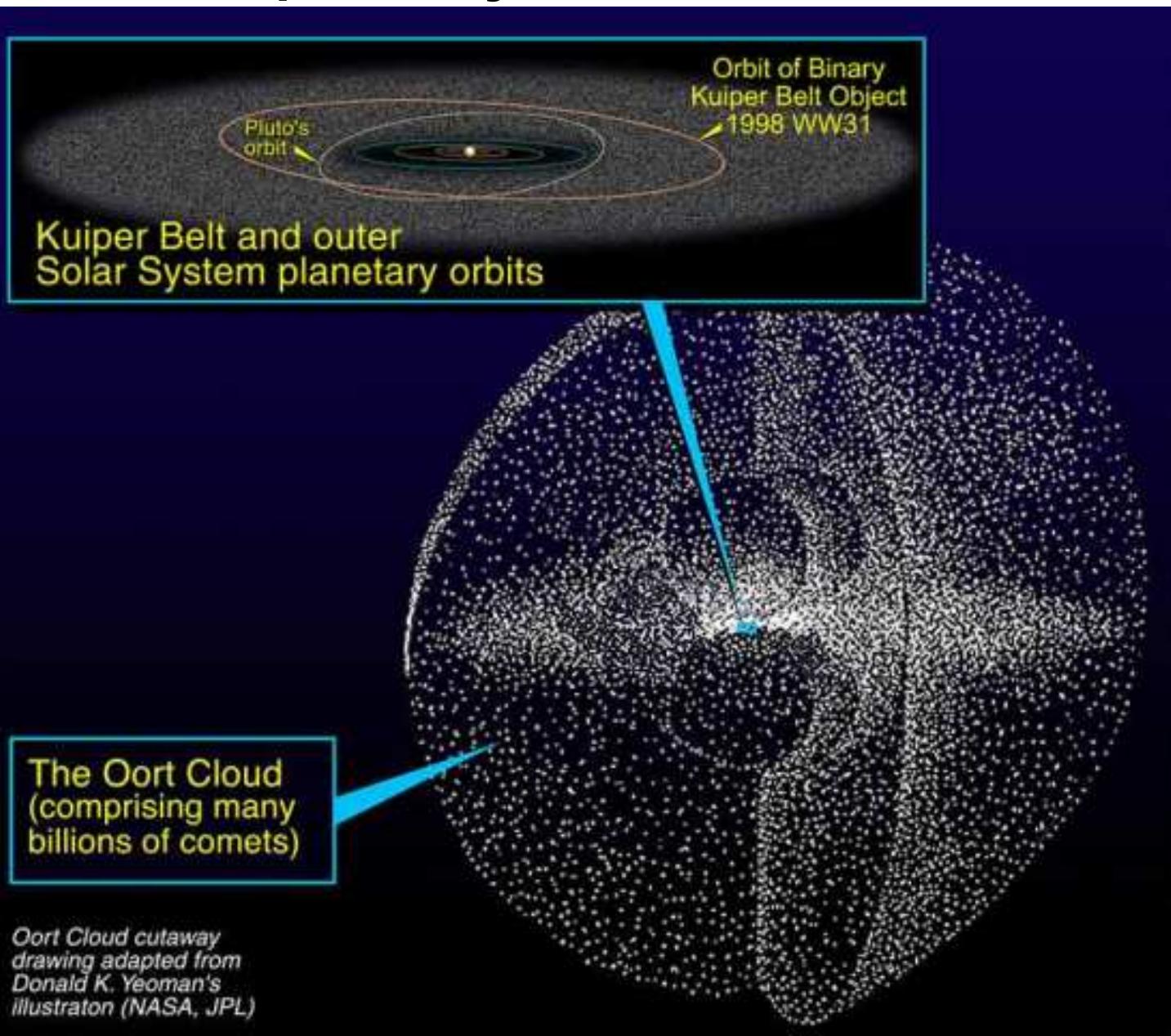
Jupiteris



Asteroidų žiedas



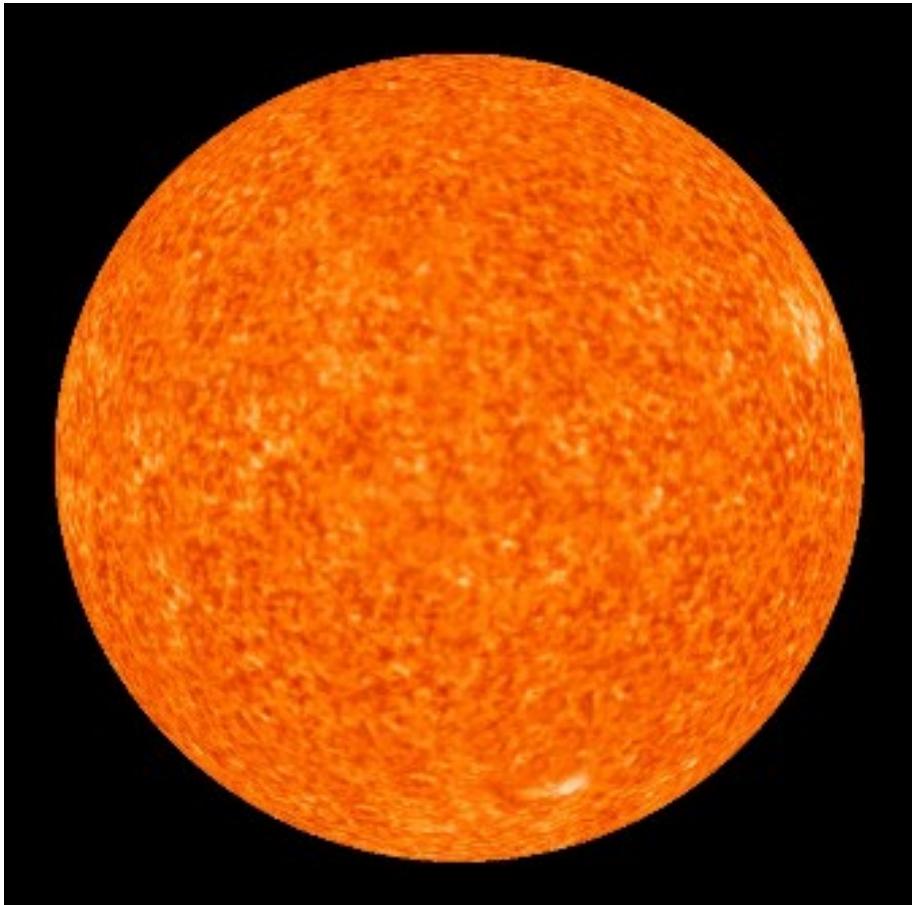
Kuperio juosta ir Oorto debesis



Olandų astronomas Janas Hendrikas Ortas (Oort) 1950 m. iškėlė kometų kilmės hipotezę: 50 000 astronominių vienetų atstumu Saulė supa kometų spiečius, kuriame gali būti net iki 100 milijardų kometų.

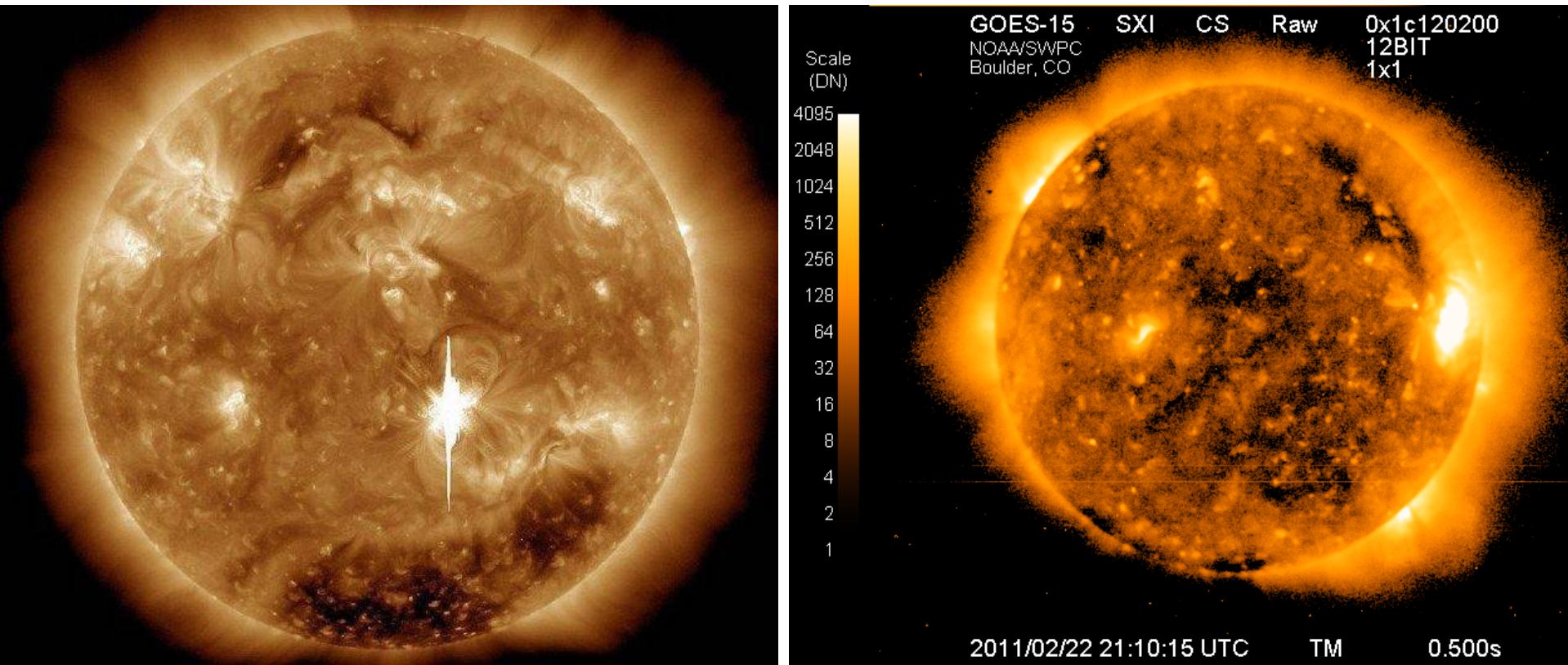
Šis kometų spiečius buvo pavadintas Orto kometų debesiu.

Saulė klasifikuojama tarp žvaigždžių geltonuoju nykštuku, nors yra tarp vidutinių žvaigždžių



- Skersmuo: 1 395 000 **km**. (~100 x didesnis už Žemės (o atstumas iki Žemės – 150 mln. km); masė: $2 \cdot 10^{30}$ **kg**)
- Temperatūra: 5500 C (paviršiuje) 15,600,000 C (gelmėse)
- Saulė - 70% vandenilio, 28% helio, 2% - kitų elementų.
- Saulės gelmėse vandenilis virsta heliu.
- Ties pusiauju Saulė apsisuka kartą per 25.4 dienas, ties ašigaliu – per 36 dienas.
- Vidutinis tankis – 1.4 g/cm³, gelmėse 160 g/cm³

Saulé 2011.02.22



Solar-Terrestrial Data - click for info

15 Feb 2012 2110 GMT

Current Solar

SFI: 105 SN: 64

A-Index: 10

K-Index: 2

X-Ray: B1.8

304A: 150.2 @ SEM

Ptn Flx: 0.10

Elc Flx: 19.90

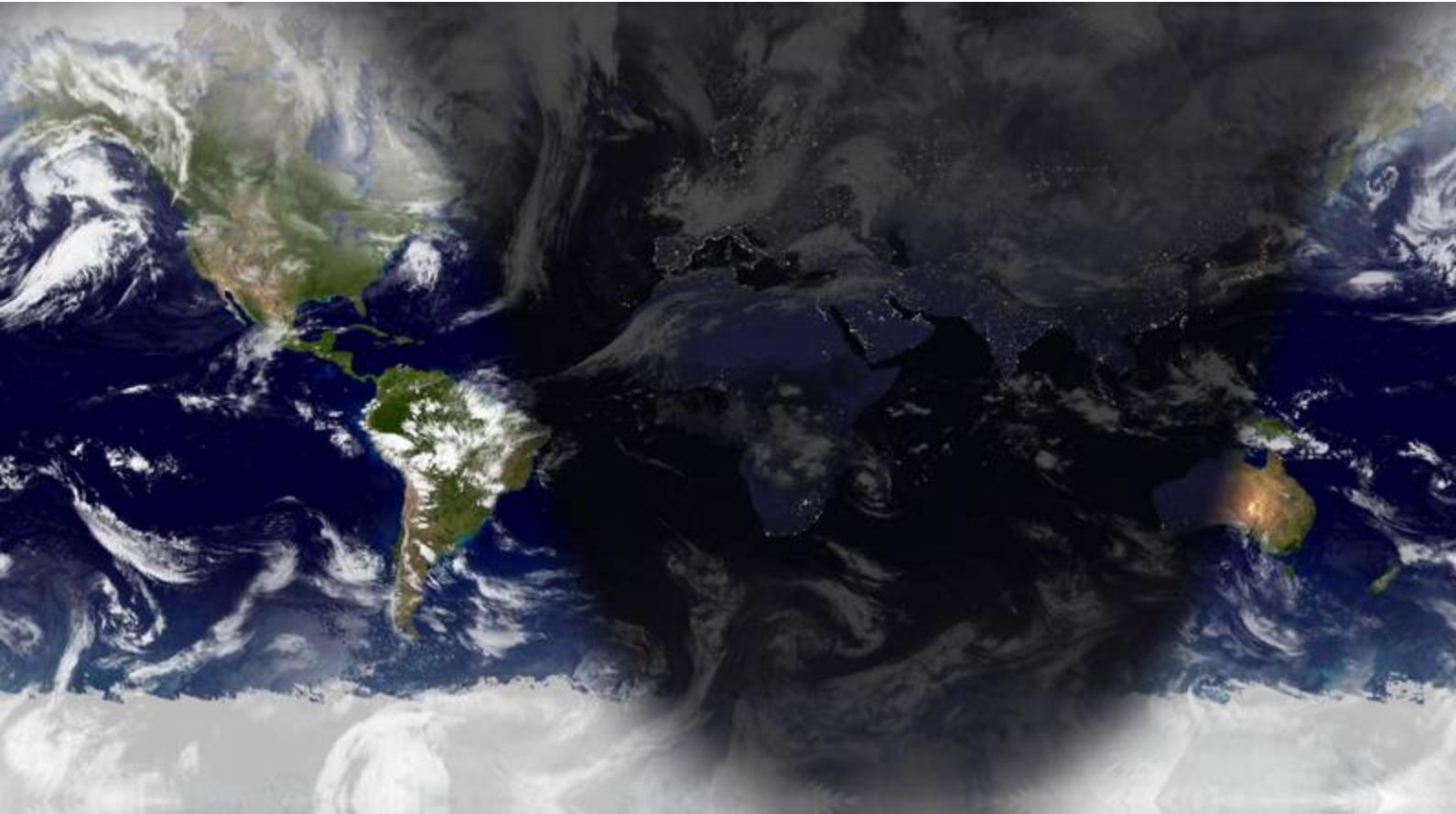
Aurora: 9 /n= 1.22

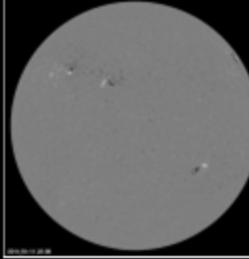
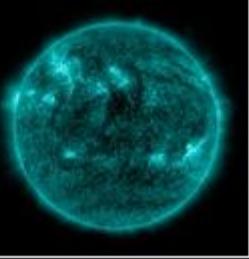
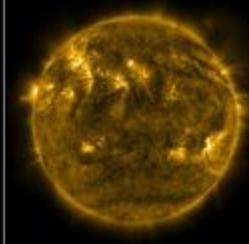
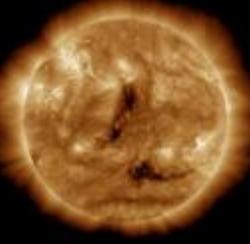
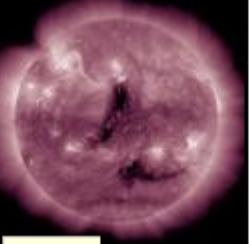
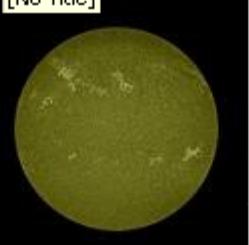
Geomag Field QUIET

Sig Noise Lvl S1-S2

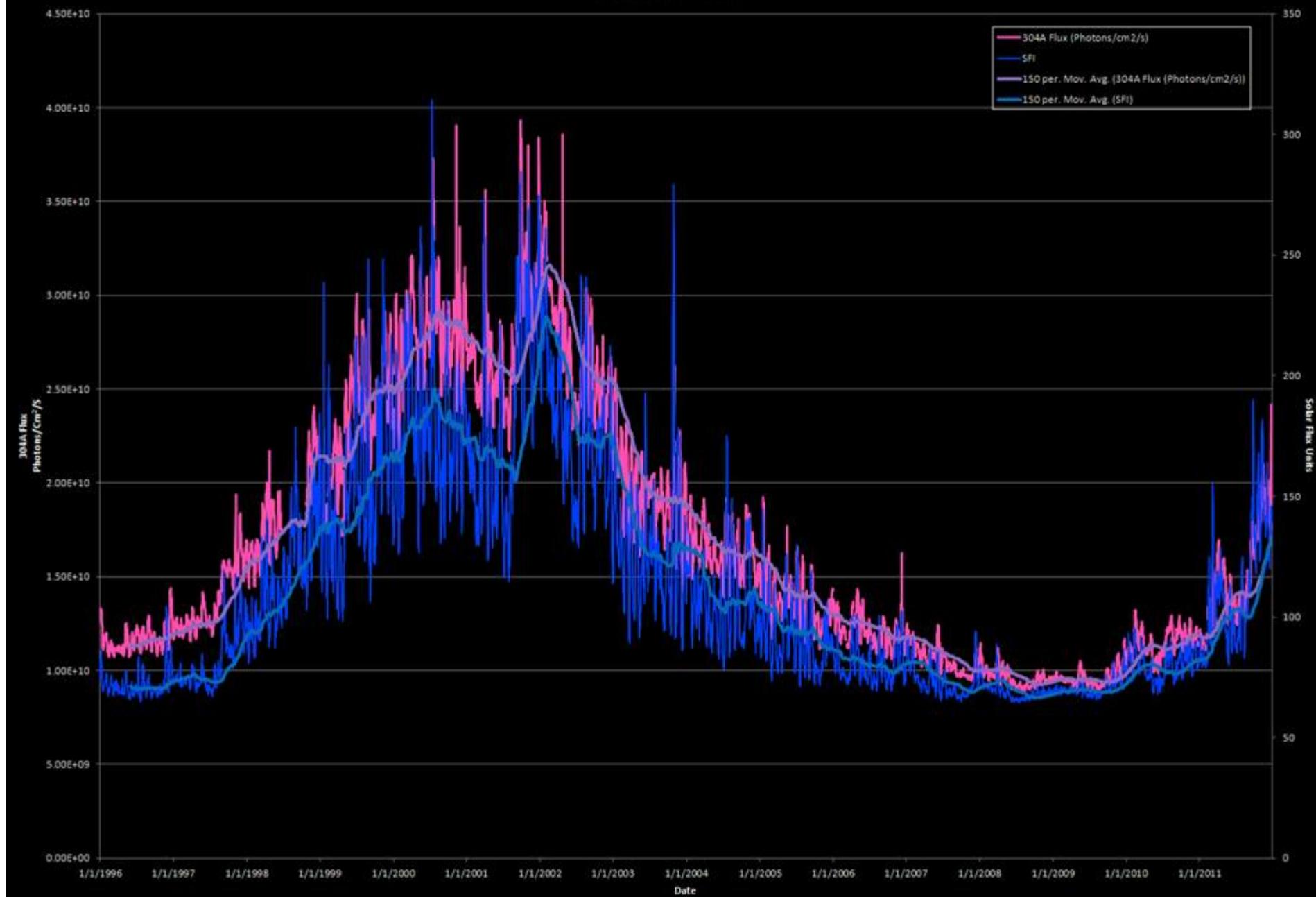


<http://www.n0nbh.com> - (C) Paul L Herrman 2012

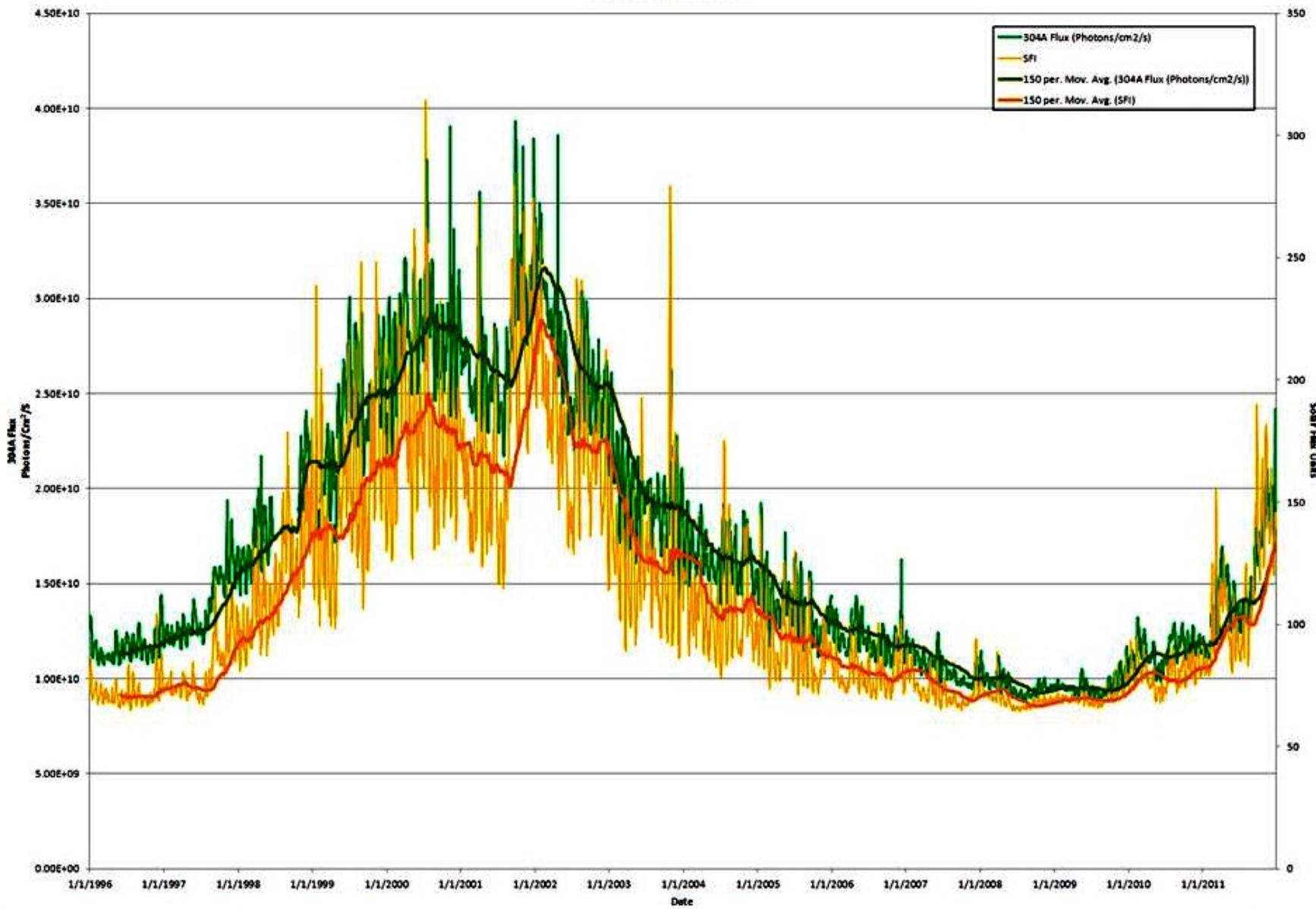


 2013/01/14 12:12 AS 7.1M 4K4C 2.1100149 U1 1500N - Sunspot 656.28 nm	<u>ha</u> 6562.8 Å 656.28nm Hydrogen (H) Ha-Line	20,000K 19,727°C 35,540°F Chromosphere, Tran-reg, sunspots, flares	 2013/01/14 12:18	<u>north_17ghz</u> 17 GHz 17647 μm Radio Interferometer	N/A N/A N/A Photosphere, sunspots, flares		<u>mdi</u> 6767 Å 676.7 nm Nickel (Ni) 0 times ionized	6,000K 5727°C 10,340°F Photosphere, sunspots
 2013/01/14 12:08	<u>mag</u> Magnetogram N/A N/A N/A	N/A N/A N/A Sunspots		<u>sdo_094</u> 94 Å 9.4 nm Iron (Fe) 17 times ionized	9,000,000K 9,000,000°C 16,000,000°F Flaring regions		<u>sdo_131</u> 131 Å 13.1 nm Iron (Fe) 7/19/22 times ionized	1,000,000K 999,727°C 1,799,540°F Flaring regions
 2013/01/14 12:11	<u>sdo_171</u> 171 Å 17.1 nm Iron (Fe) 8 times ionized	1,000,000K 999,727°C 1,799,540°F Quiet corona, upper transition region		<u>sdo_193</u> 193 Å 19.3 nm Iron (Fe) 11/23 times ionized	1,500,000K 1,499,727°C 2,699,540°F Corona and hot flare plasma		<u>sdo_211</u> 211 Å 22.1 nm Iron (Fe) 13 times ionized	2,000,000K 1,999,727°C 3,599,540°F Active-region corona
 2013/01/14 12:12	<u>sdo_304</u> 304 Å 30.4 nm Helium (He) 1 times ionized	80,000K 79,727°C 143,540°F Chromosphere, transition region		<u>sdo_335</u> 335 Å 33.5 nm Iron (Fe) 15 times ionized	5,000,000K 5,000,000°C 9,000,000°F Active-region corona	 [No Title]	<u>sdo_1600</u> 1600 Å 160.0 nm Carbon (C) 3 times ionized	Unknown Transition region, upper photosphere
 2013/01/14 12:12	<u>sdo_1700</u> 1700 Å 170.0 nm Continuum	Unknown Temperature minimum, photosphere		<u>sdo_4500</u> 4500 Å 450.0 nm White Light	2,000,000K 1,999,727°C 3,599,540°F Photosphere		<u>sdo_mag1</u> Magnetogram N/A N/A N/A	N/A Sunspots

304A Flux vs SFI

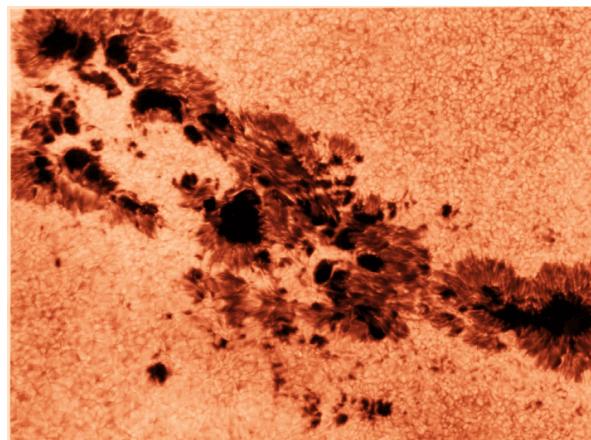
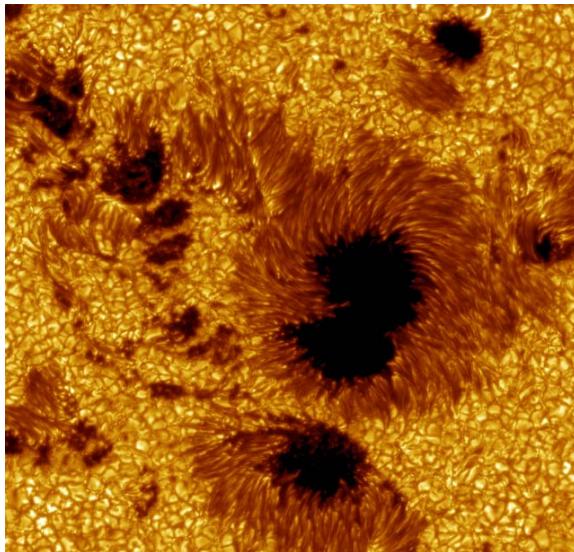


304A Flux vs SFI

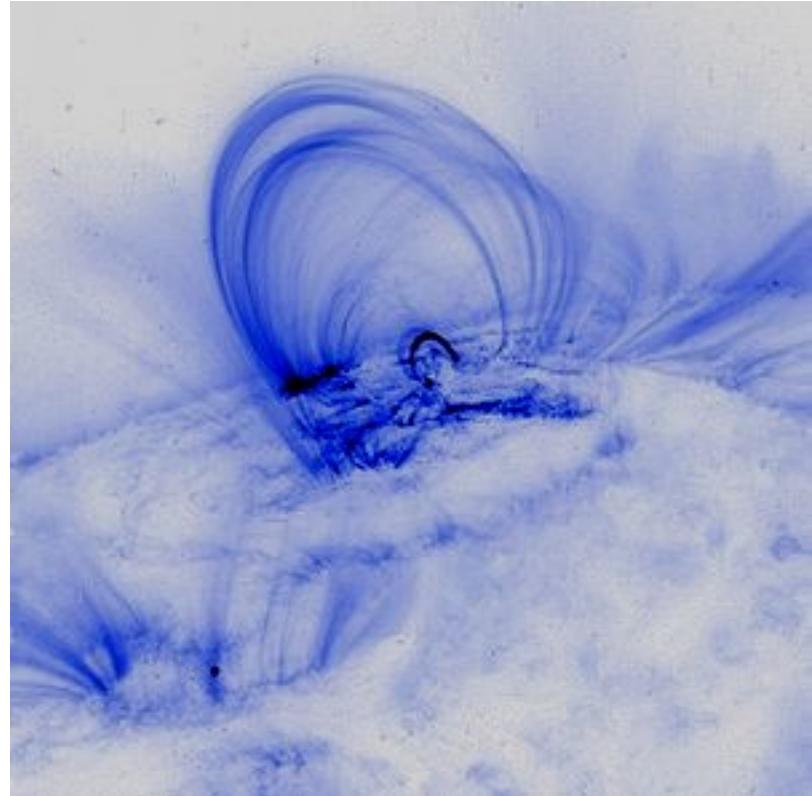
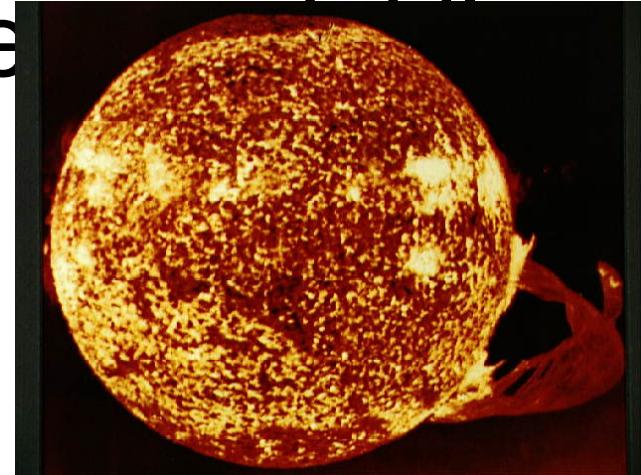
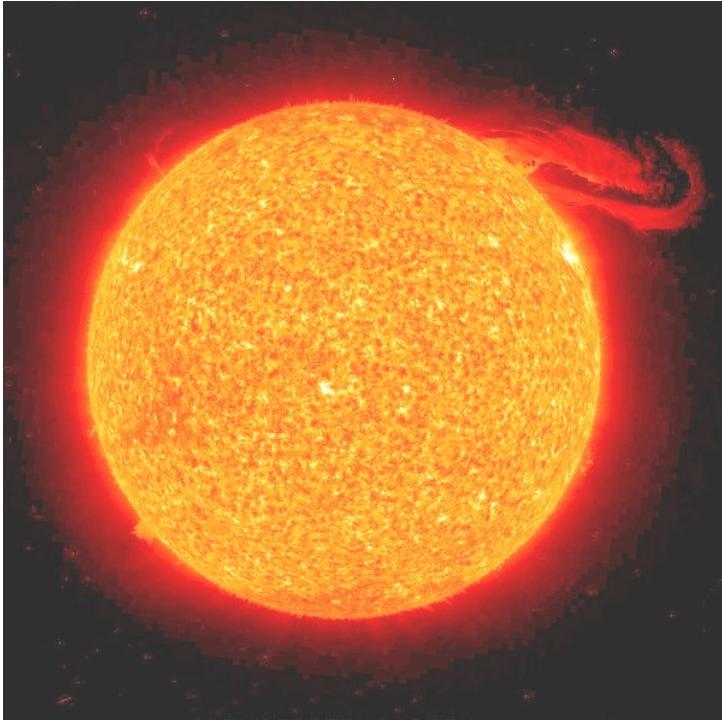


Saulė – kas intriguoja – dėmės.

Jų tyrimai reikšmingi norint suprasti ir Žemės magnetizmą.

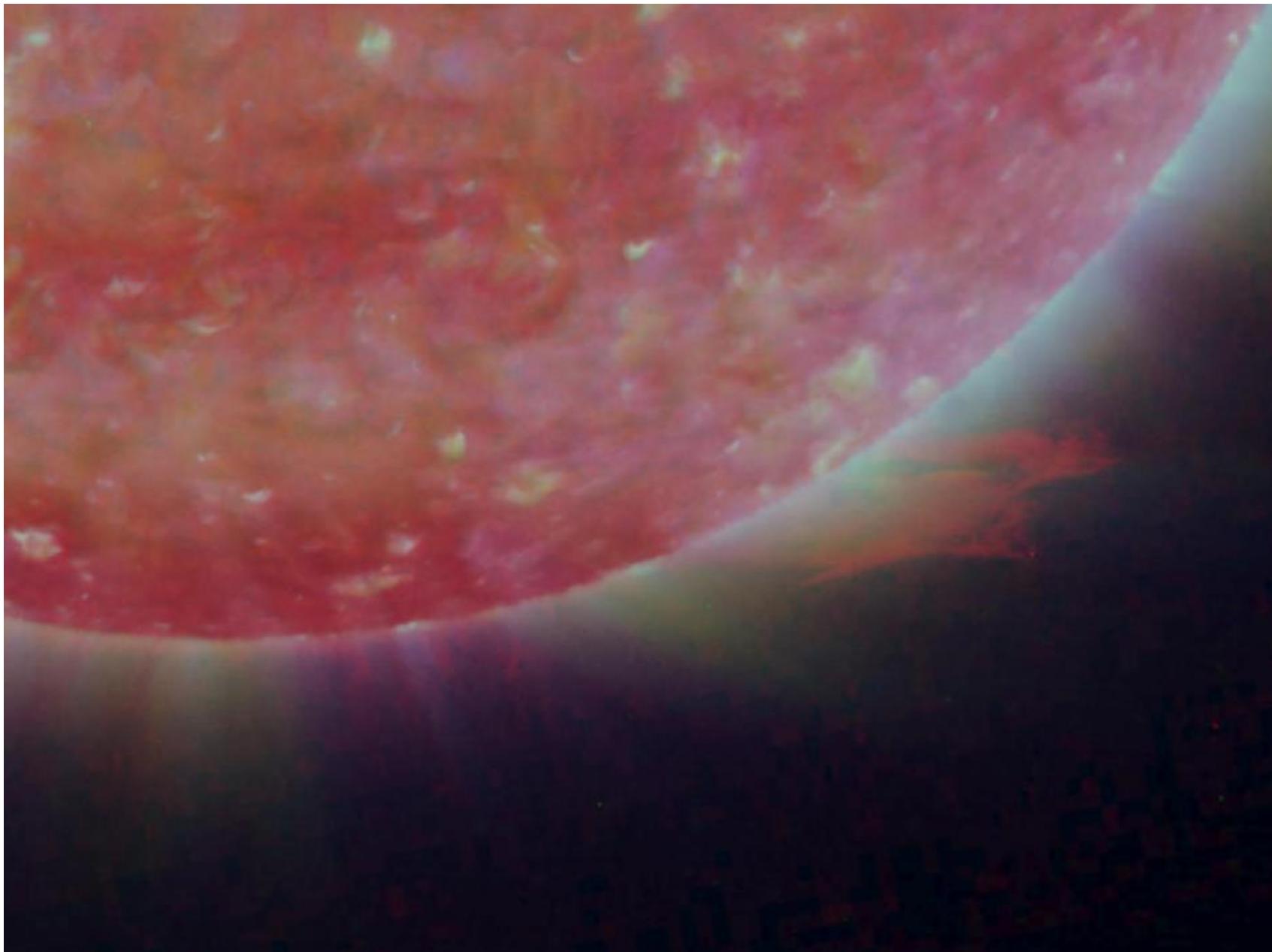


Saulés protubérantes

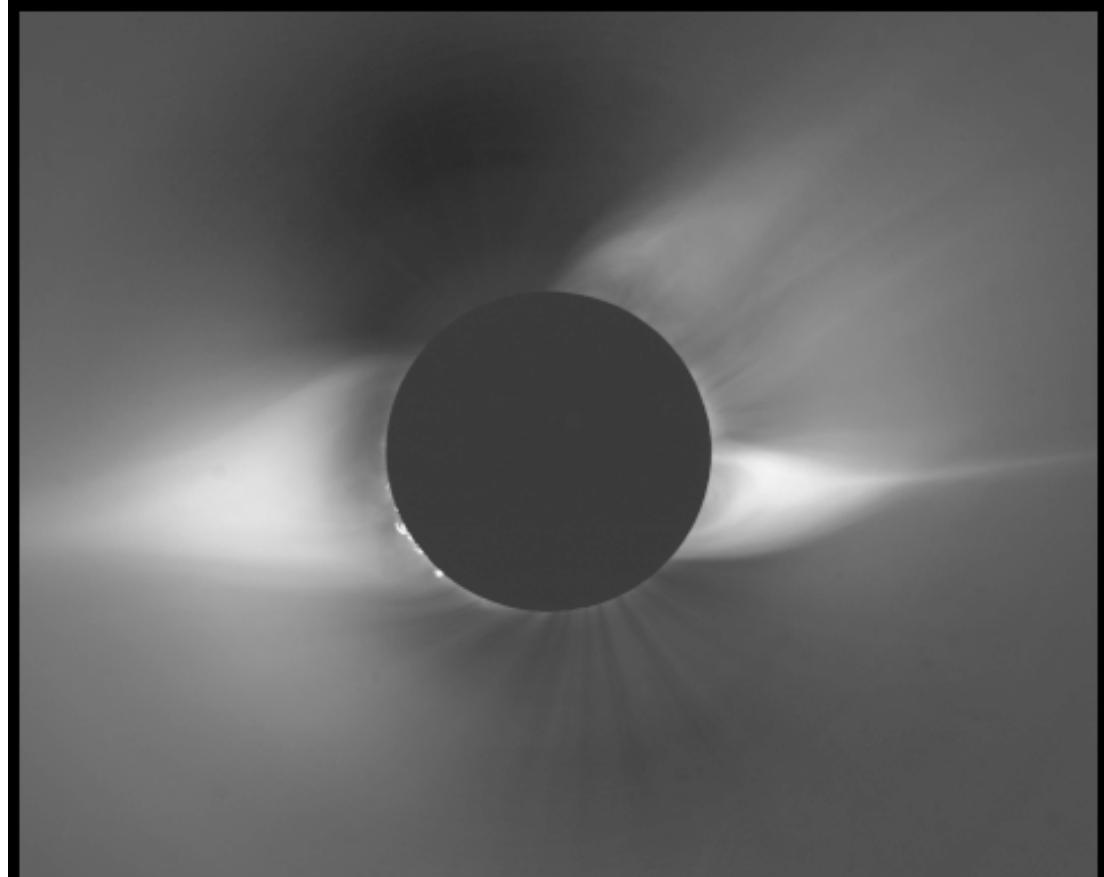
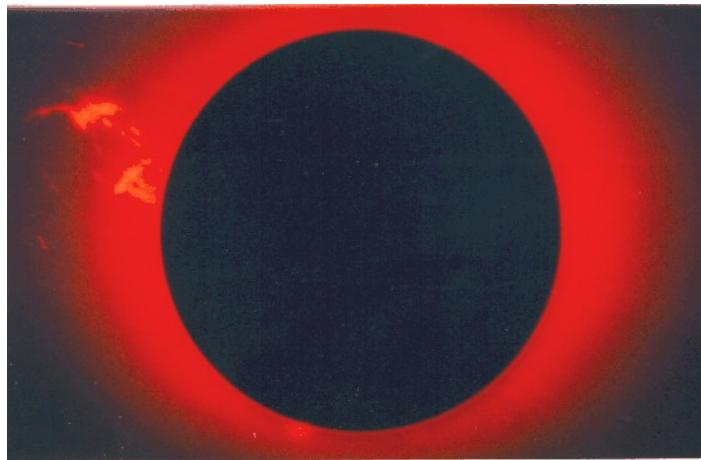


From Wikipedia

Saulé 2010.06.20

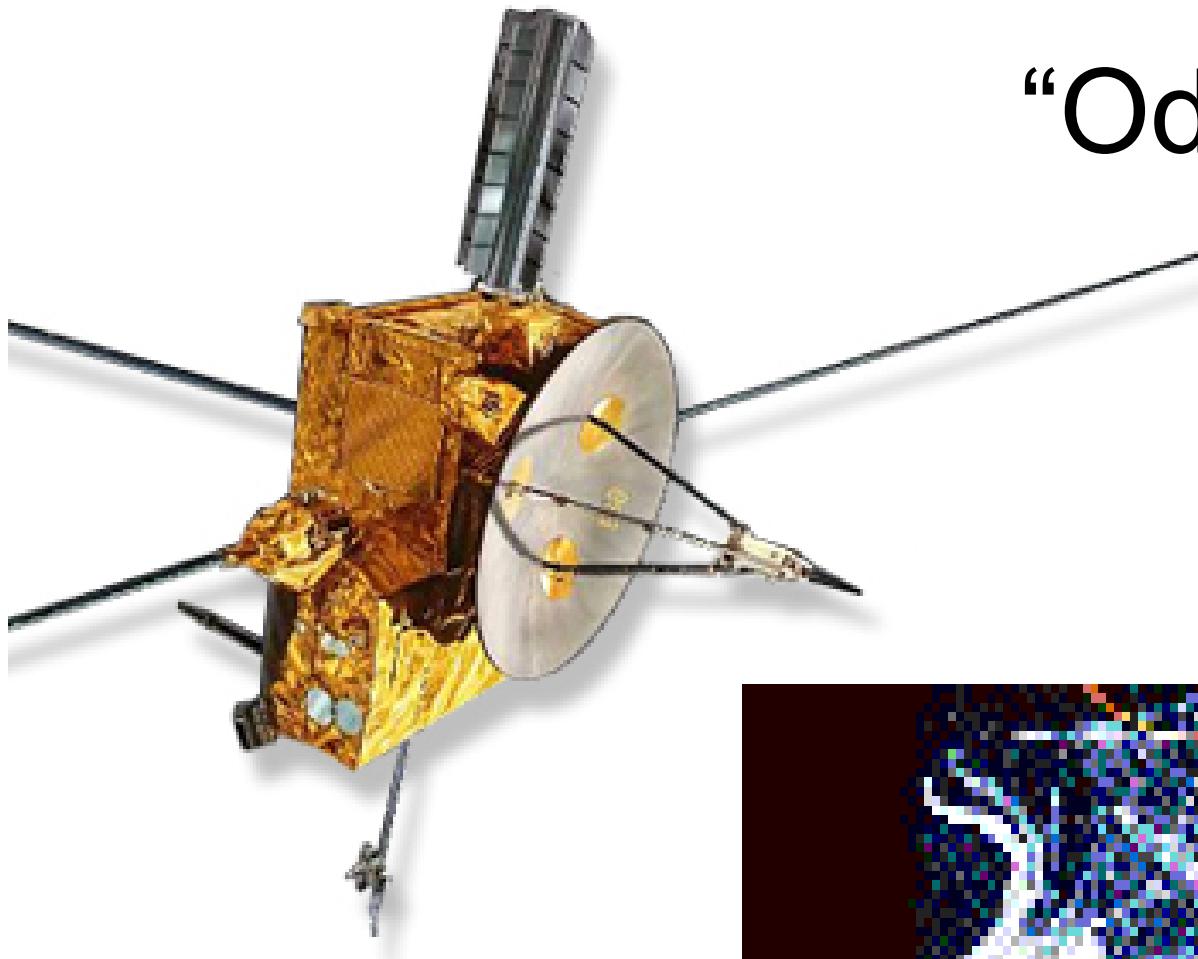


Mīslē: Saulēs vainikas



Solar Corona at Eclipse, 3 Nov 1994, Putre, Chile.
High Altitude Observatory, NCAR, Boulder, Colorado, USA.

“Odisējas”



Ulysses



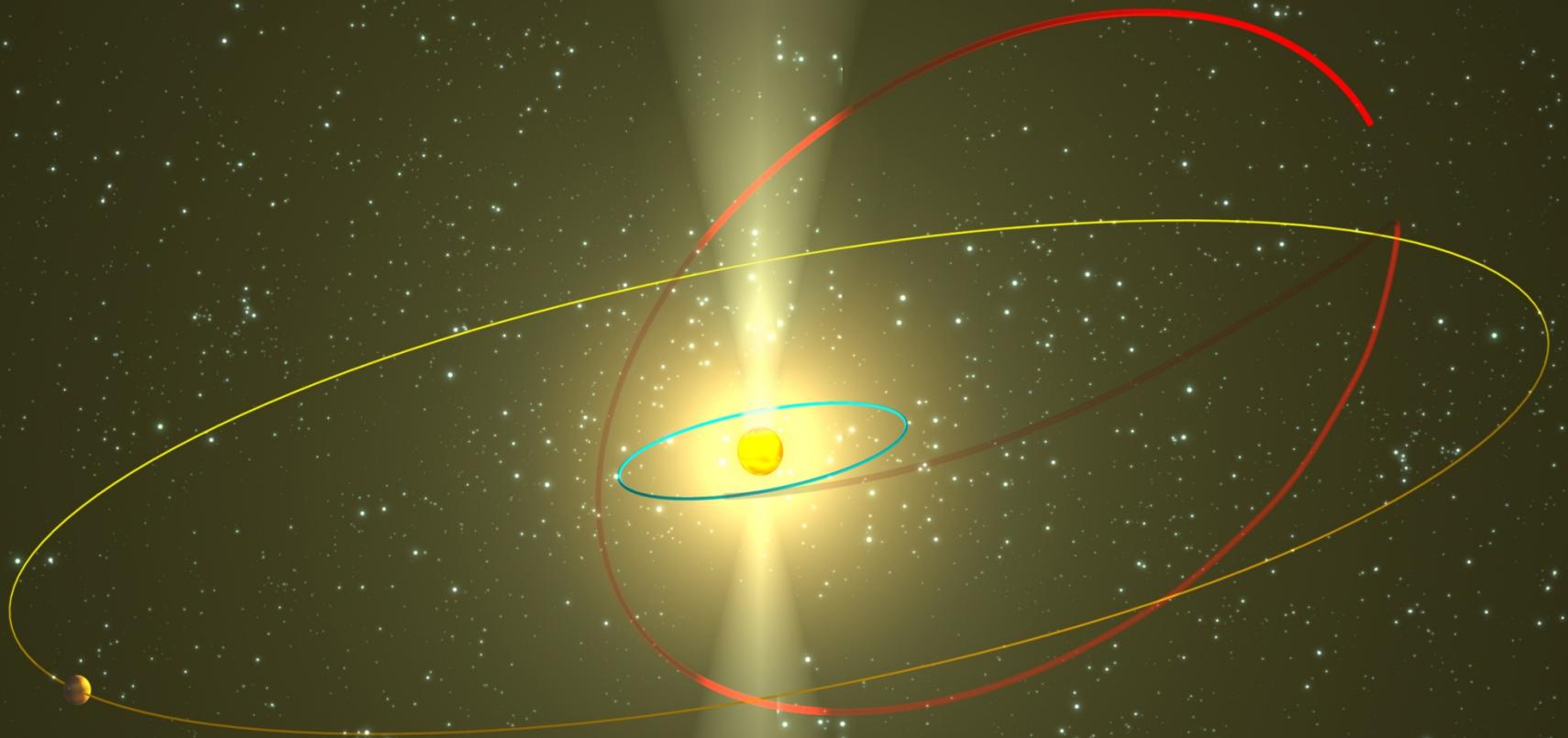


ULYSSES **Solar Explorer**

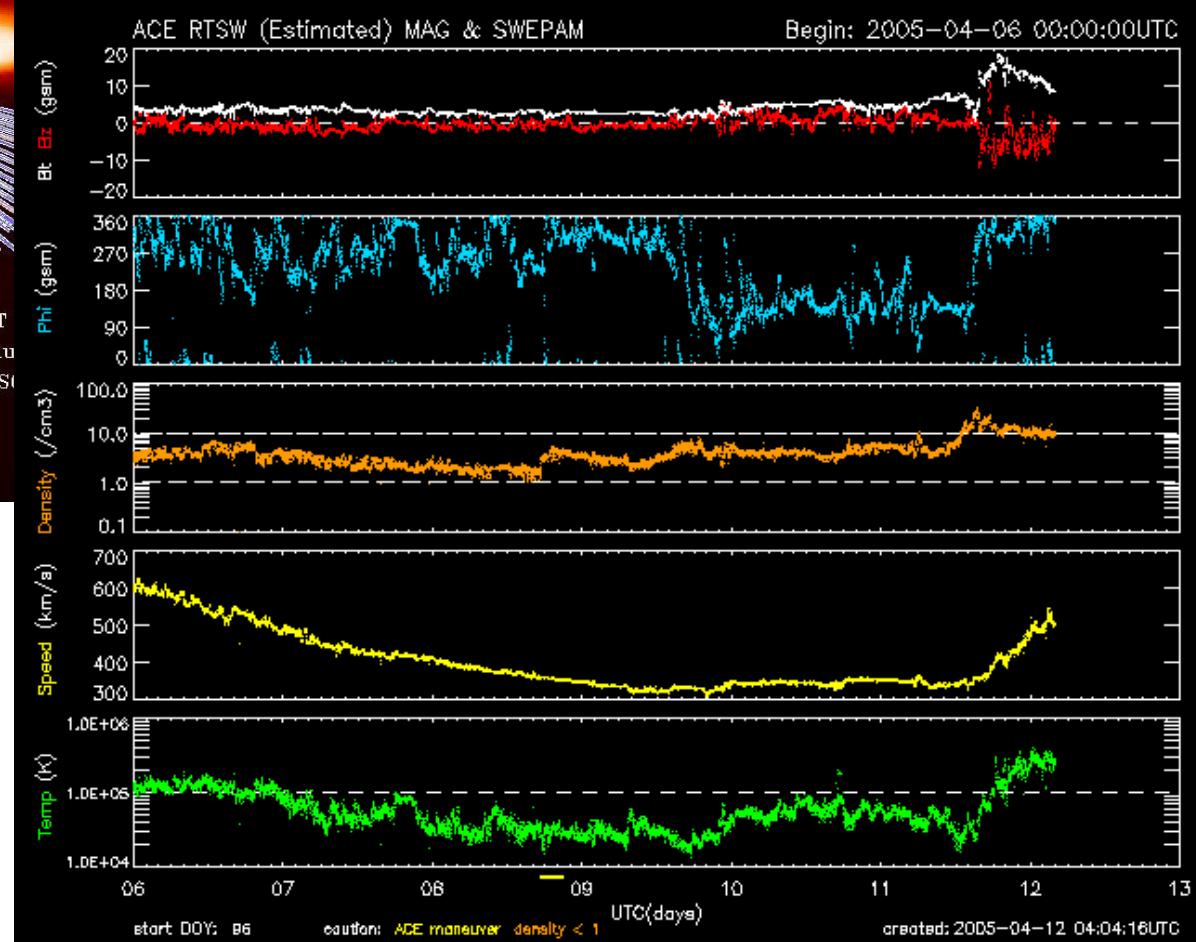
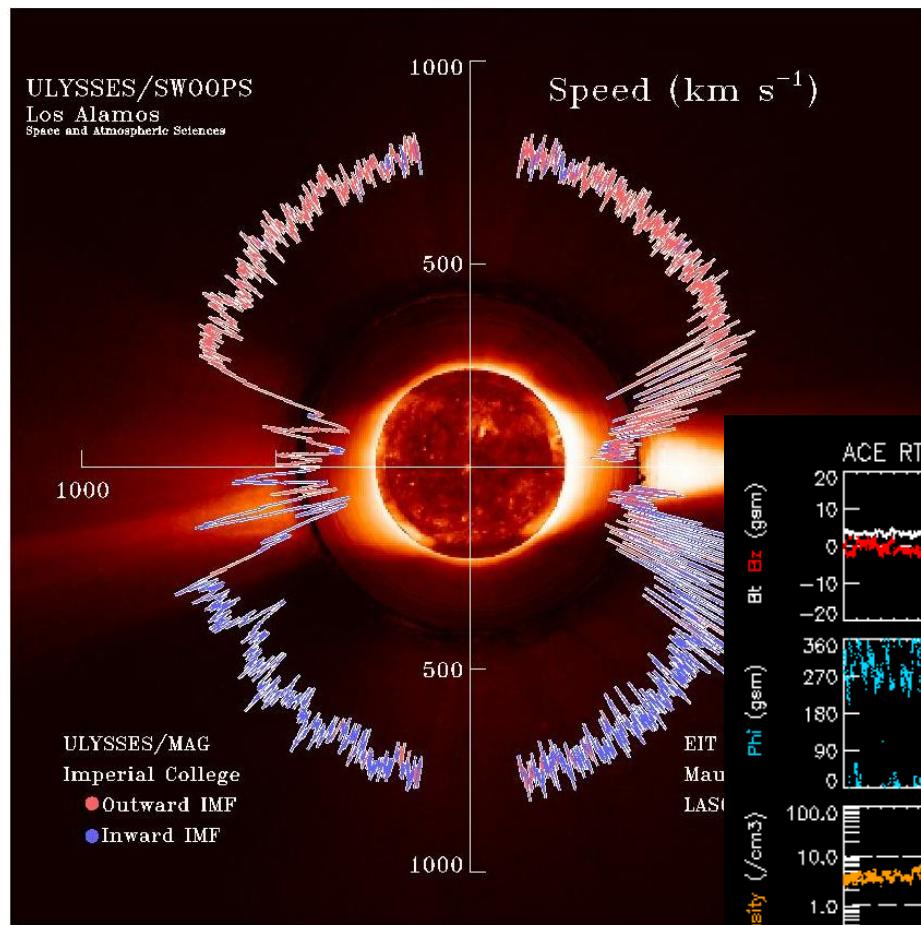
Mission Duration:

6842 Days

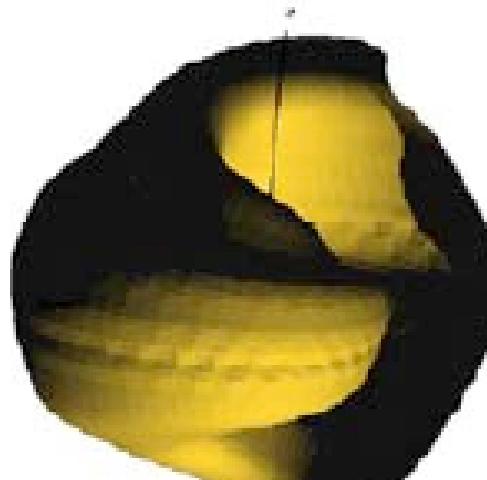
(18 Yrs - 8 Mos - 24 Days)



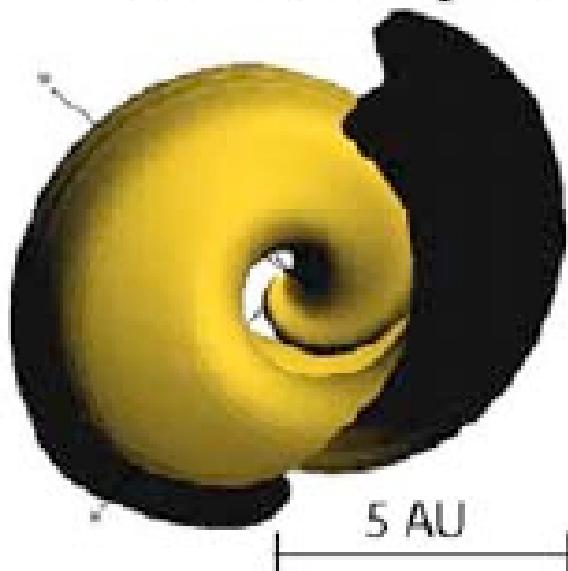
Saulés vējas



View from Earth



View from
solar south pole



Saulė “iš galo”

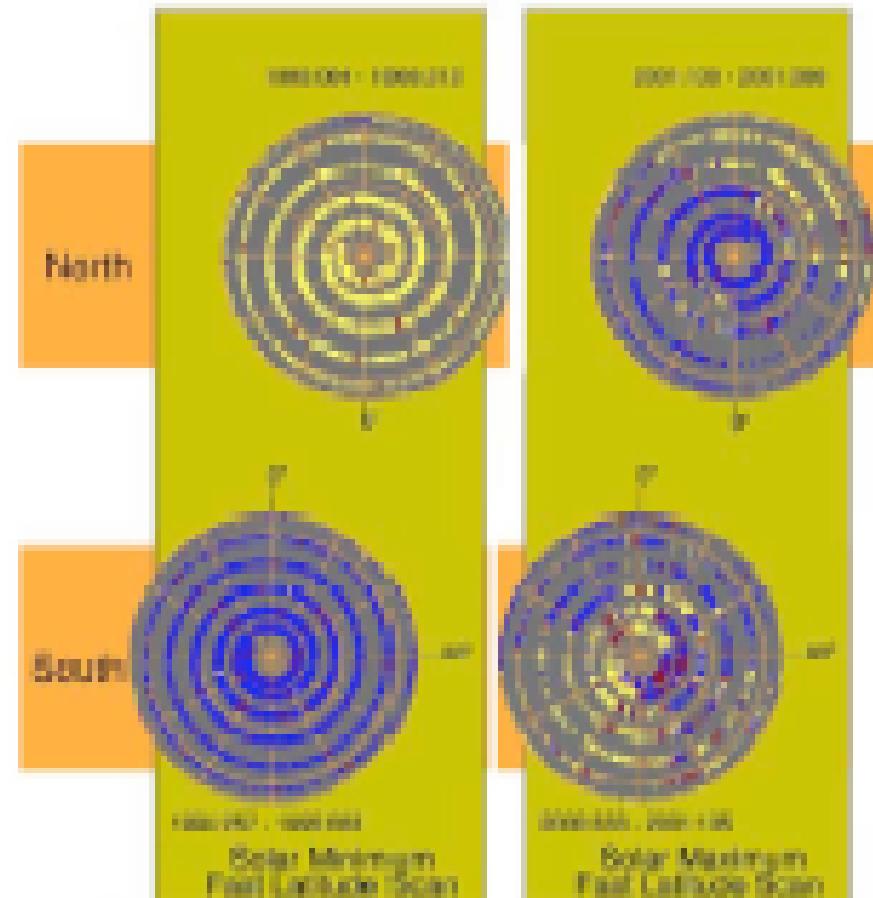
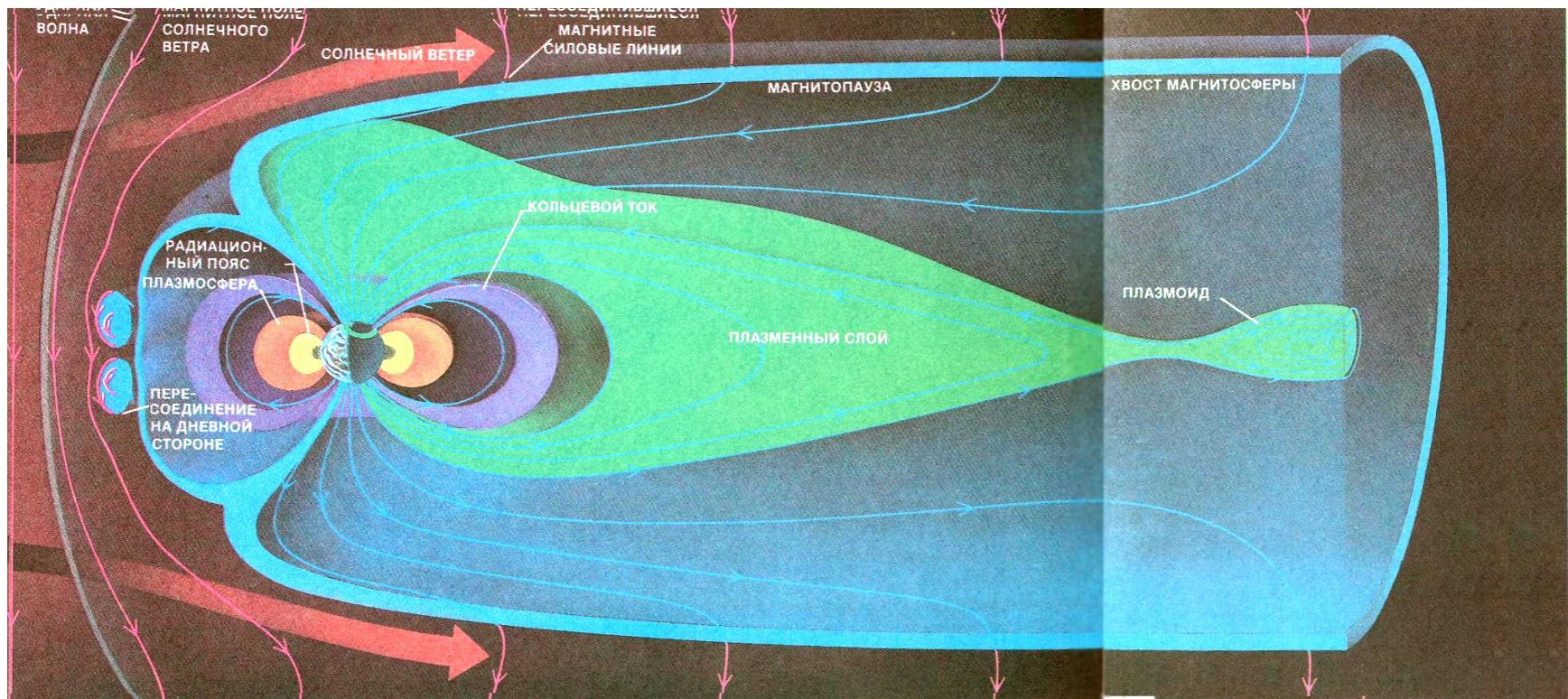
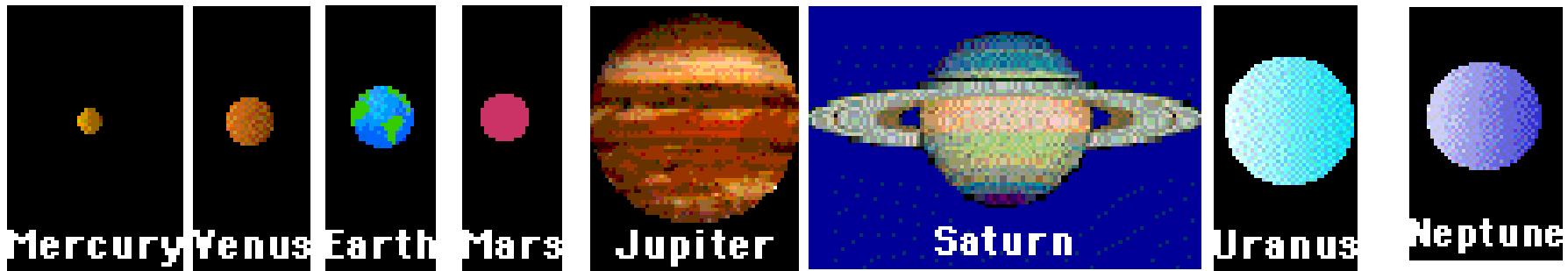
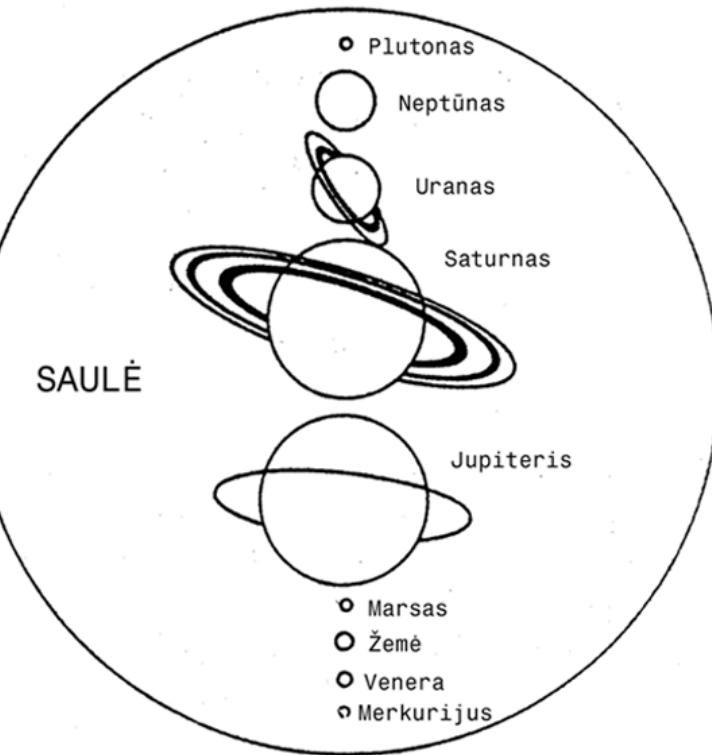


Figure 5.1. Magnetic polarity projected onto spheres representing the solar wind source surface, viewed from above the solar rotational poles. FLS-I is on the left and FLS-II is on the right. Blue (yellow) is negative (positive) polarity. Carrington longitudes 0° and 90° are marked [Jones & Balogh, 2003].

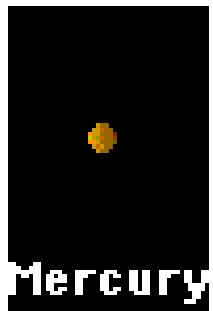
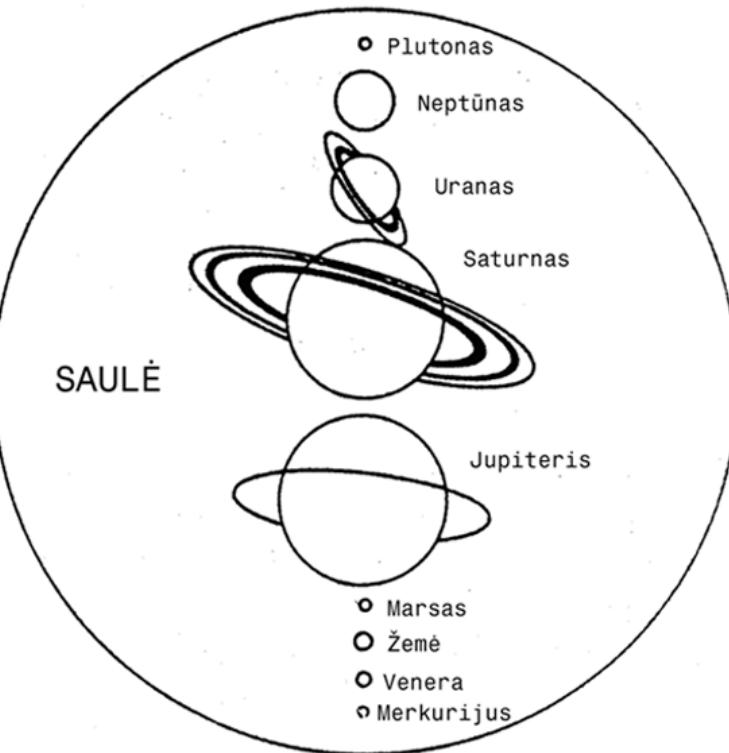
Saulēs vējas



02.24 KF



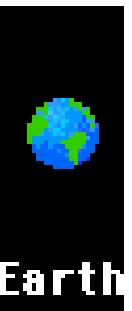
The Planets



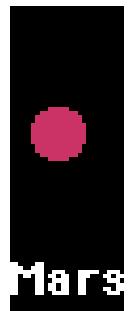
Mercury



Venus



Earth



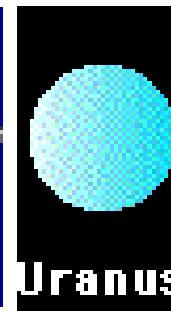
Mars



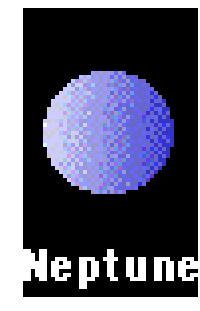
Jupiter



Saturn



Uranus



Neptune

Looking down on The Sun
11 Apr 2005 18:55 CMT

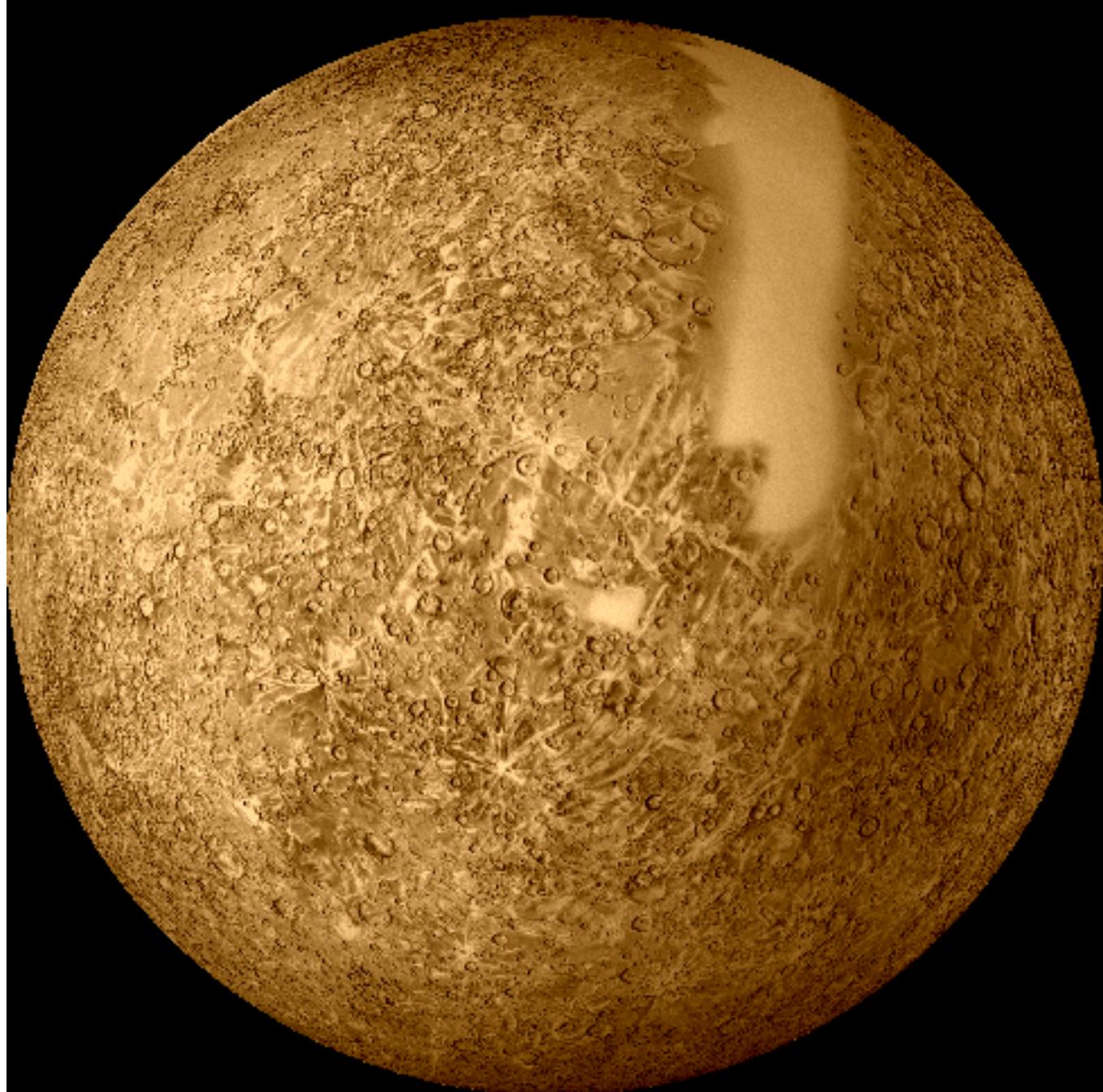


Solar System Simulator

Merkurijus

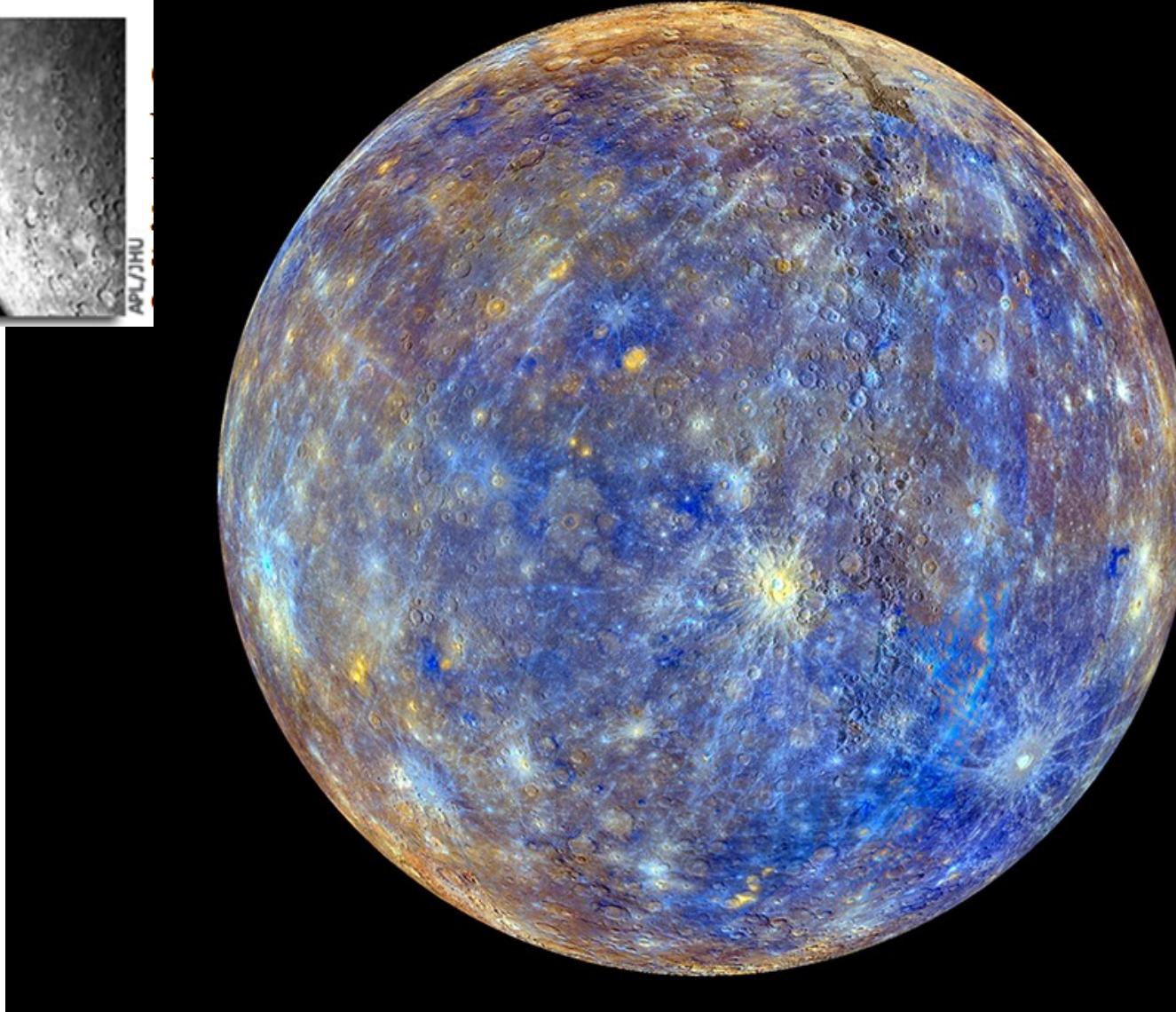
- orbita: 57,910,000 km (0.38 AU) nuo Saulės
- skersmuo: 4,880 km
- Ašis – 7° nuokrypis nuo ekliptikos plokštumos
- Merkurijus aplankė Mariner 10: 1974-75 ir Messenger: 2004-2012 misijos.
- Merkurijus apsisuka 3 X per 2 metus. Diena – 59 Žemės dienos)
- Vidutinis tankis – 5.4 g/cm³ (manoma kad poliuose krateriuose yra vandens). (Žemės vidutinis tankis – 5,5 g/cm³)
- Temperatūra - -180 - +430 °C
- Atmosfera: pėdsakai (%-tais O₂ 42, Na – 29, H – 22, 6 – He, 0.5 – K, kiti – pėdsakai)

Merkurijus





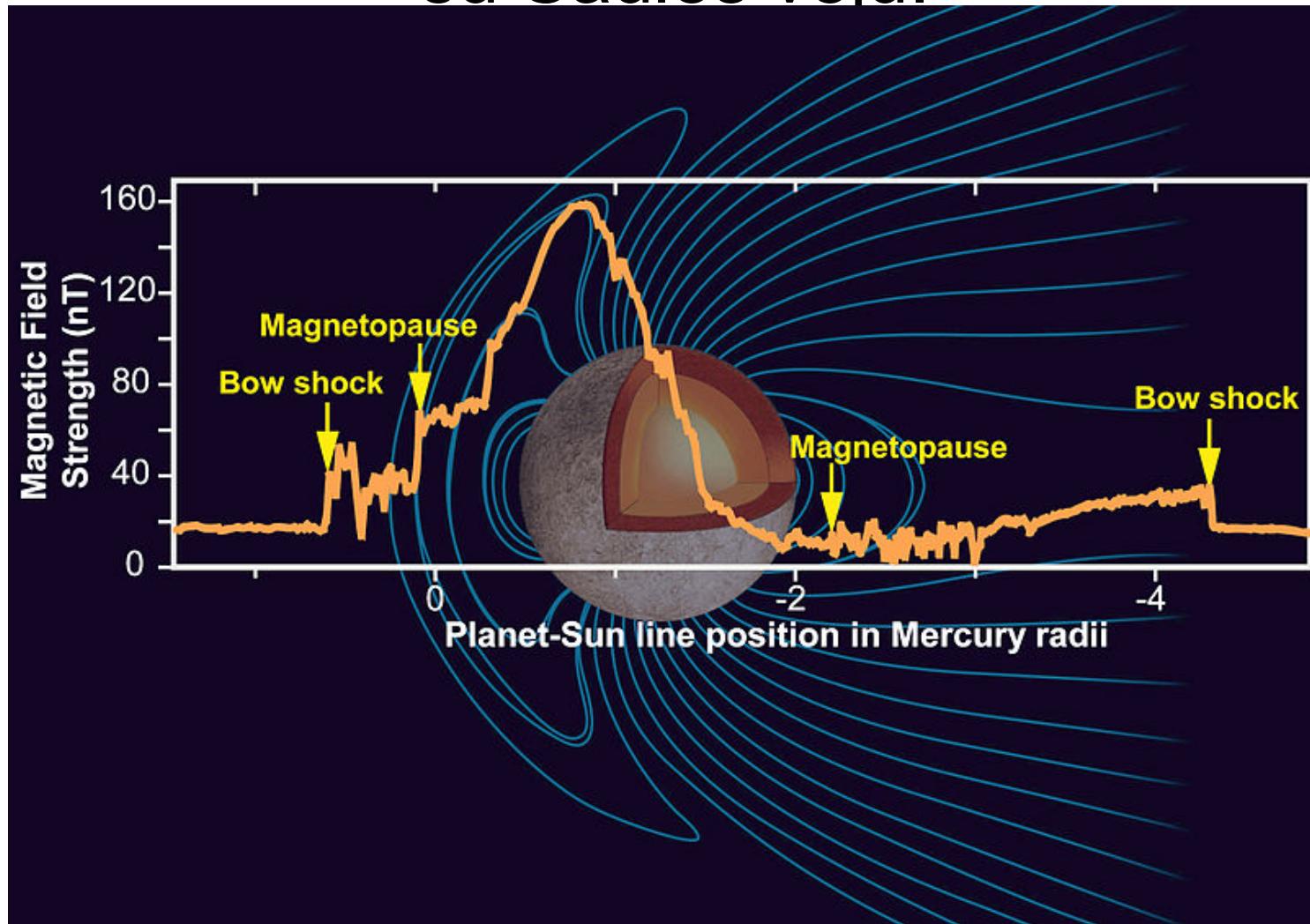
2004-2012
metų misija



This colorful view of Mercury was produced by using images from the color base map imaging campaign during MESSENGER's primary mission. These colors are not what Mercury would look like to the human eye, but rather the colors enhance the chemical, mineralogical, and physical differences between the rocks that make up Mercury's surface.

Image Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington

Merkurijaus magnetinis laukas ir jo sąveika su Saulės vėju.

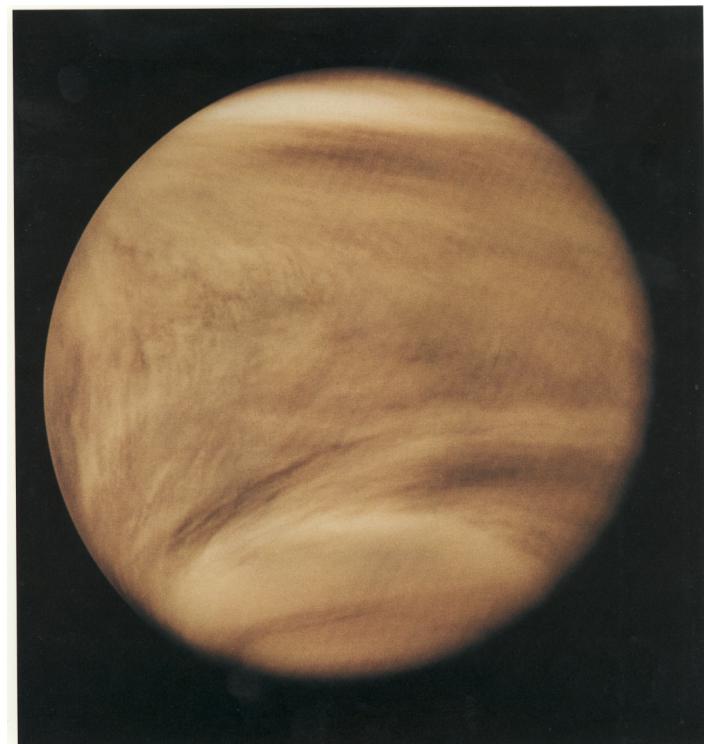
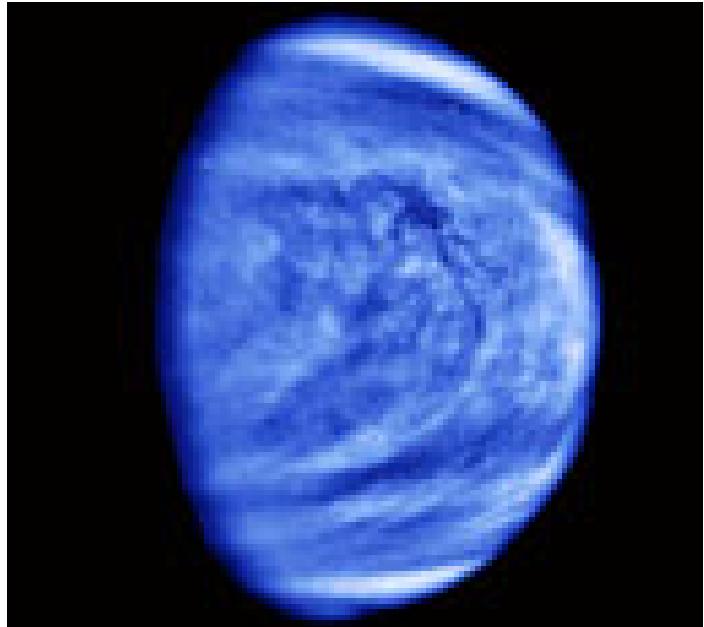
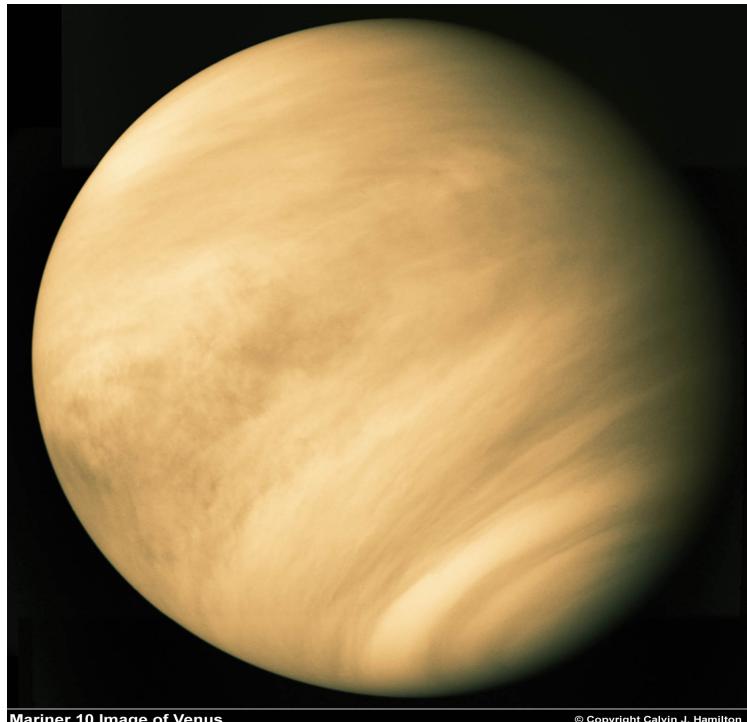


Žemės magnetinio lauko stipris ties pusiauju – $30,5 \mu\text{T}$

Venera

- Skersmuo: 12,103.6 km,
- Vidutinis tankis – 5.1 g/cm³
- Venera sukasi lėtai: 243 Žemės dienas trunka Veneros diena, truputį ilgiau kaip Veneros metai.
- Slėgis paviršiuje 90 atmosferų (~ 1 km gylyje Žemės vandenynė).
- Debesys – anglies dvideginio perteklius, sieros rūgšties sluoksniai. Akivaizdus šiltnamio efektas. Temperatūra - +480 °C

Venera



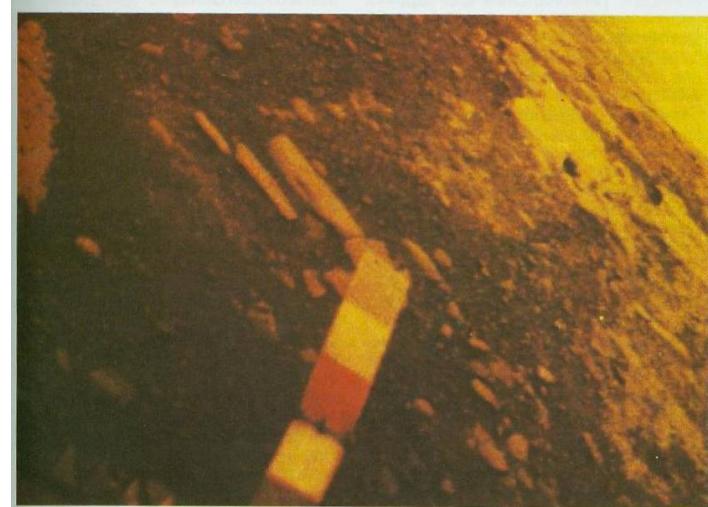
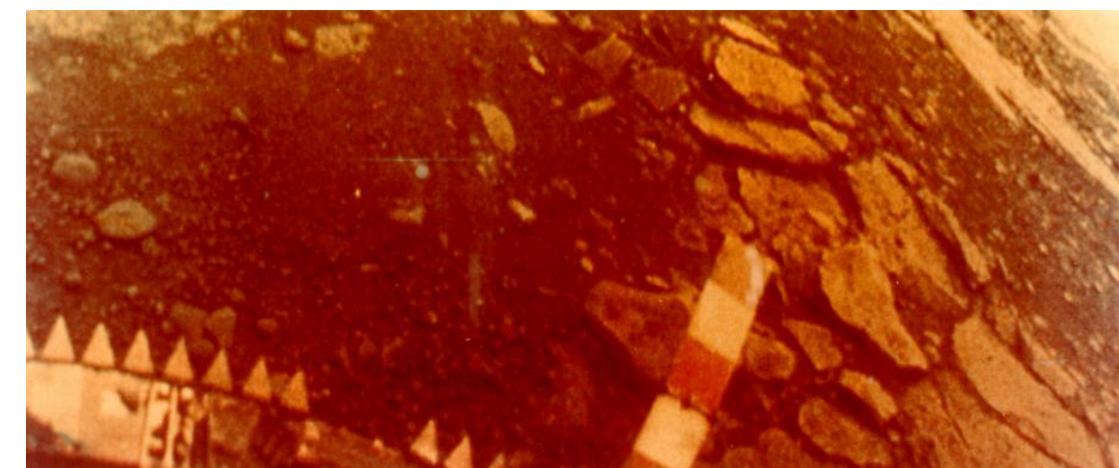
Venera



ВЕНЕРА-9 22.10.1975 ОБРАБОТКА ИППИ АН СССР 28.2.1976



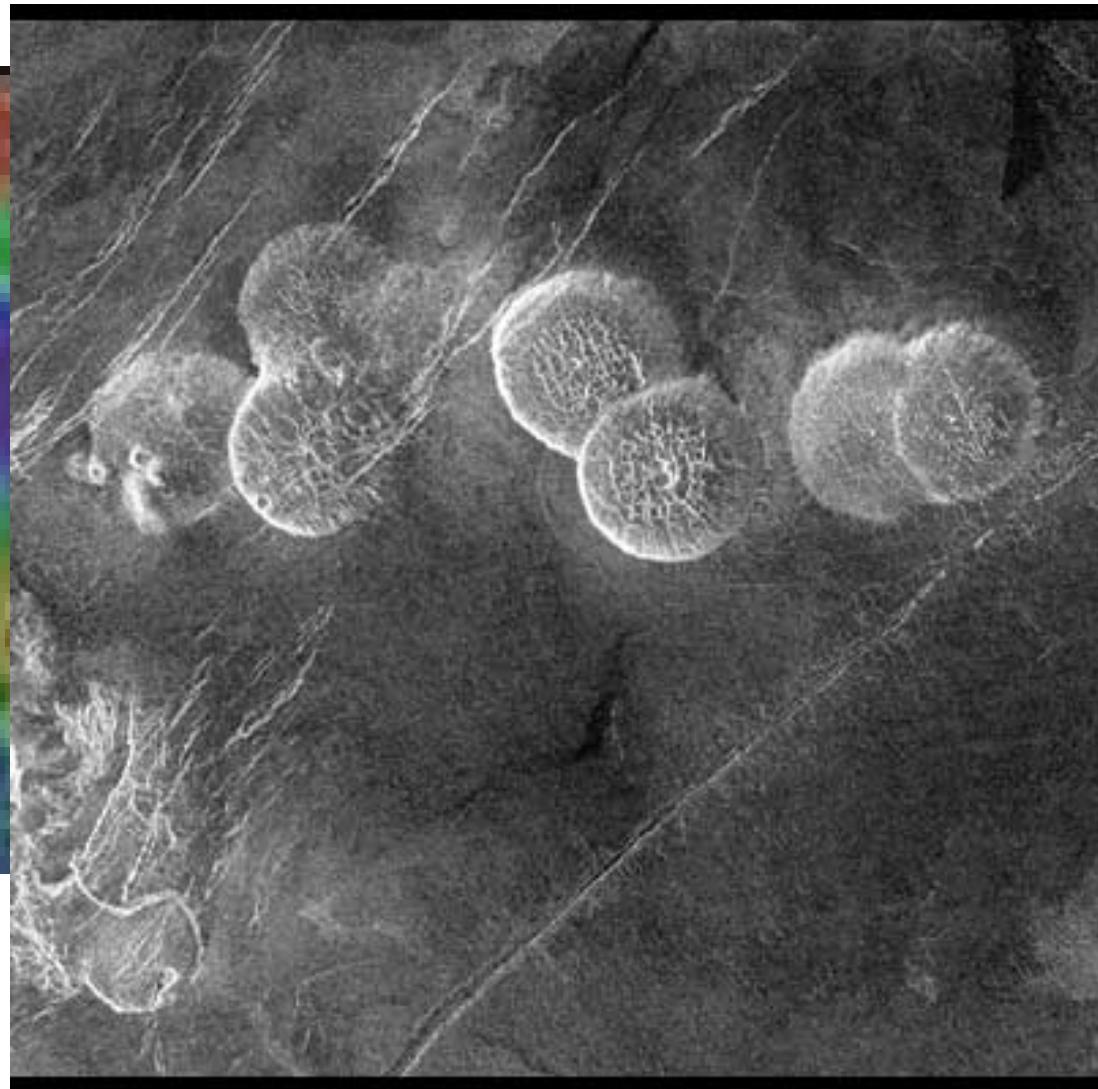
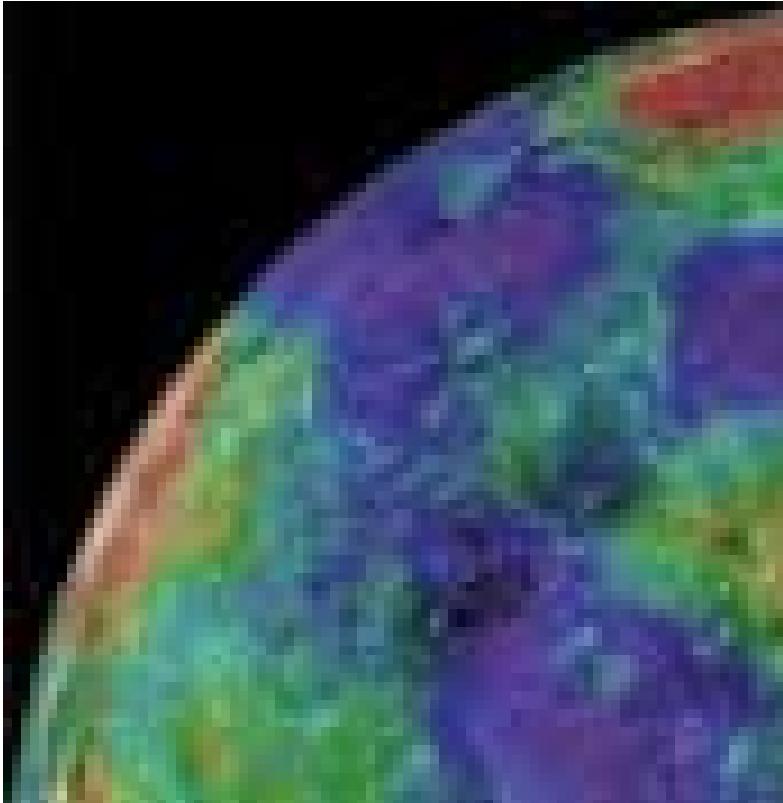
ВЕНЕРА-10 25.10.1975 ОБРАБОТКА ИППИ АН СССР 28.2.1976

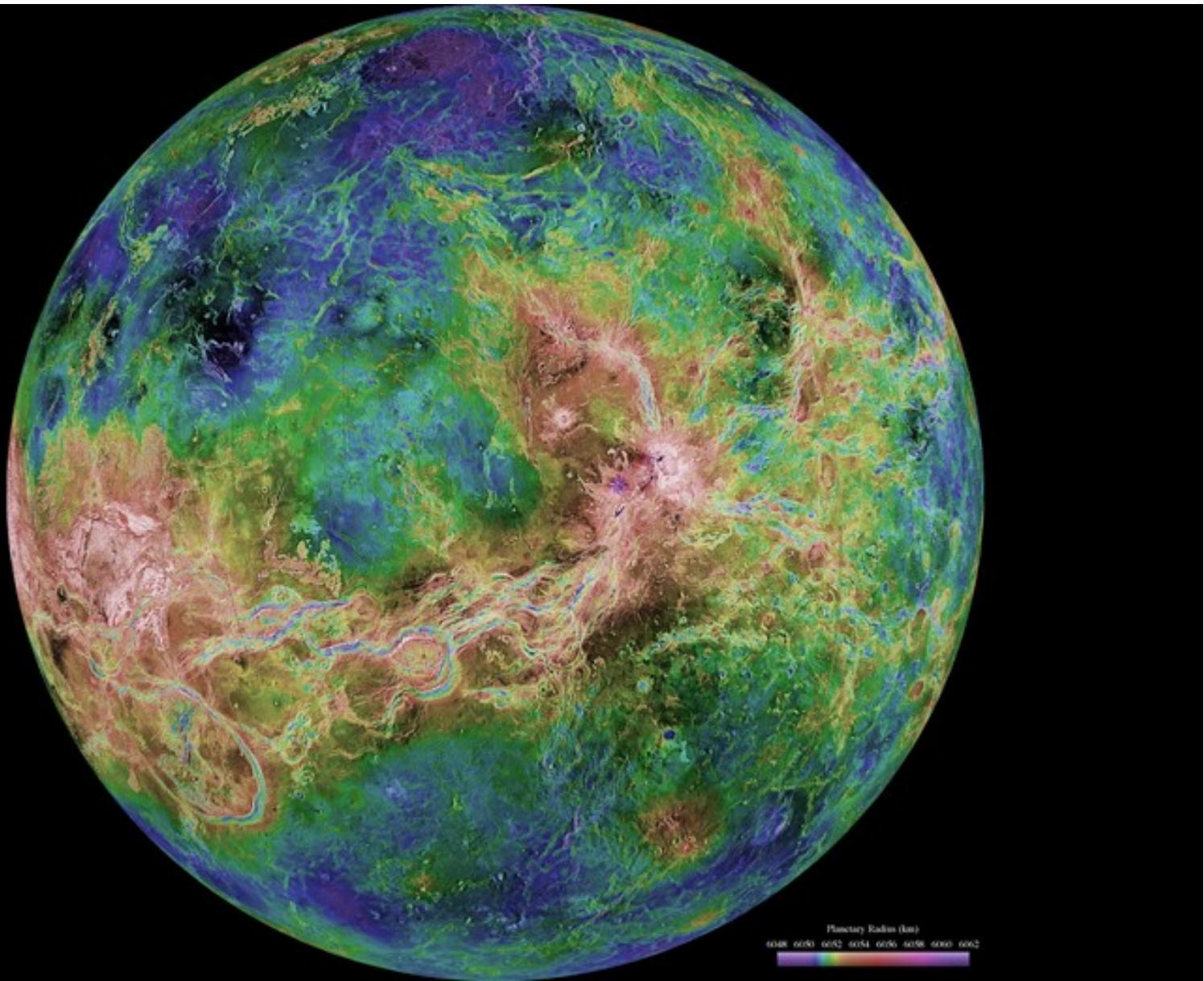


Цветное панорамное изображение поверхности Венеры, переданное с борта спускаемого аппарата станции «Венера-14»

Venera

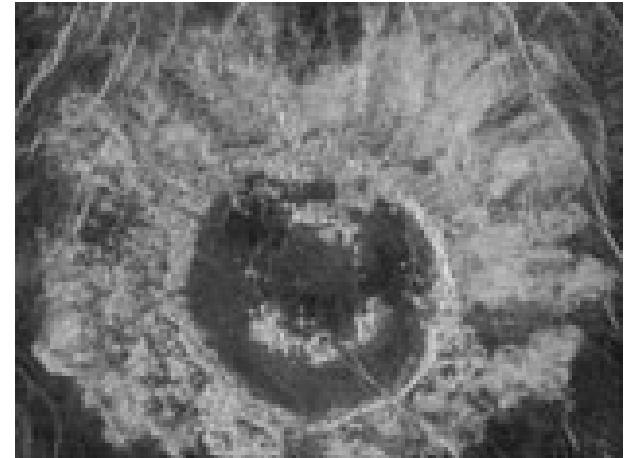
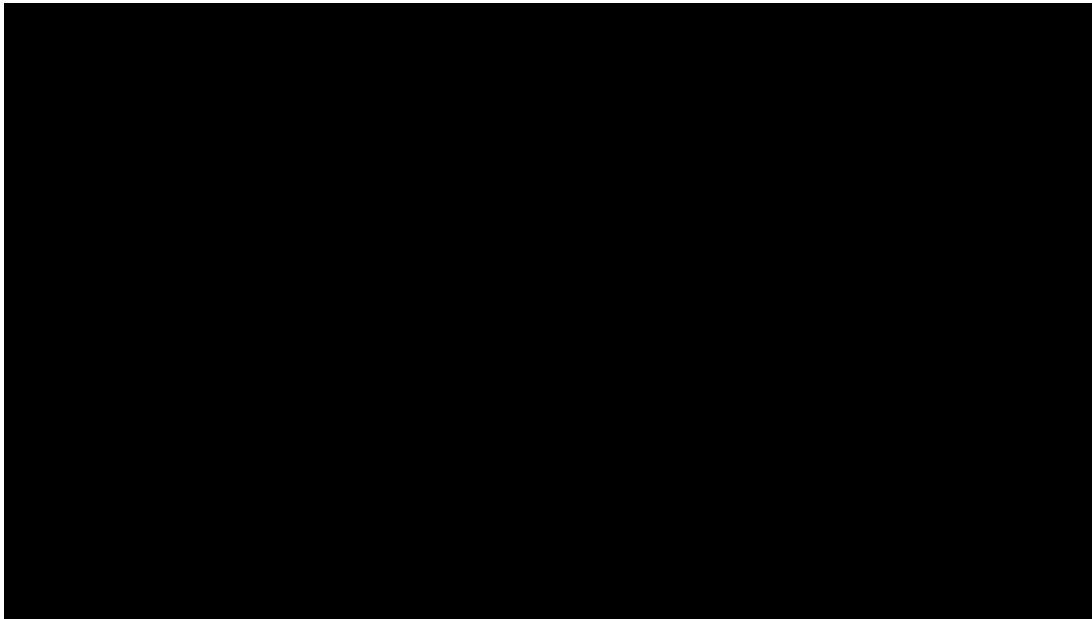
Mikrobangose





Venus is a dim world of intense heat and volcanic activity. Similar in structure and size to Earth, Venus' thick, toxic atmosphere traps heat in a runaway "greenhouse effect." The scorched world has temperatures hot enough to melt lead. Glimpses below the clouds reveal volcanoes and deformed mountains. Venus spins slowly in the opposite direction of most planets.

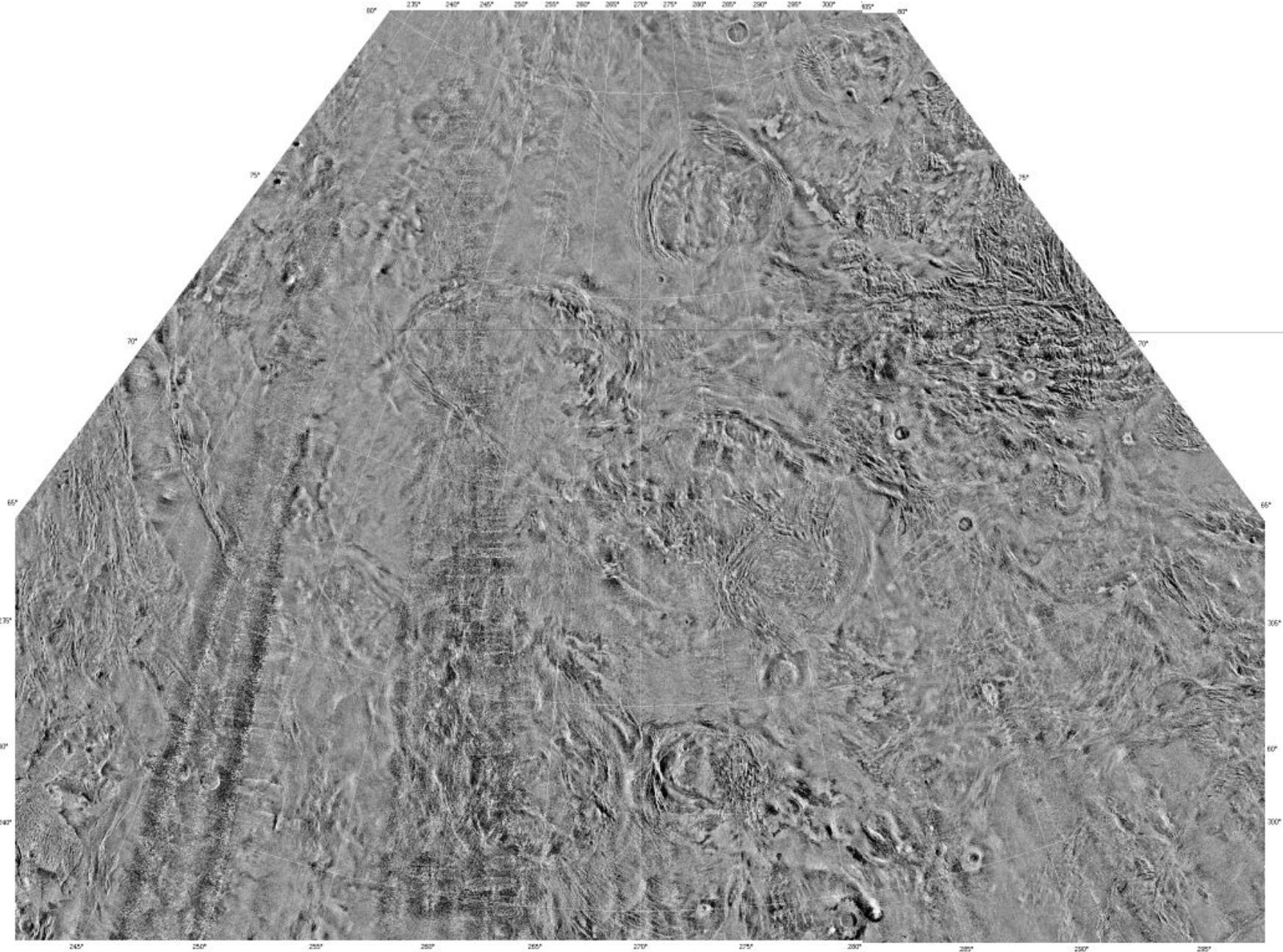
Aktyvus vulkanas



This figure shows the volcanic peak Idunn Mons in the Imdr Regio area of Venus. The topography derives from data obtained by NASA's Magellan spacecraft, with a vertical exaggeration of 30 times. Radar data (in brown) from Magellan has been draped on top of the topographic data. Bright areas are rough or have steep slopes. Dark areas are smooth.

The colored overlay shows the heat patterns derived from surface brightness data collected by the visible and infrared thermal imaging spectrometer (VIRTIS) aboard ESA's Venus Express spacecraft. Temperature variations due to topography were removed. The brightness signals the composition of the minerals that have been changed due to lava flow. Red-orange is the warmest area and purple is the coolest. The warmest area is situated on the summit, which stands about 2.5 km above the plains, and on the bright flows that originate there. Idunn Mons has a diameter of about 200 km.

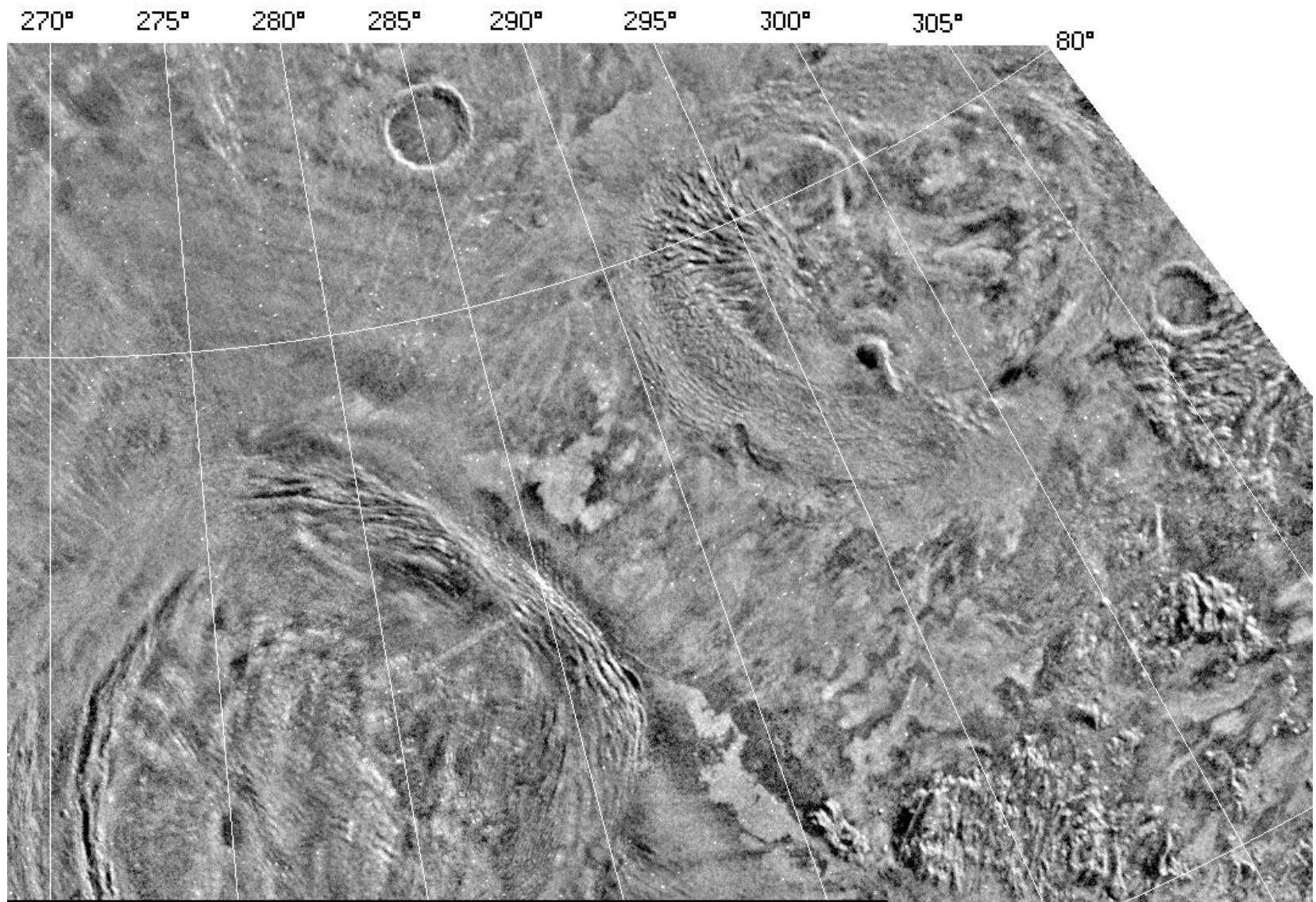
ВЕНЕРА ОБЛАСТЬ МЕТИДЫ



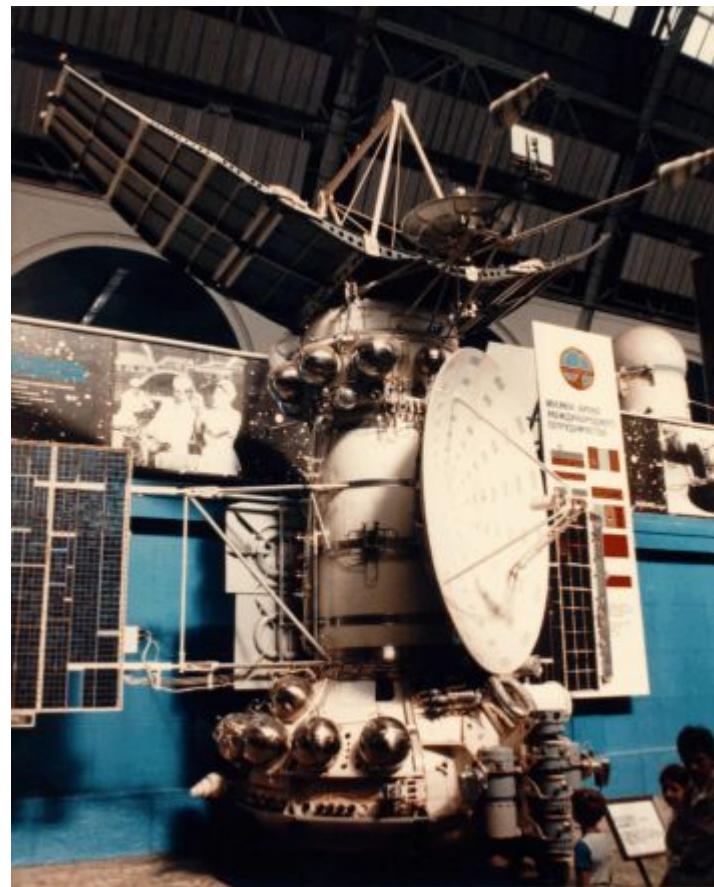
ФОТОКАРТА. ЛИСТ 3. ПРОЕКЦИЯ НОРМАЛЬНАЯ РАВНОУГОЛЬНАЯ КОНИЧЕСКАЯ ЛАМБЕРТА - ГАУССА.
СТАНДАРТНЫЕ ПАРАЛЛЕЛИ 63.3° И 77.5°.

0 100 200 300

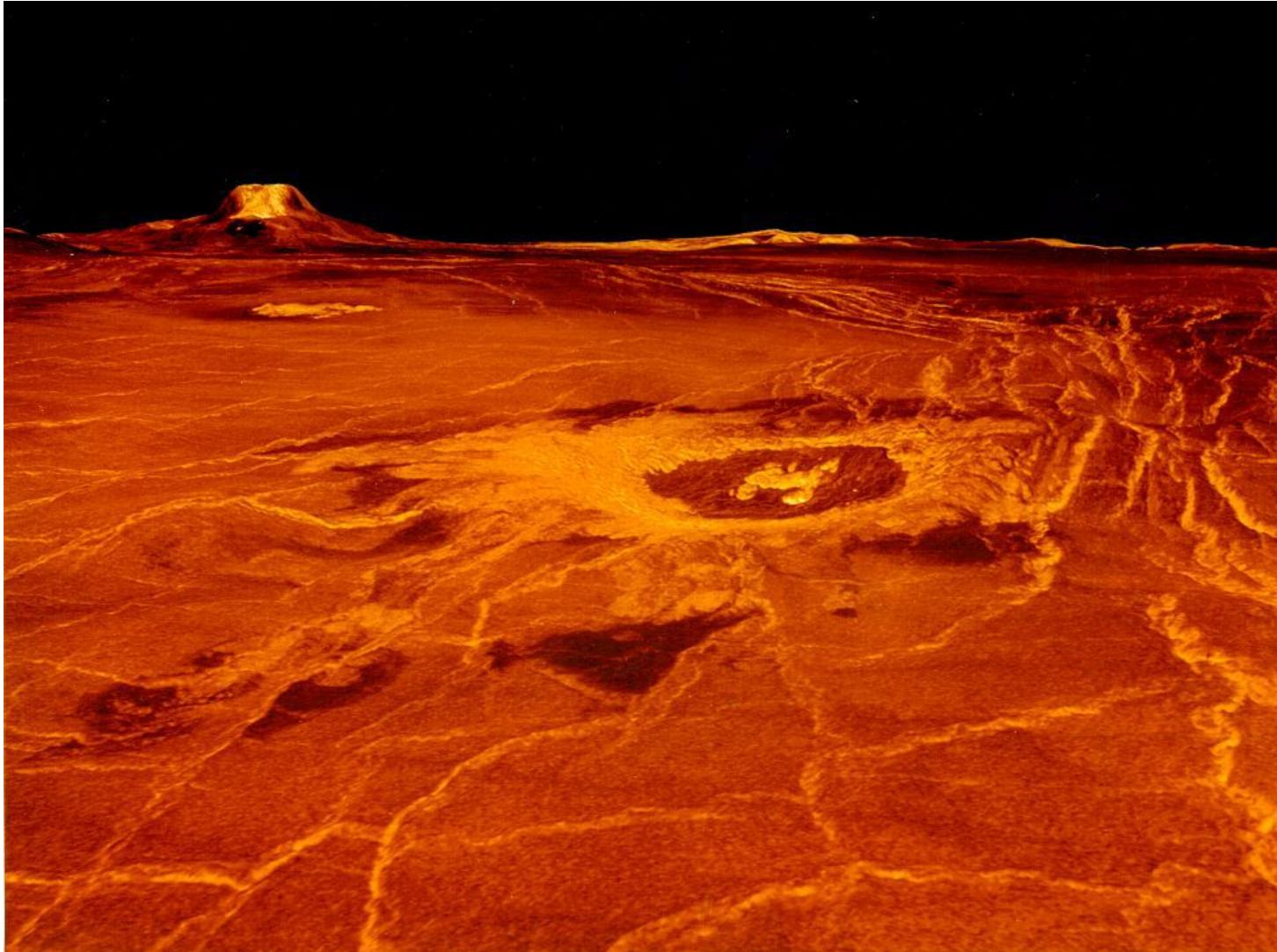
NSSDC ID: PSPG-00456, Image V0303

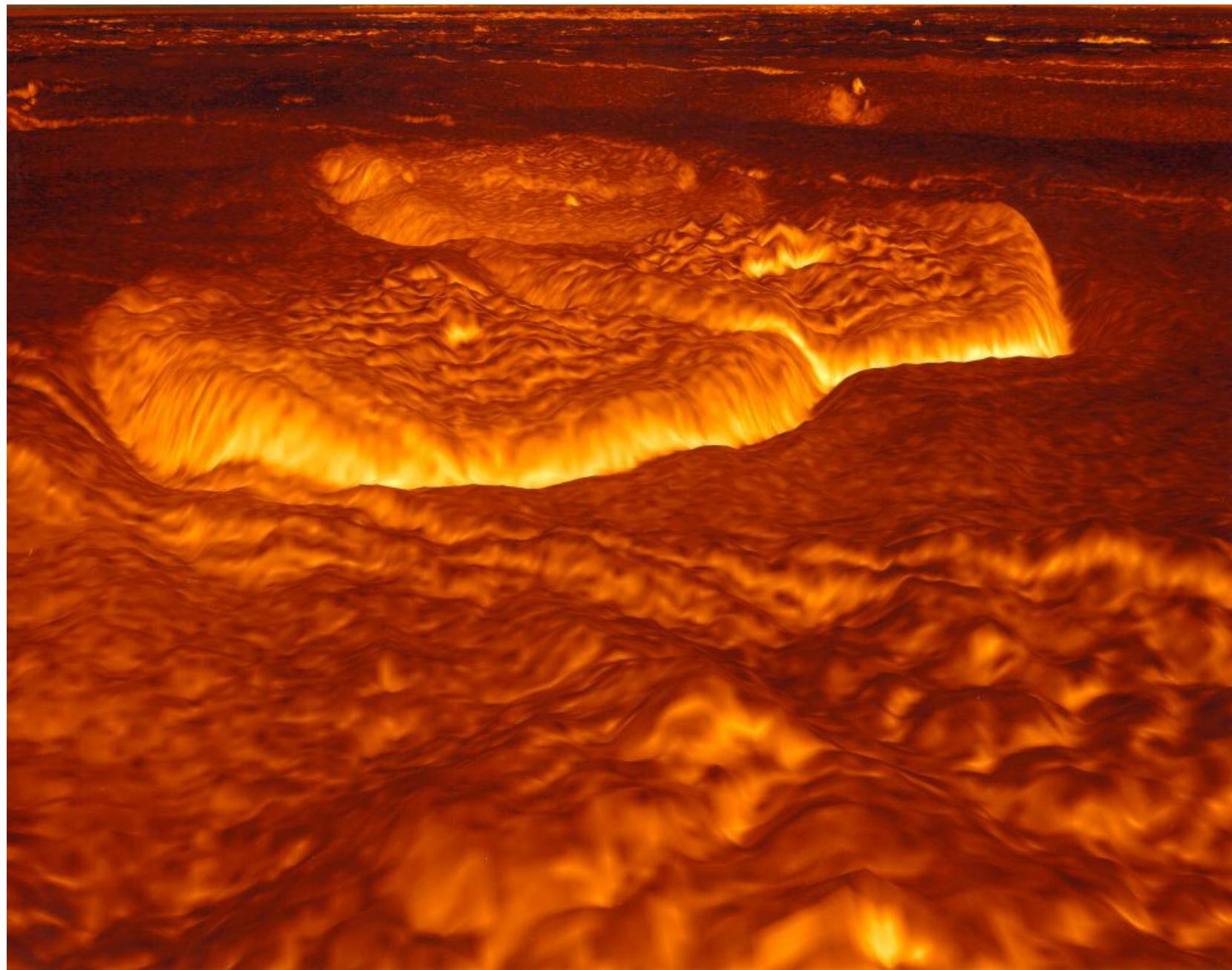


Venera 15b



Venus-mgn_eistla_regio-computer

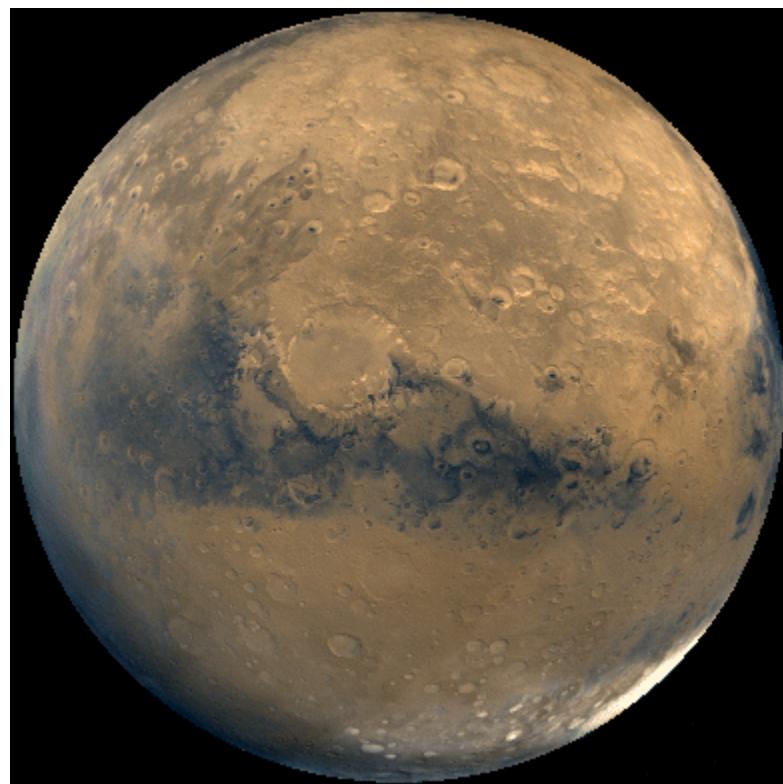
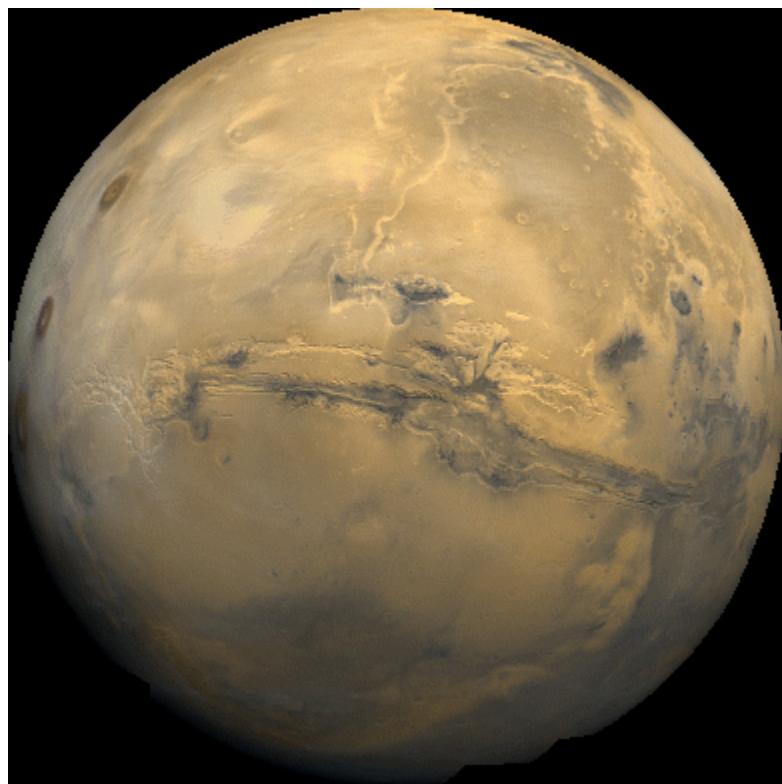




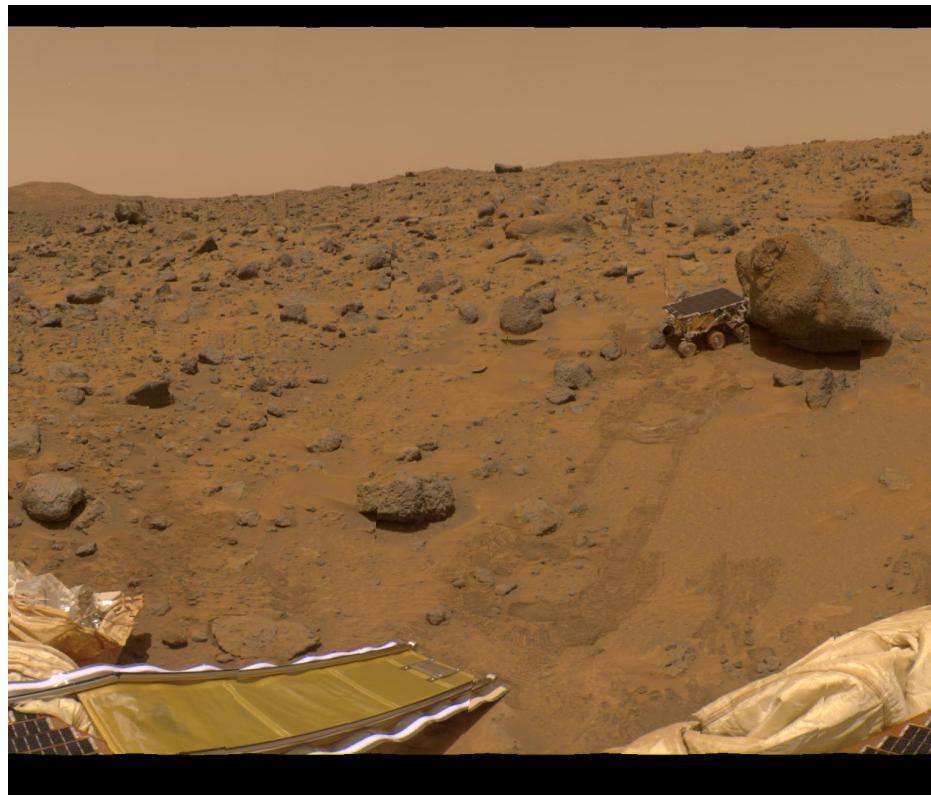
Marsas

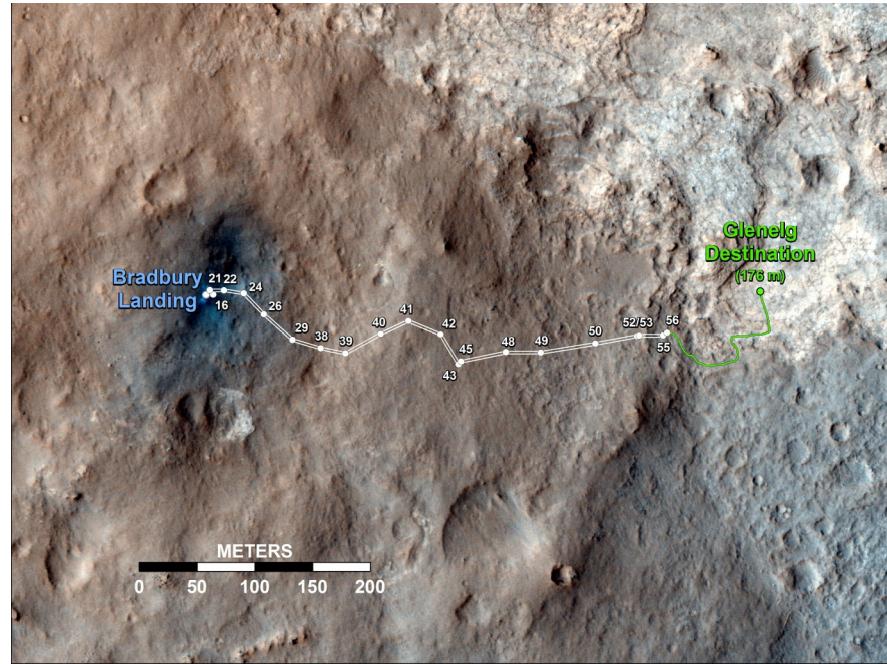
- orbita: 227,940,000 km (1.52 AU)
skersmuo: 6,794 km
- Marso diena – 24 val. 39 min., 35,244 s.
- Marso metai – 1 metai, 320 dienų 18,2 val
- Marso orbita gana eliptiška, todėl temperatūra kinta 30 °C, jei jis yra tarp afelio ir perihelio.
- Vidutinis tankis – 3.9 g/cm³
- Temperatūra - -133 - +27 °C

Marsas



Marsas



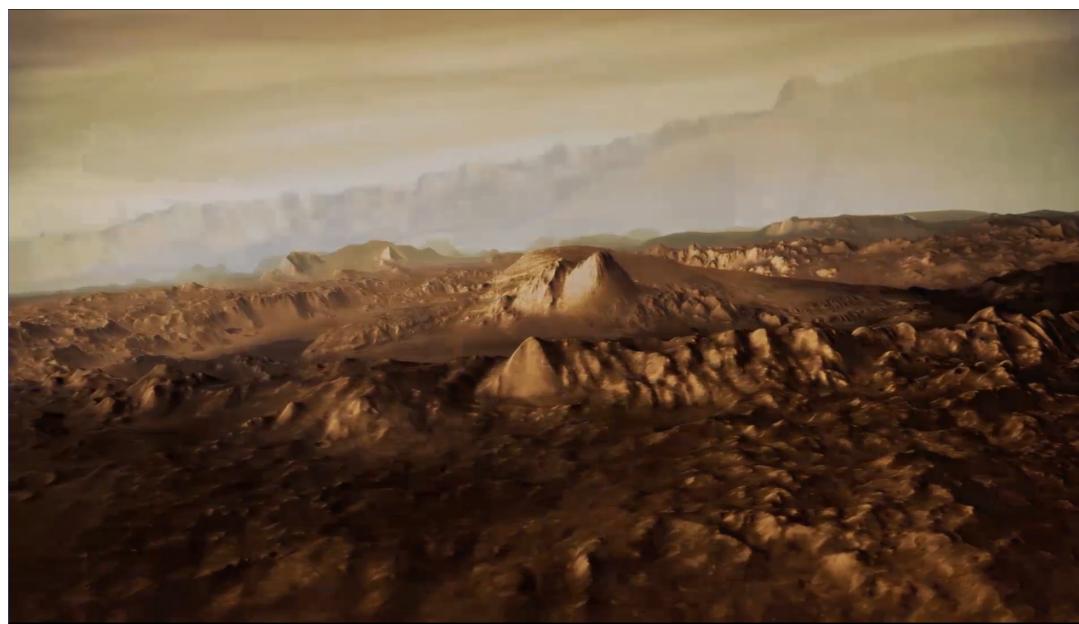
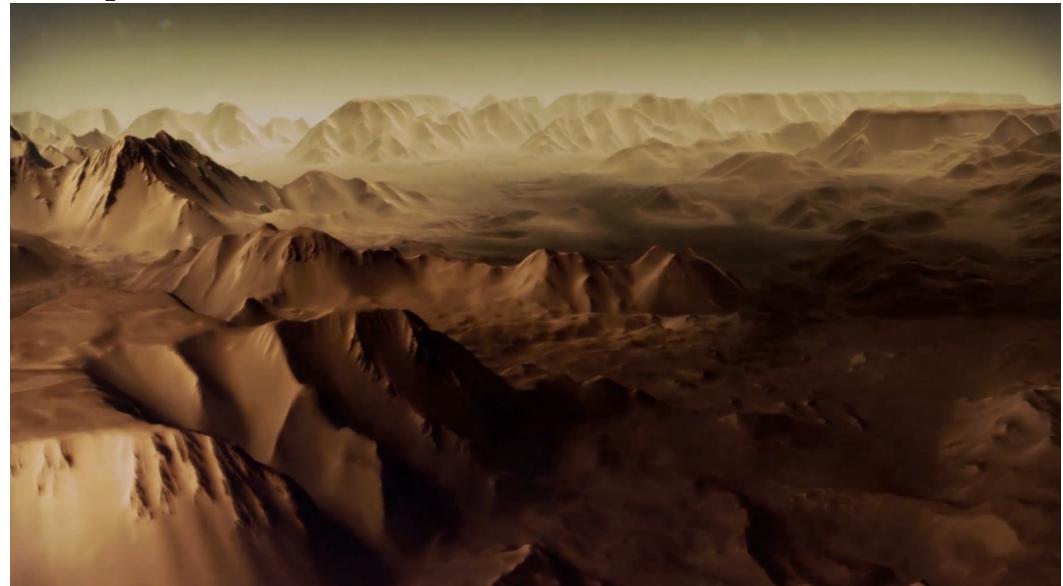


Marsas

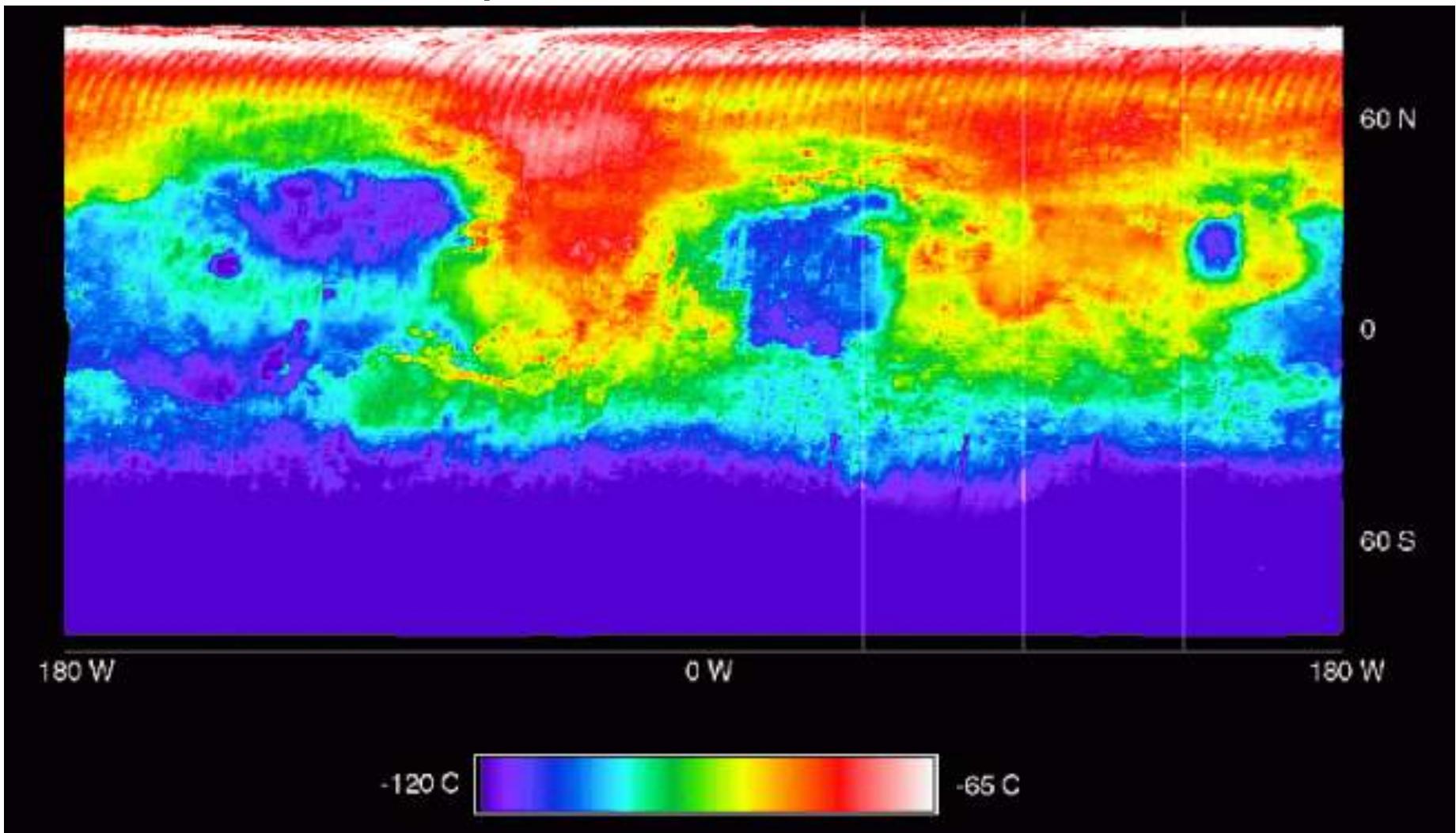


Olimpas -didžiausias Marso vulkanas. Jis panašus į didžiausią Žemės kalną Havajuose esantį Mauna Loa vulkaną (9.2 km nuo papédės), tik Marso vulcano papédės skersmuo ~ 624 km ir aukštis 25 km.

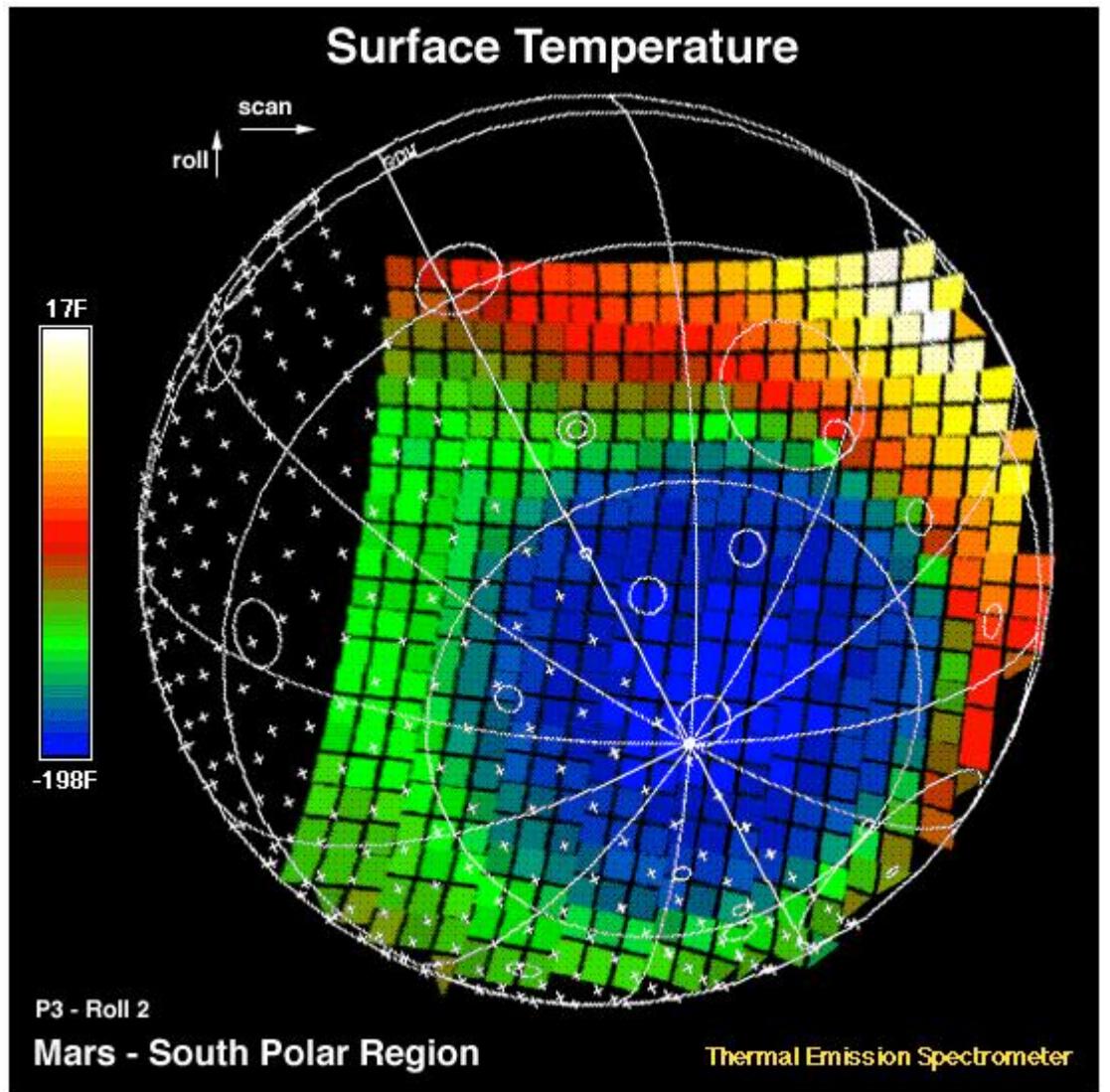
Marso peisažas



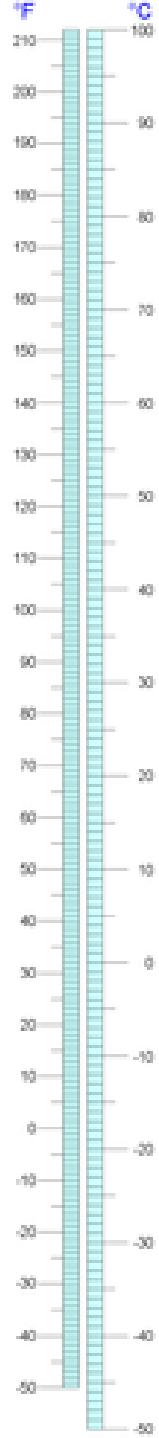
Marso temperatūra 1999 m. birželio 2 d.



Explanation: It's 2 AM on Mars and surface temperatures range from -65C to -120C, as measured by the Thermal Emission Spectrometer (TES) onboard the Mars Global Surveyor spacecraft. TES data used to make this detailed temperature map were acquired while passing over the night side of the Red Planet during 500 mapping orbits of Mars. With the warmest temperatures shown in white, progressing through red, yellow, and green colors to the coldest temperatures in blue, the map reveals the northern hemisphere during summer while the south experiences the cold martian winter. Near Mars' equator, the variations in nighttime temperatures are related to surface materials. Cold blue areas are covered with fine dust particles and the warmer regions are covered with coarser sand and rocks.



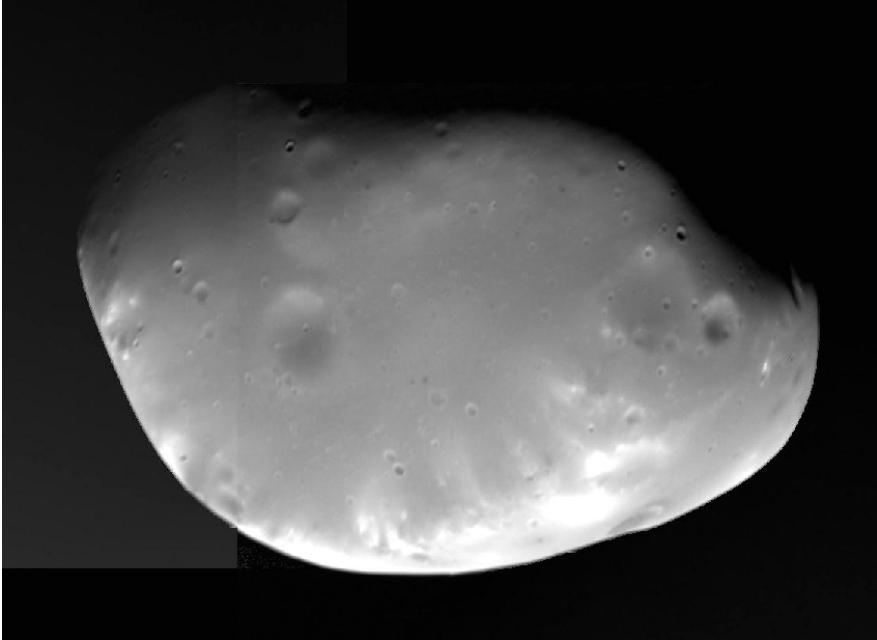
This image shows surface temperatures for the south pole of Mars. In this image areas in blue are coldest while those that are yellow to white are warmest. A scale is provided to the left. *Image from: NASA/JPL*



Phobos ir Deimos

- Phobos (Baimė): **skersmuo**: 22.2 km (27 x 21.6 x 18.8) **mass**: 10.8 tera-tonų
- In Greek mythology, Phobos is one of the sons of Ares (Mars) and Aphrodite (Venus). "phobos" is Greek for "fear" (the root of "phobia").
- Deimos (Siaubas) **skersmuo** 12.6 km (15 x 12.2 x 11) gal mažiausias mėnulis Saulės sistemoje **mass**: 1.8 tera-tonų
- Deimos is one of the sons of Ares (Mars) and Aphrodite (Venus); "deimos" is Greek for "panic".

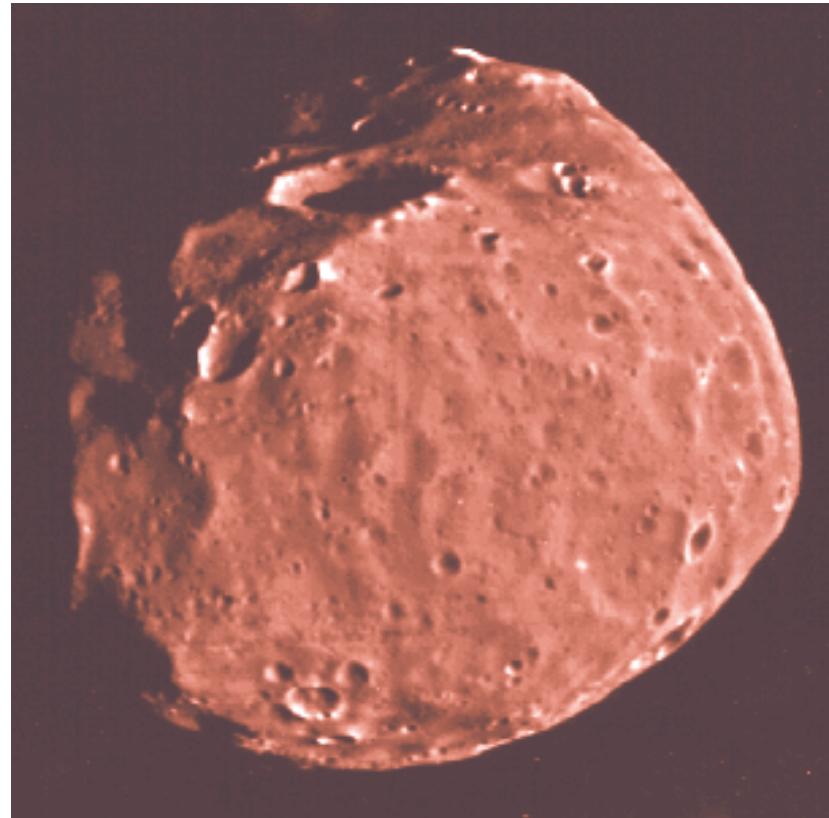
Deimos



Skersmuo 12.6 km (15 x 12.2 x 11)
gal mažiausias mėnulis

Saulės sistemoje Deimos is one of the sons of Ares (Mars) and Aphrodite (Venus); "deimos" is Greek for "panic".

Phobos



Skersmuo: 22.2 km (27 x 21.6

x 18.8) In Greek mythology, Phobos is one of the sons of Ares (Mars) and Aphrodite (Venus). "phobos" is Greek for "fear" (the root of "phobia").

Jupiteris

- Jupiteris penkta planeta ir pati didžiausia (2 X daugiau už visas kitas kartu paėmus, 318 kartų didesnis už Žemę).
- orbita: 778,330,000 km (5.20 AU)
- diametras: 142,984 km Vidutinis tankis – 1.34 g/cm³
- Temperatūra - -150 °C
- Jupiter (Greek Zeus) was the King of the Gods, the ruler of Olympus and the patron of the Roman state. Zeus was the son of Cronus (Saturn).

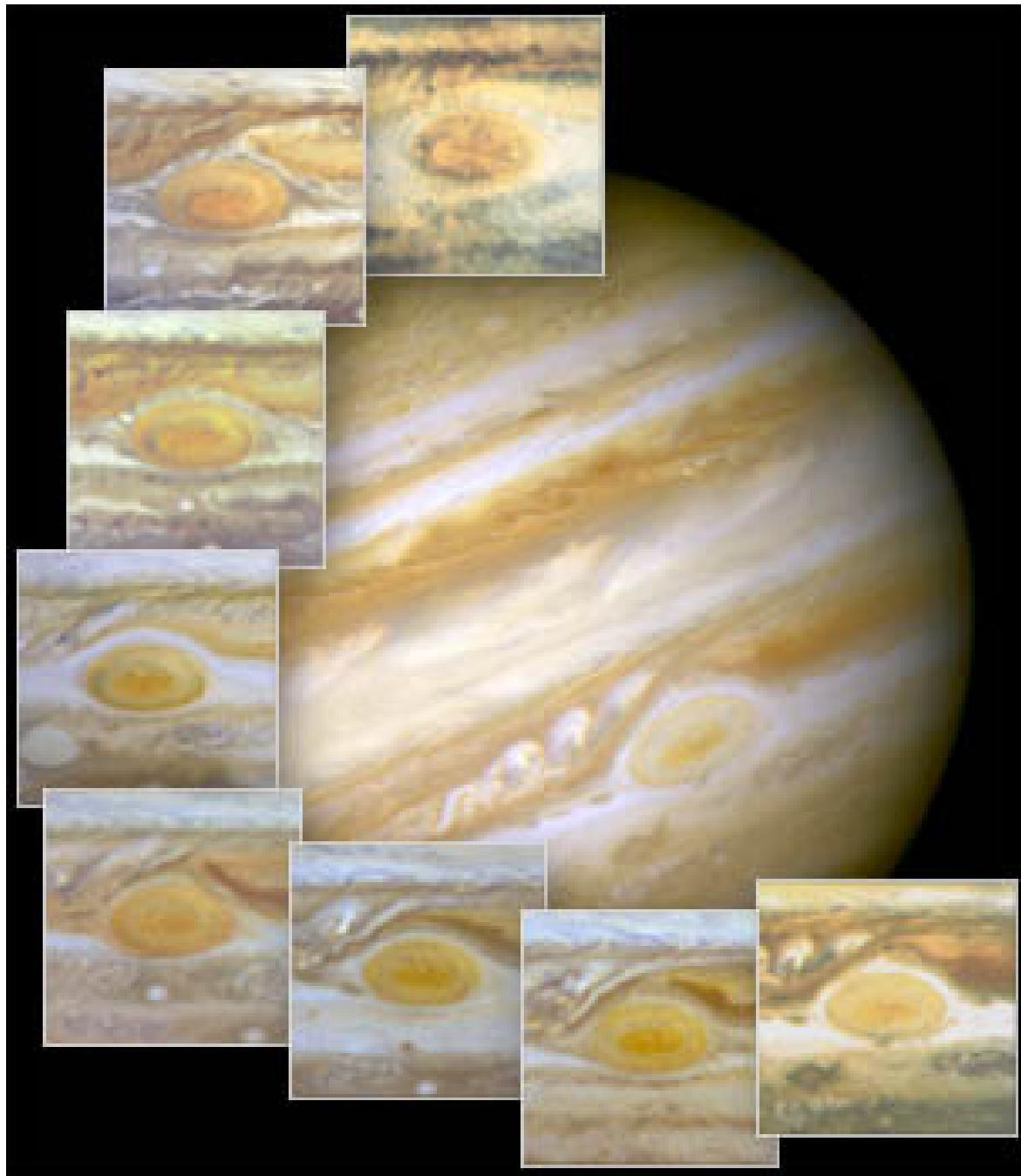
Jupiteris



Jupiteris, Io ir Ganimedas nufotograuoti mégéjo teleskopu



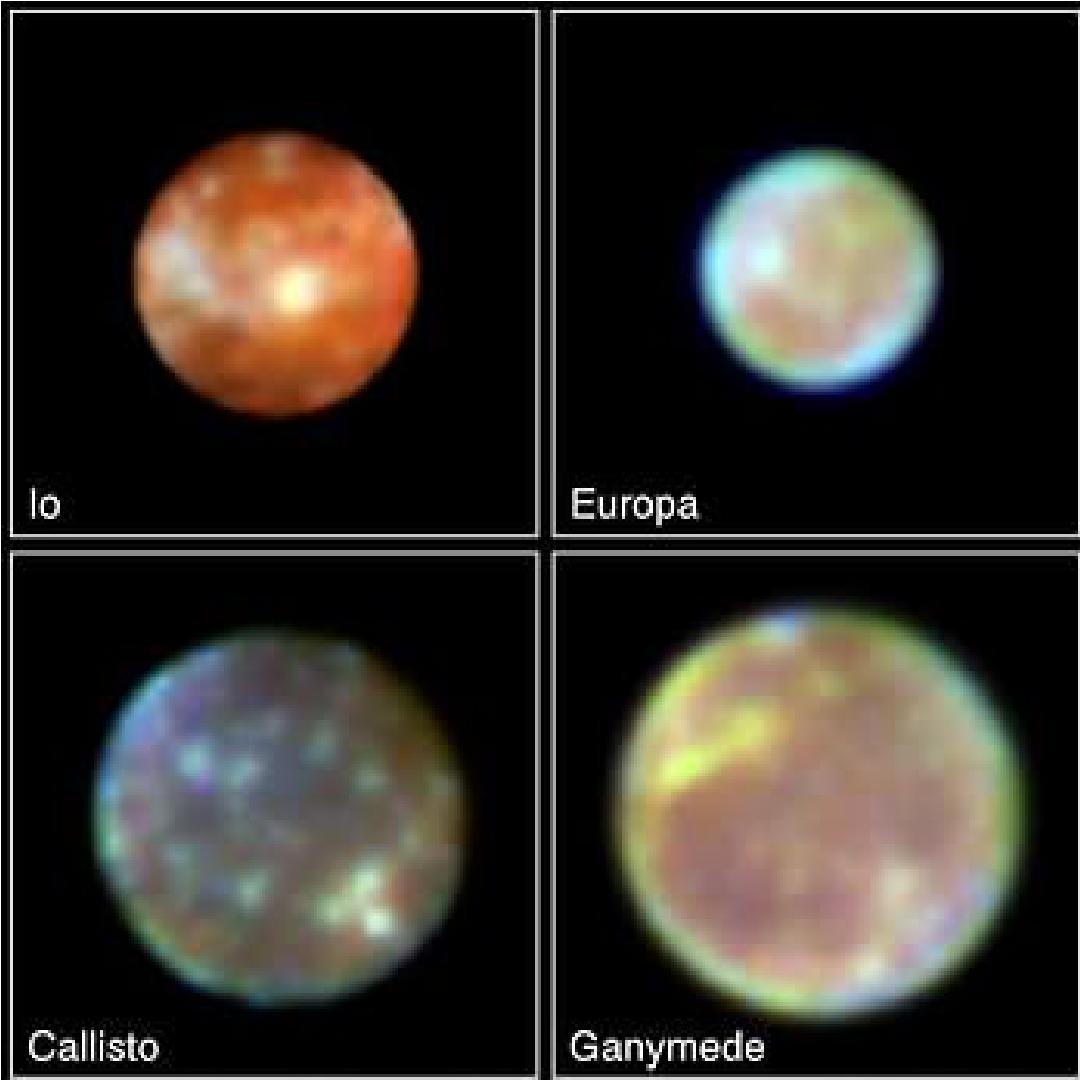
Jupiteris



Jupiterio ménuliai

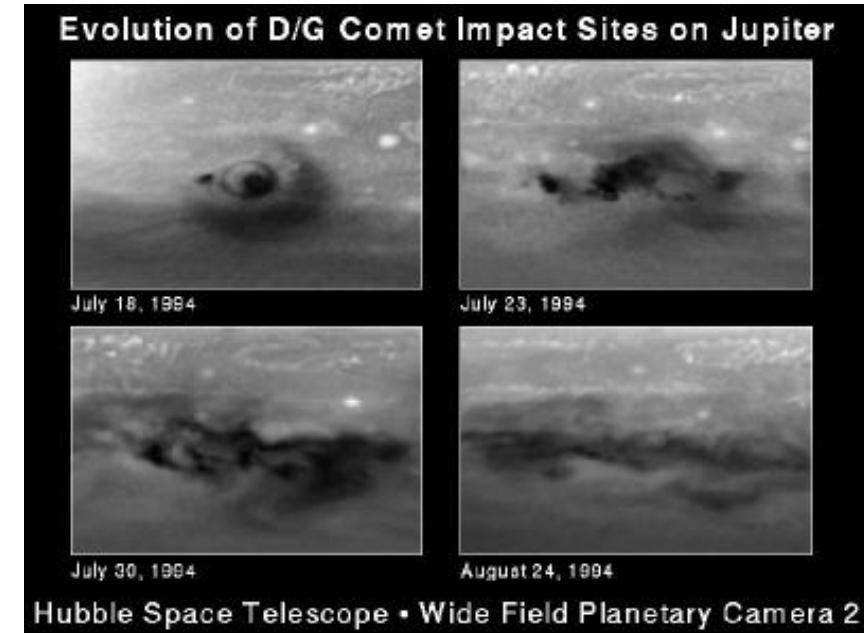
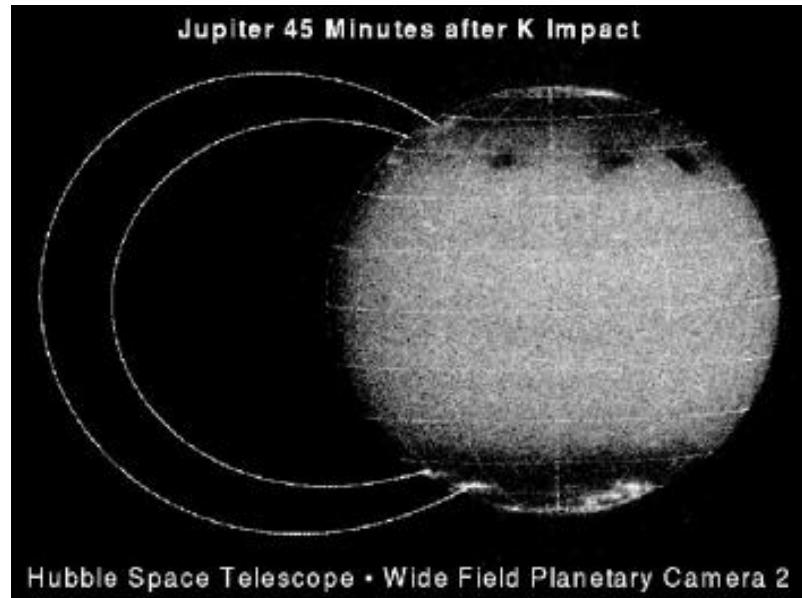
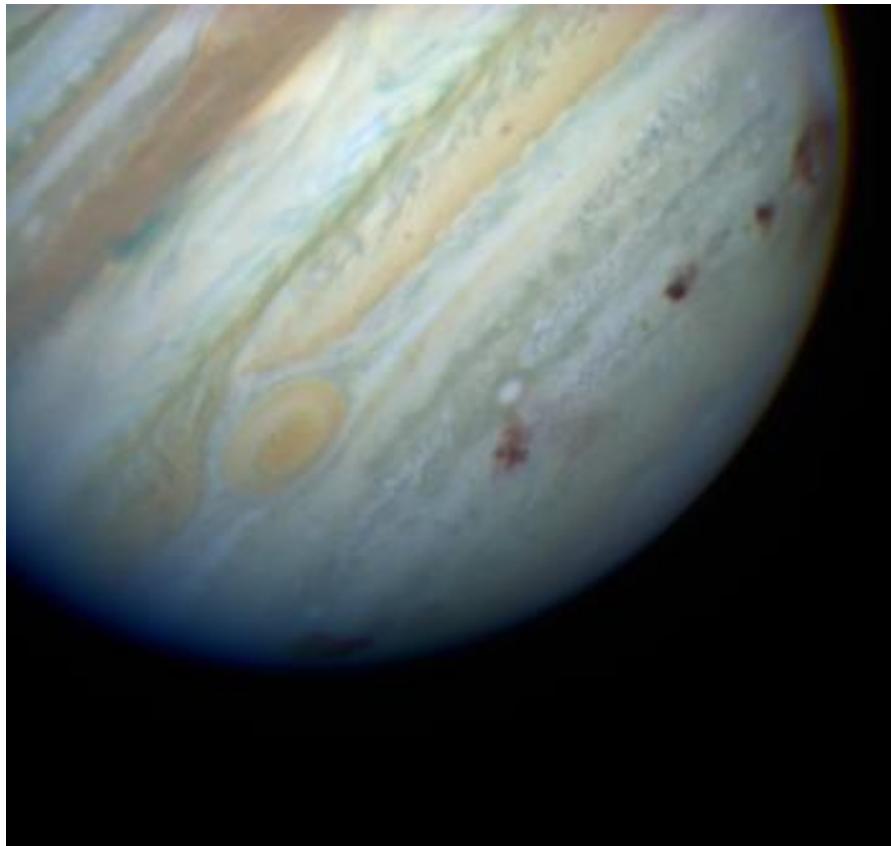
Distance	Radius	Mass			
Satellite	(000 km)	(km)	(kg)	Discoverer	Date
Metis	128	20	9.56e16	Synnott	1979
Adrastea	129	10	1.91e16	Jewitt	1979
Amalthea	181	98	7.17e18	Barnard	1892
Thebe	222	50	7.77e17	Synnott	1979
Io	422	1815	8.94e22	Galileo	1610
Europa	671	1569	4.80e22	Galileo	1610
Ganymede	1070	2631	1.48e23	Galileo	1610
Callisto	1883	2400	1.08e23	Galileo	1610
Leda	11094	8	5.68e15	Kowal	1974
Himalia	11480	93	9.56e18	Perrine	1904
Lysithea	11720	18	7.77e16	Nicholson	1938
Elara	11737	38	7.77e17	Perrine	1905
Ananke	21200	15	3.82e16	Nicholson	1951
Carme	22600	20	9.56e16	Nicholson	1938
Pasiphae	23500	25	1.91e17	Melotte	1908
Sinope	23700	18	7.77e16	Nicholson	1914

“Galilėjaus palydovai”



Jupiter's Galilean Satellites HST · WFPC2
PRC95-35 · ST Scl OPO · October 9, 1995
J. Spencer (Lowell Obs.), K. Noll (ST Scl), NASA

Šumeikerio kometos susidūrimas su Jupiteriu



Jupiterio žiedas

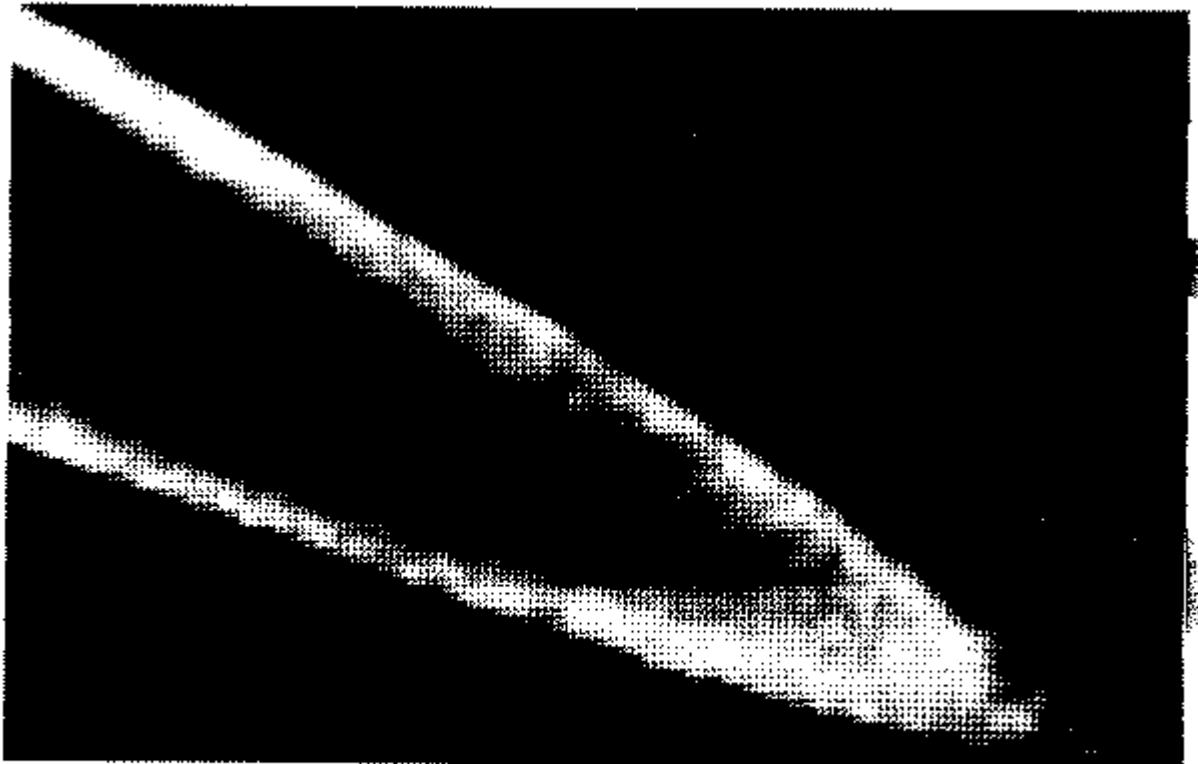


Fig. 10. Enlarged portion of a wide-angle picture taken by Voyager 2 through the clear filter, showing the brightness variations within the ring ansa; the thin brightest region and somewhat dimmer regions both interior and exterior to it. It appears that ring material may extend down to Jupiter's cloud tops. The brightest segment is approximately $1.8 R_J$ from the center of Jupiter. This picture was taken at a range of 1,556,000 km from the center of Jupiter, about 27 hours after closest approach of Voyager 2.

Saturnas

Orbita: 1,429,400,000 km (9.54 AU) nuo Saulės

Skersmuo: 120,536 km (pusiaujo)

- In Roman mythology, Saturn is the god of agriculture. The associated Greek god, Cronus, was the son of Uranus and Gaia and the father of Zeus (Jupiter). Saturn is the root of the English word "Saturday"
- Kaip ir Jupiteris, Saturne maždaug 75% vandenilio, 25% helio bei vandens, metano, amoniako ir “uolienu” pėdsakai, panašu į pirmampradžio debesies sandarą, iš kurio Saulės sistema susidare.
- Vidutinis tankis – 0.7 g/cm³
- Temperatūra - -180 °C

Saturnas

Saturn

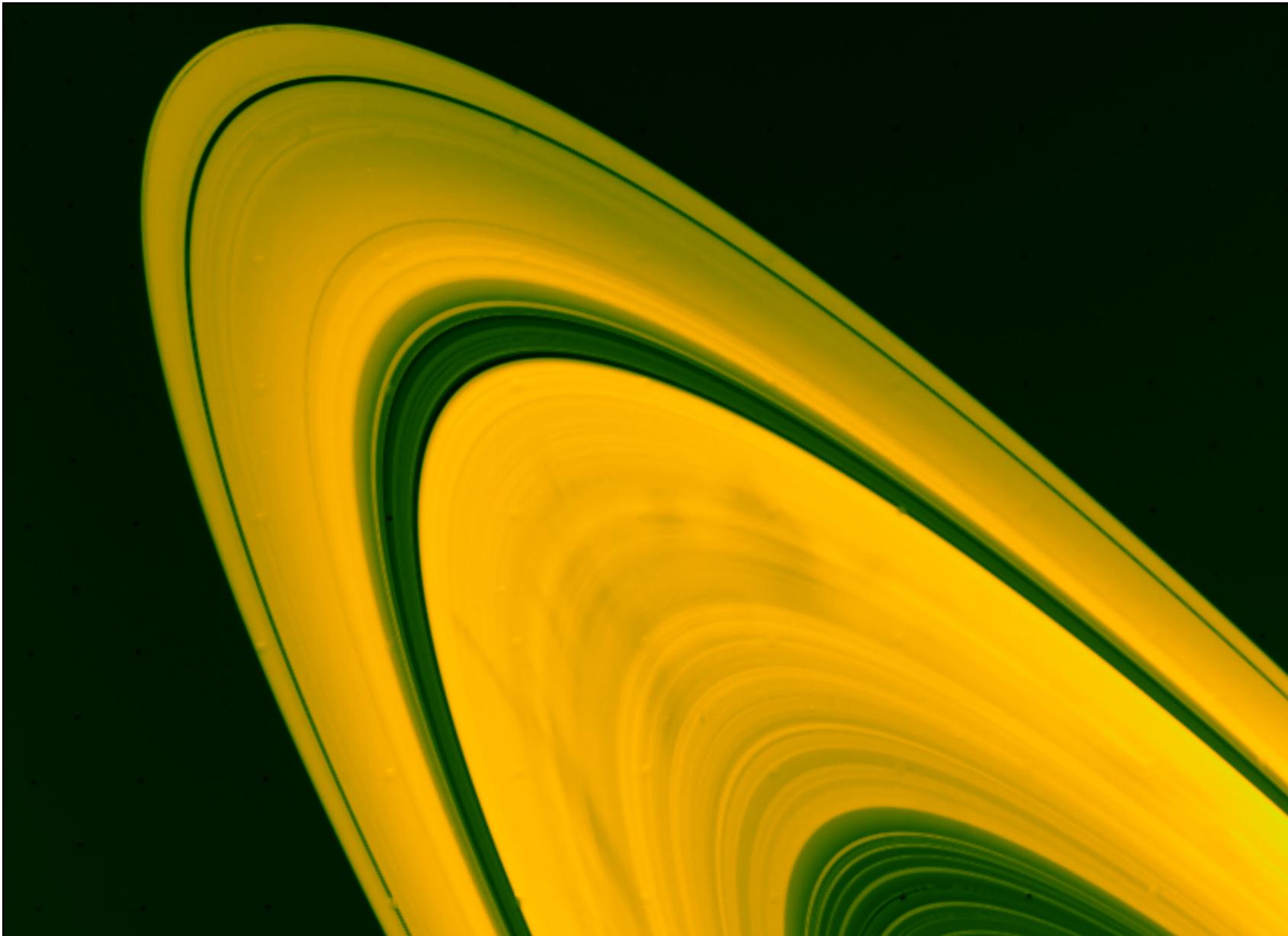


HST · WFPC2
December 1, 1994

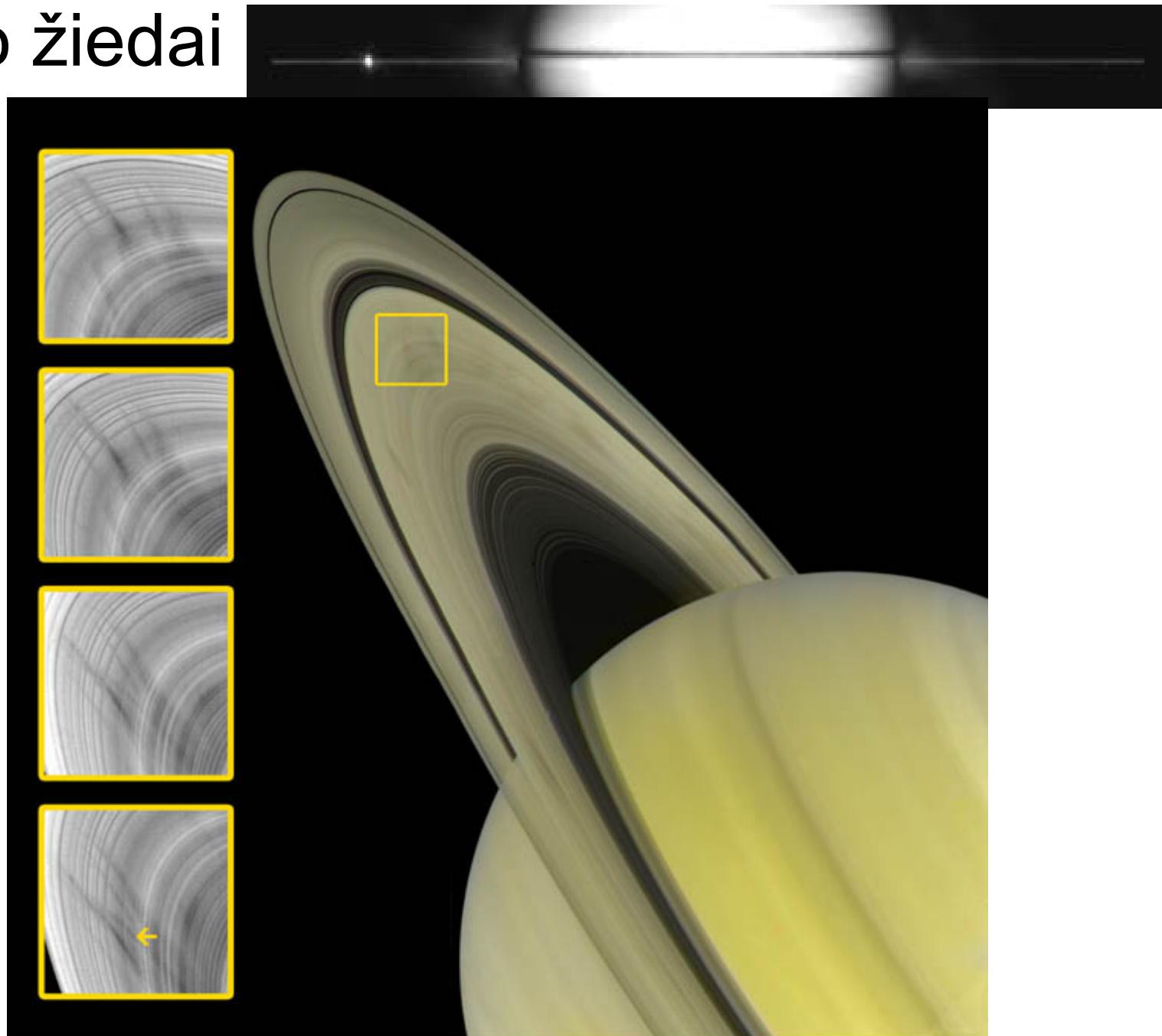
PR94-53 · ST Scl OPO · December 1994 · R. Beebe (NMSU), NASA

12/13/94 zgl

Saturno žiedai



Saturno žiedai

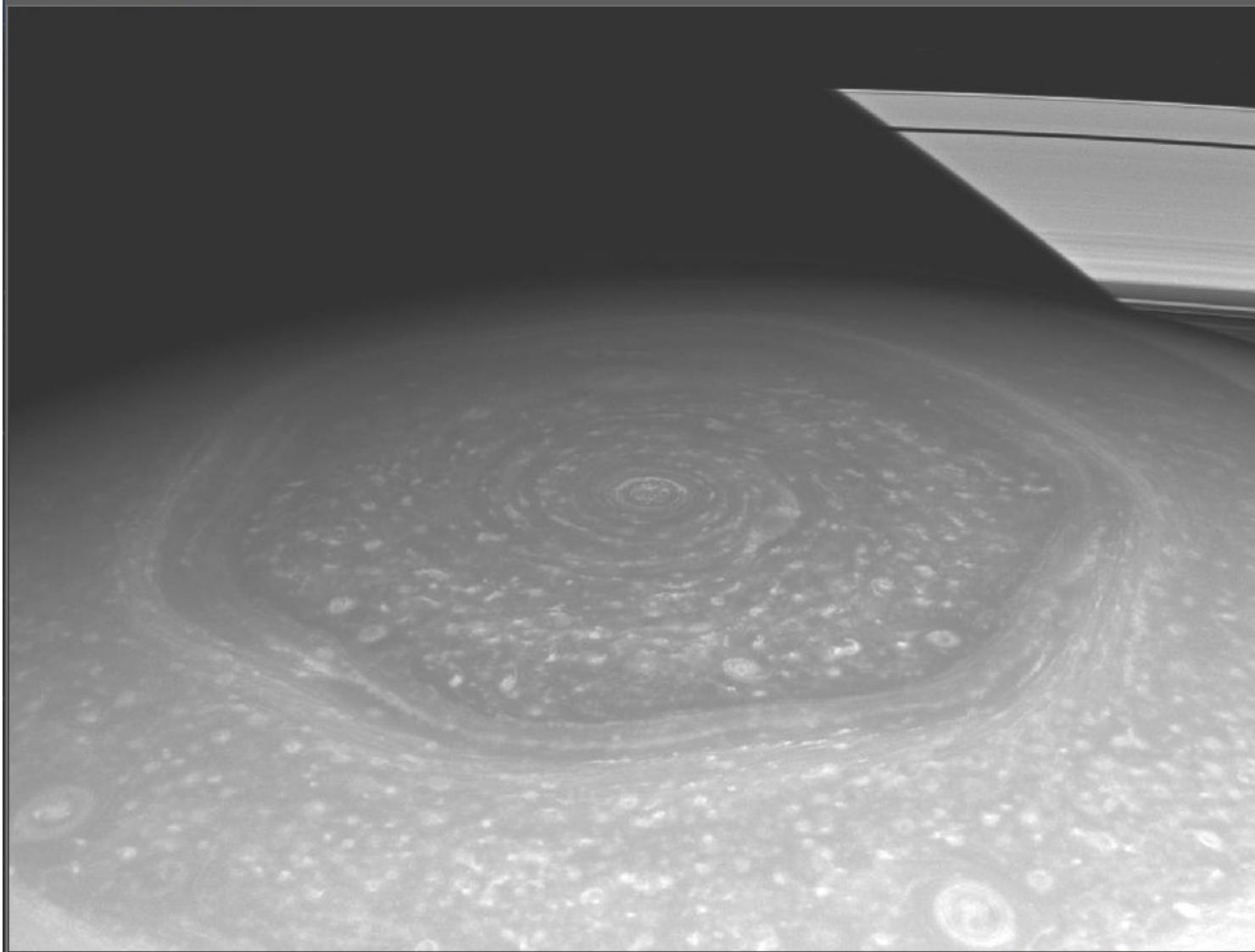


Spokes in Saturn's B-Ring

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Saturno žiedai

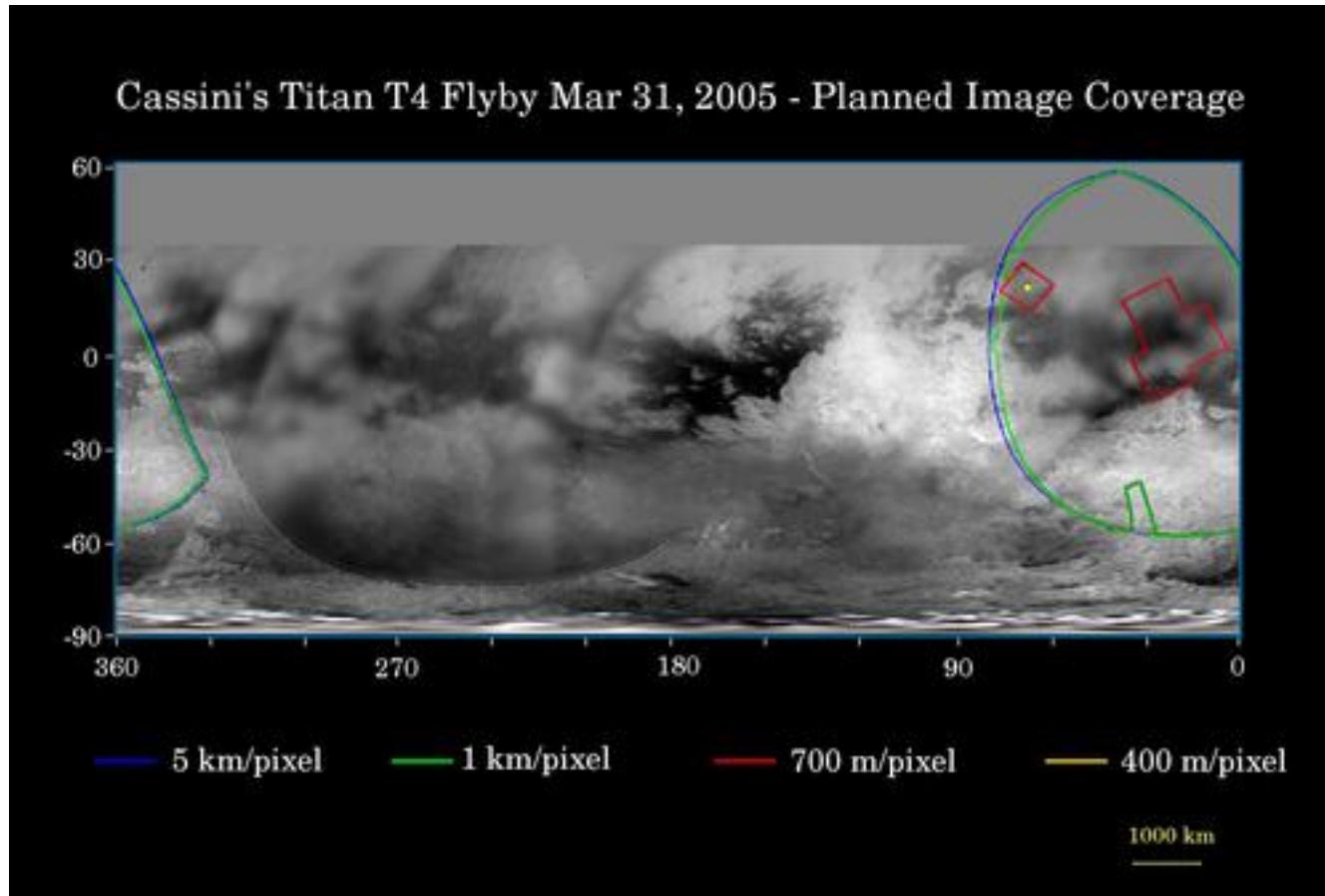




Saturn's north polar hexagon basks in the Sun's light now that spring has come to the northern hemisphere. Many smaller storms dot the north polar region and Saturn's signature rings, which appear to disappear on account of Saturn's shadow, put in an appearance in the background. The view was acquired at a distance of approximately 403,000 miles (649,000 kilometers) from Saturn and at a Sun-Saturn-spacecraft, or phase, angle of 21 degrees. Image scale is 22 miles (35 kilometers) per pixel.

The image was taken with the Cassini spacecraft's wide-angle camera on Nov. 27, 2012 using a spectral filter sensitive to wavelengths of near-infrared light centered at 750 nanometers. Image Credit: NASA/JPL-Caltech/Space Science Institute

Kasini misija link Titano



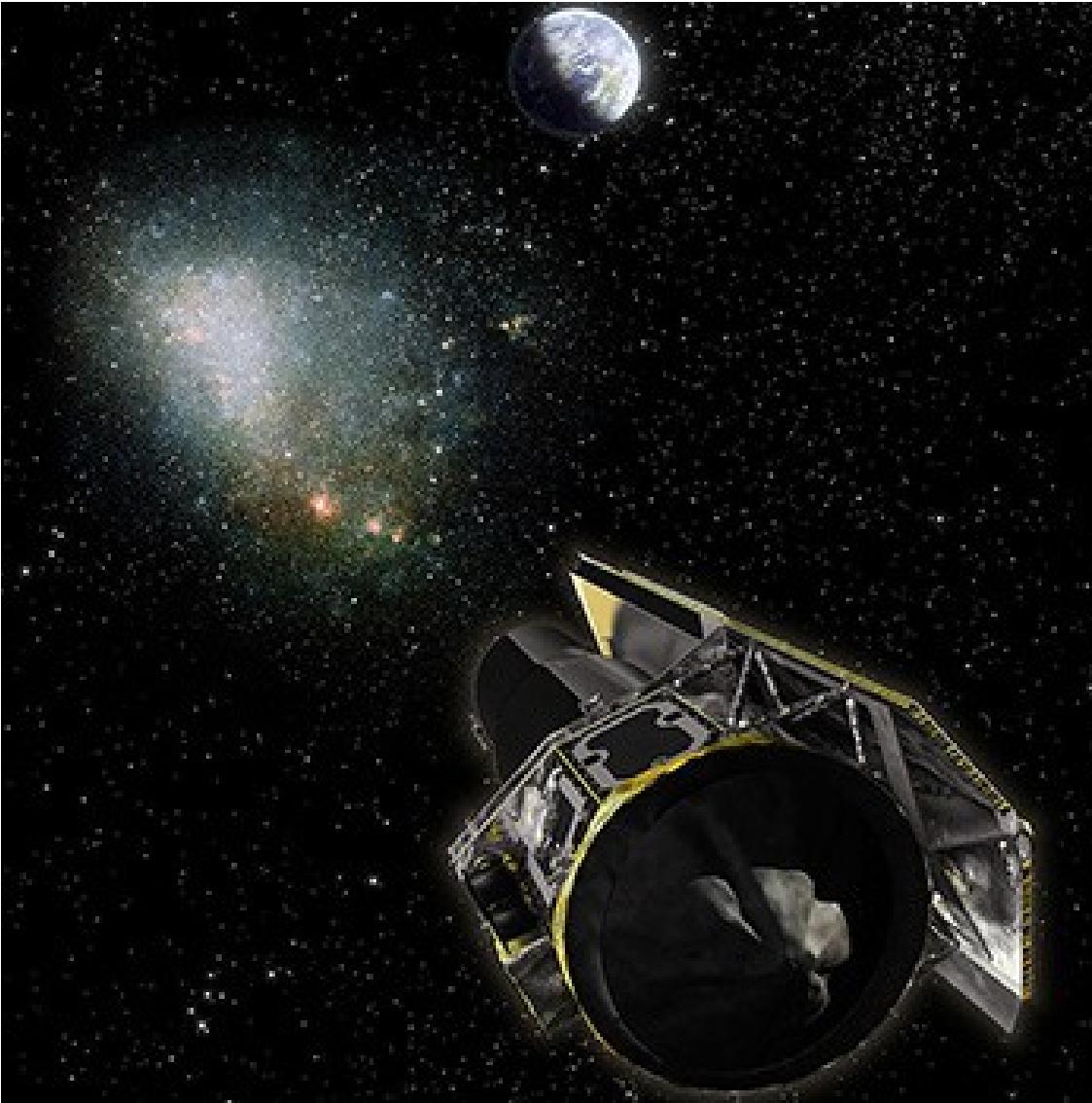
At 5,150 kilometers across, Titan is one of the solar system's largest moons.

Dionė (NASA nuotr.)

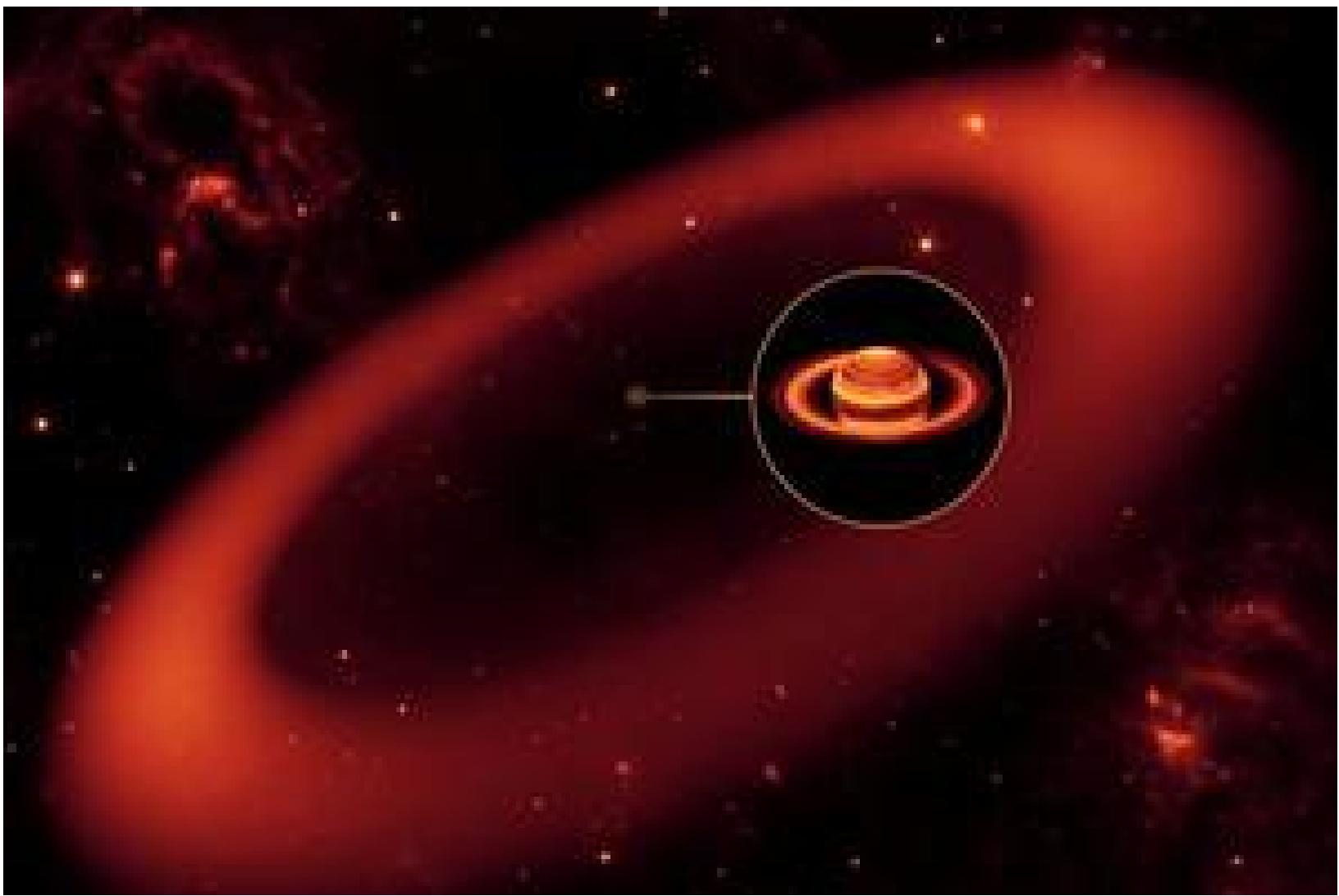


JAV mokslininkai pranešė Saturno palydovo Dionės aukštutiniame atmosferos sluoksnyje aptikę deguonies. Ši atradimą padaryti padėjo NASA kosminio aparato „Cassini“ 2010 m. balandži surinkti duomenys. Deguonies taip pat buvo aptikta kitame Saturno palydove Réjoje. Tyrimų rezultatai paskelbti žurnale „Geophysical Research Letters“, pranešė NASA.

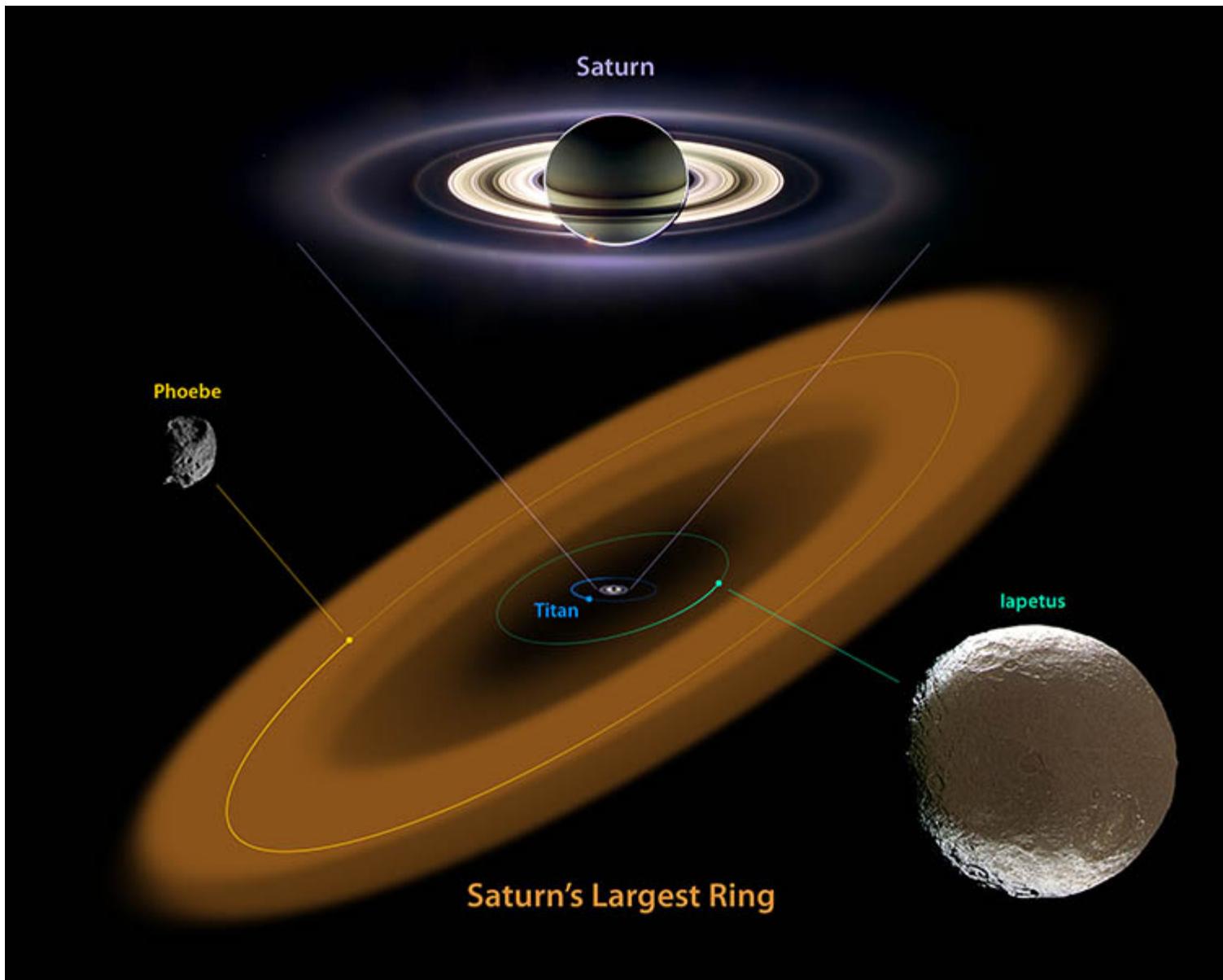
NASA's Spitzer Telescope

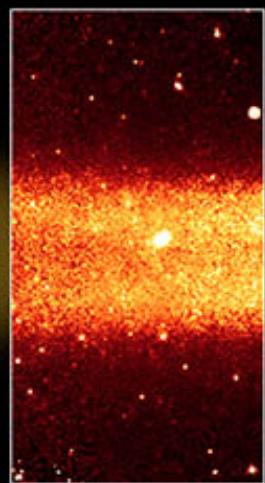


10.06.09



- Naujasis žiedas sudaro 27° kampą su pagrindiniu žiedu. Žiedo sudėtis: ledo ir dulkių dalelytės. Jo temperatūra – $(-194)^{\circ}$ C. Žiedo storis ~ 6 mln km (prasideda ties 6 millijonų km nuo Saturno ir tęsiasi iki 12 mln km).
- Vienas Saturno ménulių – Fobis skrieja žiedo viduje ir matyt yra jo šaltinis.





Dust Ring



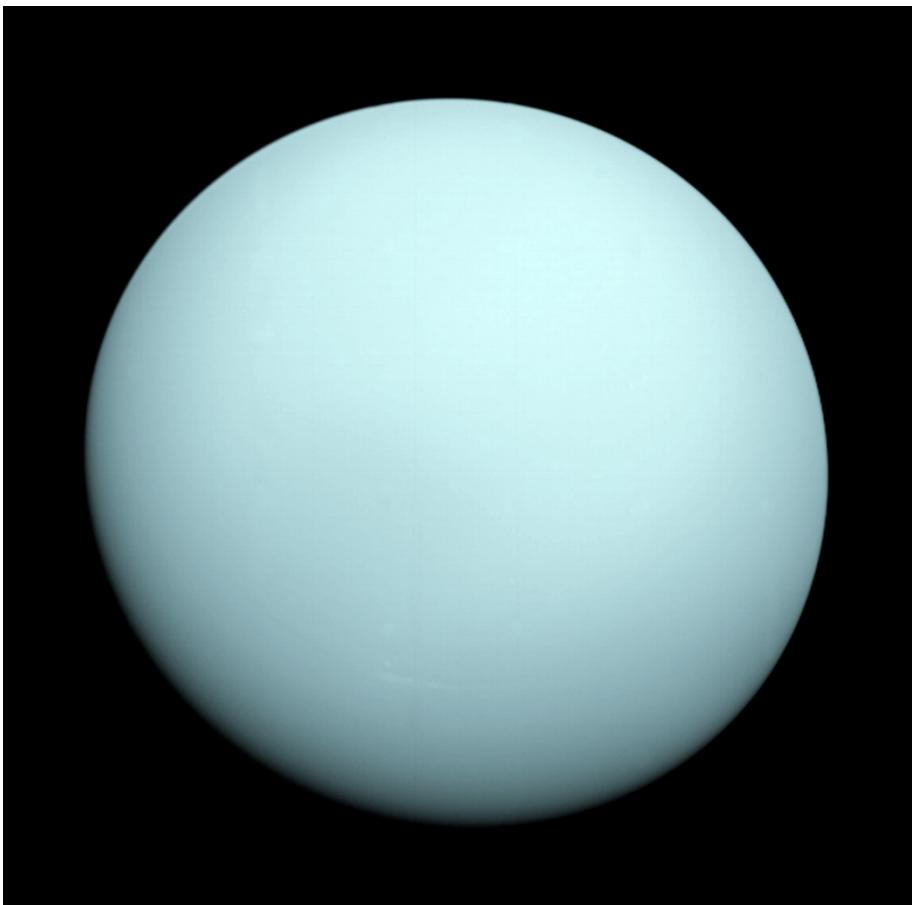
Infrared View of Saturn's Largest Ring
NASA / JPL-Caltech / A. Verbiscer (Univ. of Virginia)

Spitzer Space Telescope • MIPS
ssc2009-19a

Uranas

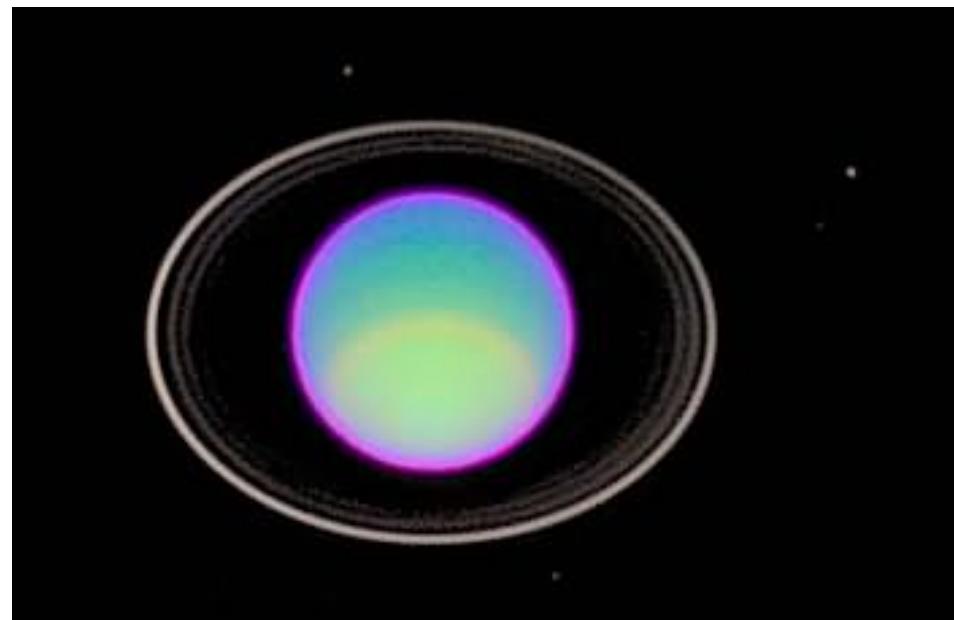
- Orbita: 2,870,990,000 km (19.218 AU)
Skersmuo: 51,118 km (pusiausjo)
- Vidutinis tankis – 1.5 g/cm³
- Temperatūra - -210 °C
- Uranus is the ancient Greek deity of the Heavens, the earliest supreme god. Uranus was the son and mate of Gaia the father of Cronus (Saturn) and of the Cyclopes and Titans (predecessors of the Olympian gods).

Uranas



Uranus

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Urano ménuliai

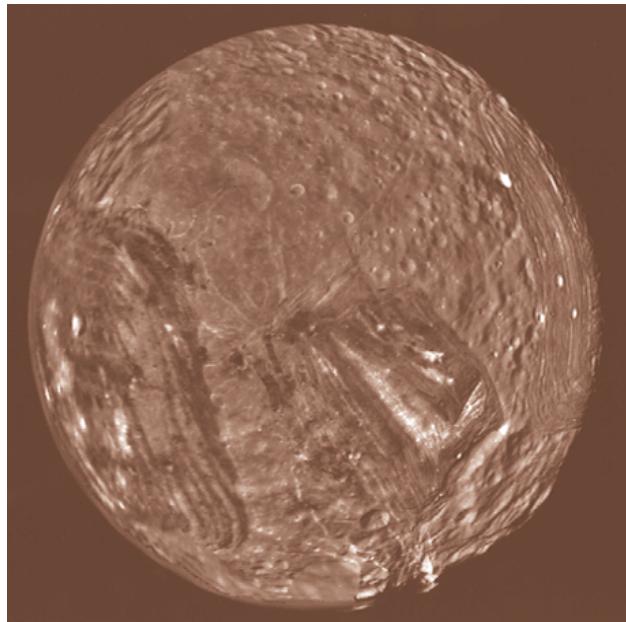
Uranus' Rings

	Distance (km)	Width (km)
1986U2R	38000	2,500
6	41840	1-3
5	42230	2-3
4	42580	2-3
Alpha	44720	7-12
Beta	45670	7-12
Eta	47190	0-2
Gamma	47630	1-4
Delta	48290	3-9
1986U1R	50020	1-2
Epsilon	51140	20-100

palydovas	Atstumas, t.km)	spindulys (km)	masė (kg)	Kosm.laivas	Data
Cordelia	50	13	?	Voyager 2	1986
Ophelia	54	16	?	Voyager 2	1986
Bianca	59	22	?	Voyager 2	1986
Cressida	62	33	?	Voyager 2	1986
Desdemona	63	29	?	Voyager 2	1986
Juliet	64	42	?	Voyager 2	1986
Portia	66	55	?	Voyager 2	1986
Rosalind	70	27	?	Voyager 2	1986
2003U2	75	6	?	Showalter	2003
Belinda	75	34	?	Voyager 2	1986
1986U10	76	40	?	Voyager 2	1986
Puck	86	77	?	Voyager 2	1985
2003U1	98	8	?	Showalter	2003
Miranda	130	236	6.30e19	Kuiper	1948
Ariel	191	579	1.27e21	Lassell	1851
Umbriel	266	585	1.27e21	Lassell	1851
Titania	436	789	3.49e21	Herschel	1787
Oberon	583	761	3.03e21	Herschel	1787
2001U3	4281	6	?	Sheppard	2003
Caliban	7169	40	?	Gladman	1997
Stephano	7948	15	?	Gladman	1999
Trinculo	8578	5			
Sycorax	12213	80	?	Nicholson	1997
2003U3	14689	6	?	Sheppard	2003
Prospero	16568	20	?	Holman	1999
Setebos	17681	20	?	Kavelaars	1999
2002U2	21000	6		Sheppard	2003

Urano mėnuliai

Miranda



Miranda ("mi RAN duh") is the eleventh of [Uranus's known satellites](#). Miranda is the innermost of Uranus' large moons.

orbit: 129,850 km from Uranus **diameter:** 472 km

mass: 6.3e19 kg

Miranda is about half water ice and half rocky material.

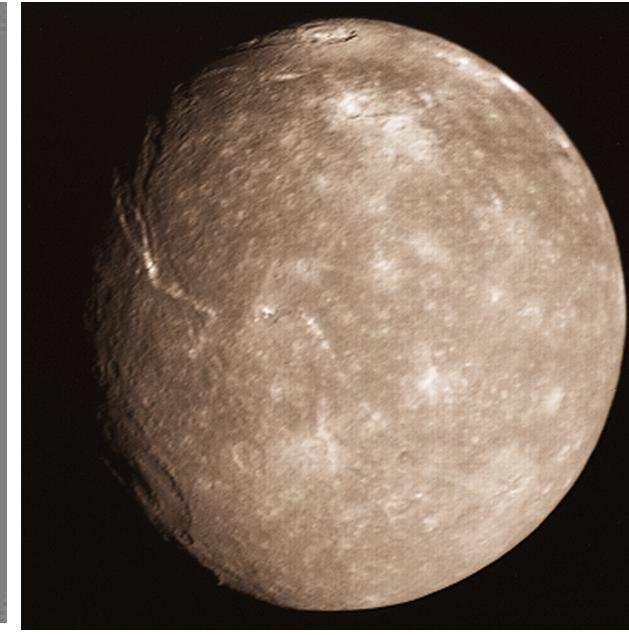
Arielis



Ariel ("AIR ee el") is the twelfth of [Uranus's known satellites](#).

Ariel may have been hot inside long ago, but it's cold now. Perhaps the valleys are cracks which formed when Ariel froze.

Titanija



Titania [Ty-TAY-ne-ah] is the largest moon of Uranus. It is marked by a few large impact basins, but is generally covered with small craters and very rough rocks. The above image shows a 1,600 kilometer (1,000 mile) long trench. A large double walled crater can be seen towards the top of the image. There are many faults on Titania indicating there has been internal forces molding its surface.

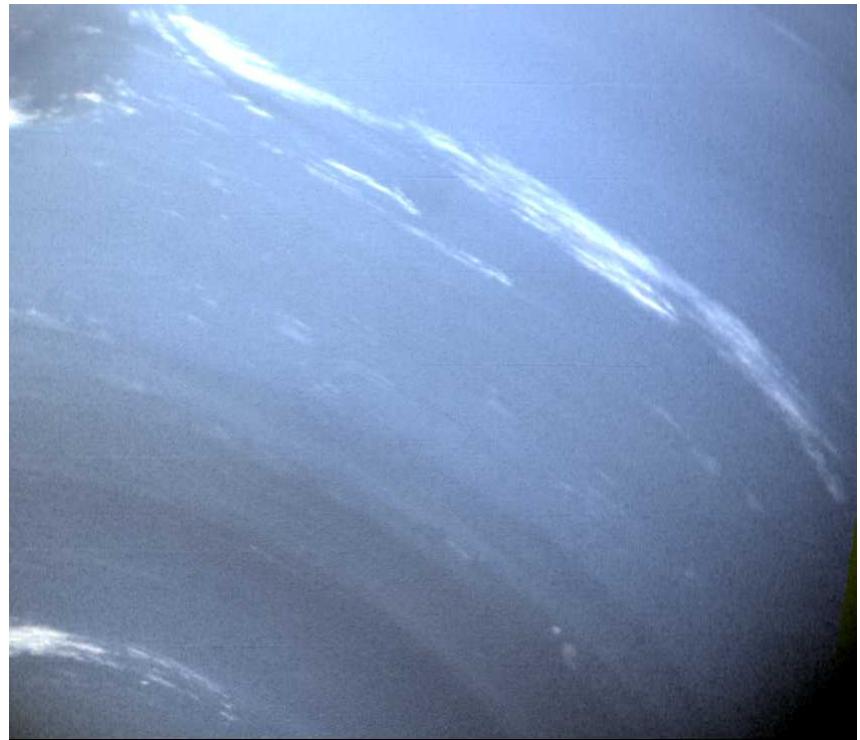
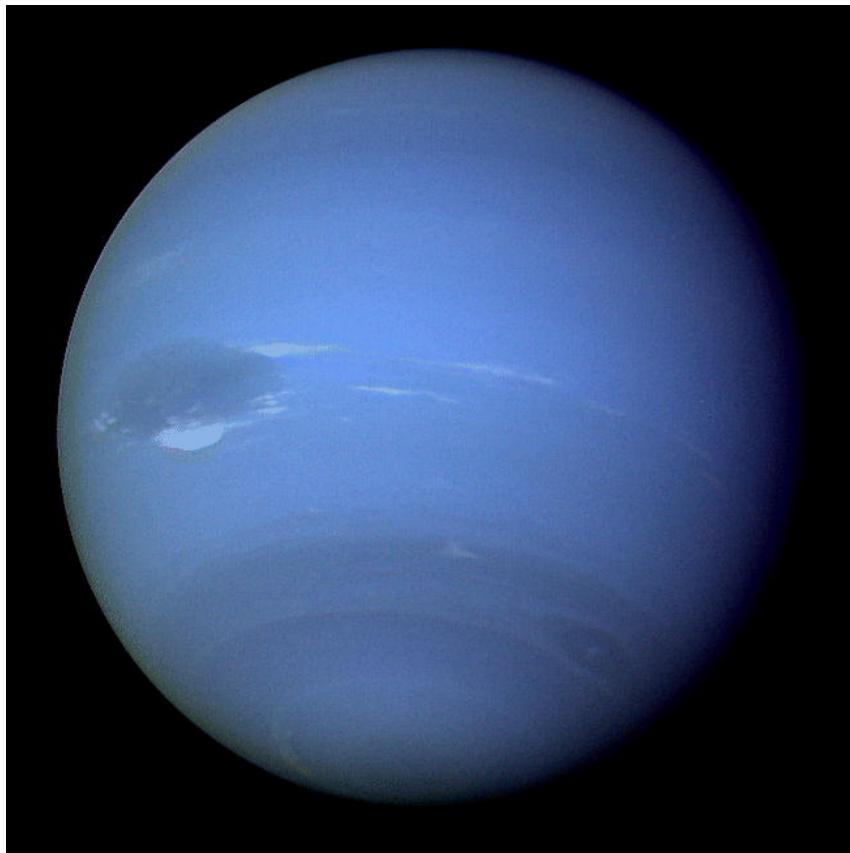
Neptūnas

Orbita: 4,504,000,000 km (30.06 AU)

Skeršmuo: 49,532 km

- Vidutinis tankis – 2.1 g/cm³
- Temperatūra - -220 °C
- In Roman mythology Neptune (Greek: Poseidon) was the god of the Sea.

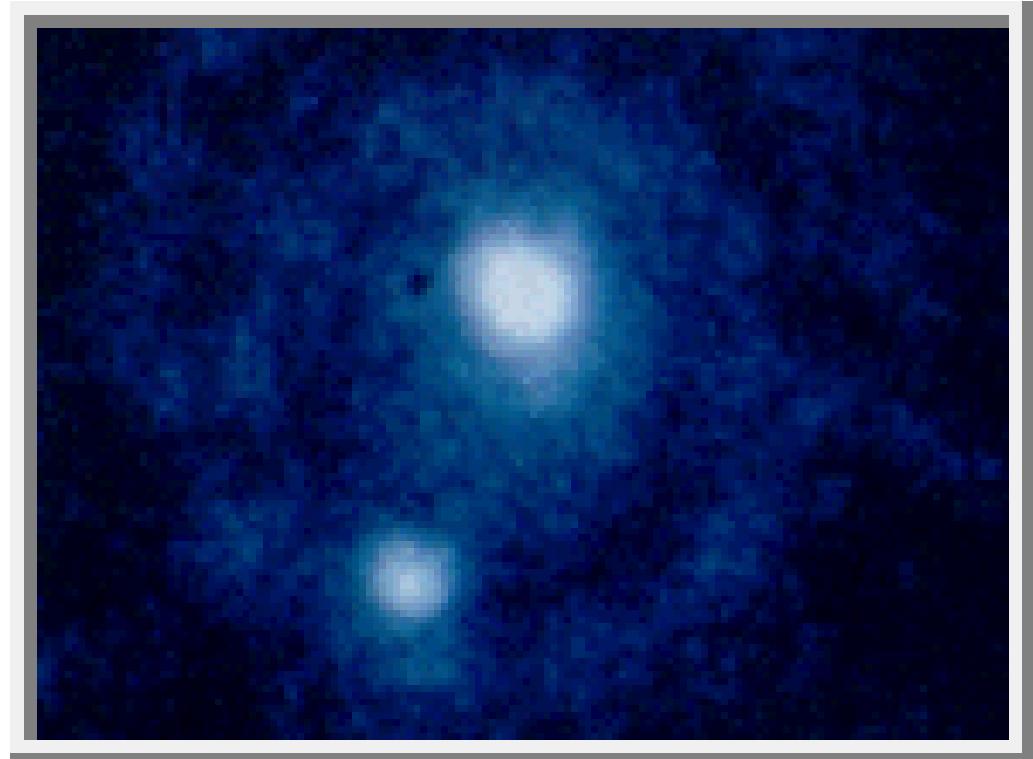
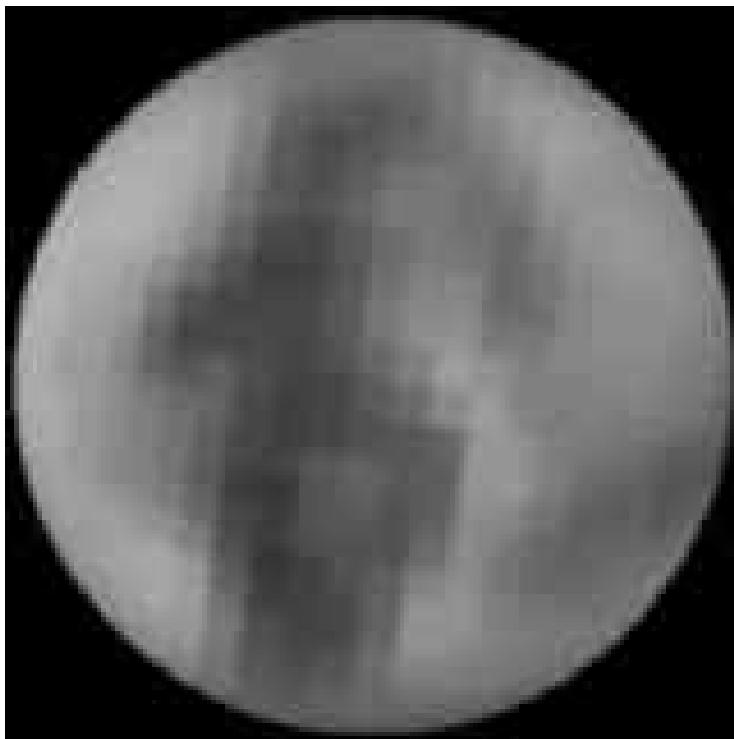
Neptūnas



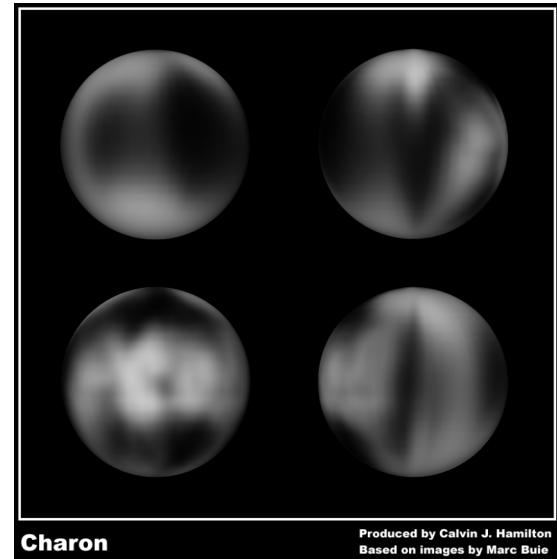
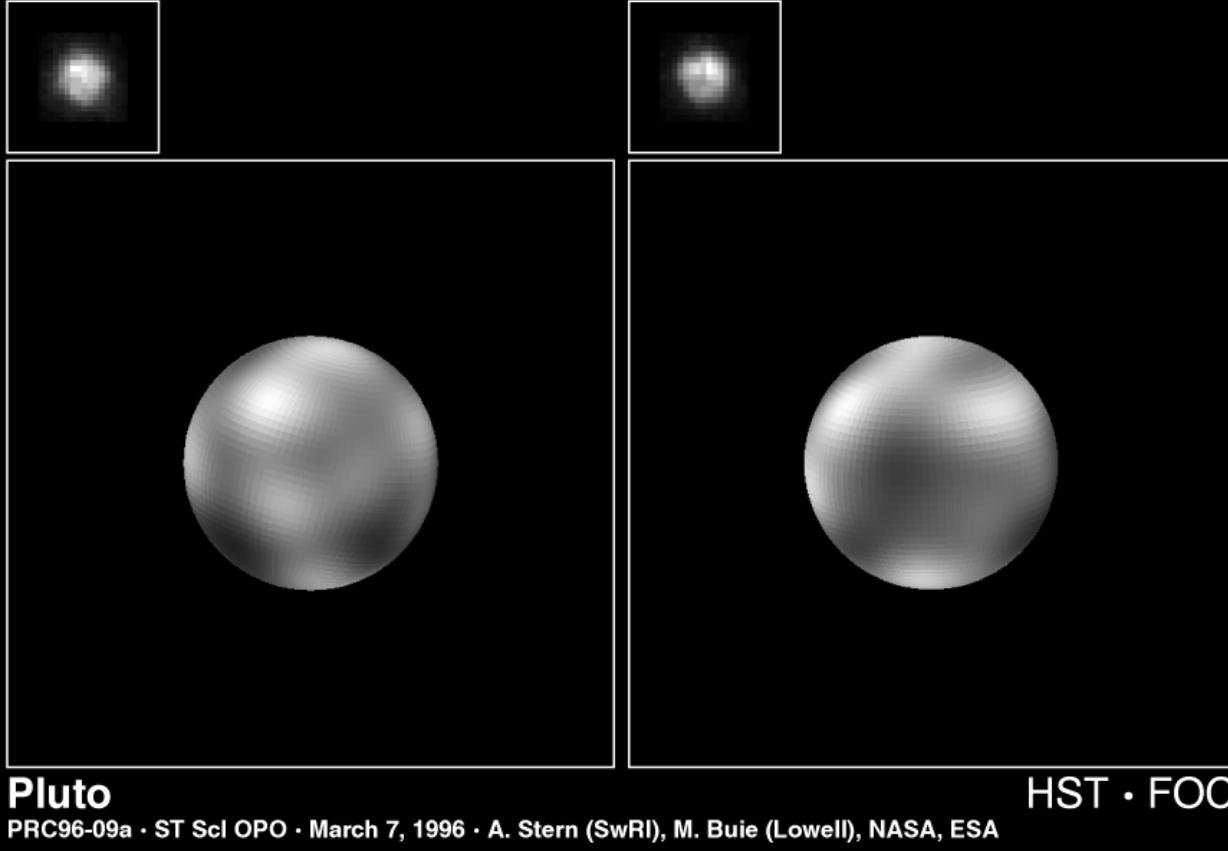
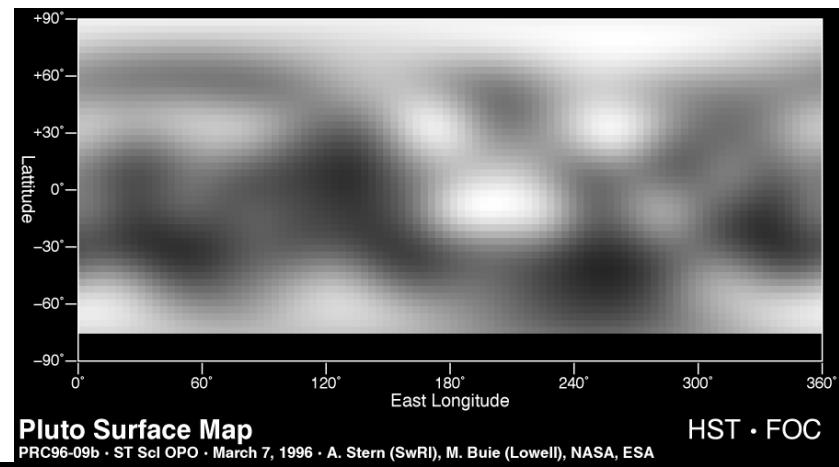
Plutonas - nuo 2006 nykštukinė planeta

- Plutonas yra mažesnis už septynis Saulės sistemos ménulius: **Ménulį, Io, Europą, Ganymedą, Callistą, Titaną ir Tritoną.**
- Orbita: 5,913,520,000 km (39.5 AU) (vidutinis) Skersmuo: 2274 km
- Vidutinis tankis – 2.05 g/cm³
- Temperatūra - -230 °C
- Romėnų mitologijoje Plutonas – požemiuų dievas (graikų ekvivalentas - Hadas). Planetai tas vardas suteiktas todėl, kad jis labai toli nuo Saulės, kur tur būt jau vyrauja tamsa. Sutrumpintas ženklas "PL" yra Percival Lowell Inicialai. (*Astronomas analizavęs Neptūno orbitą ir nustatęs, kad turi egzistuoti dangaus kūnas , ją trikdantis. Analizę pradėjo 1927 m., 1929 m. pradėjo šio dangaus kūno ieškoti, 1930 m. surado.*)

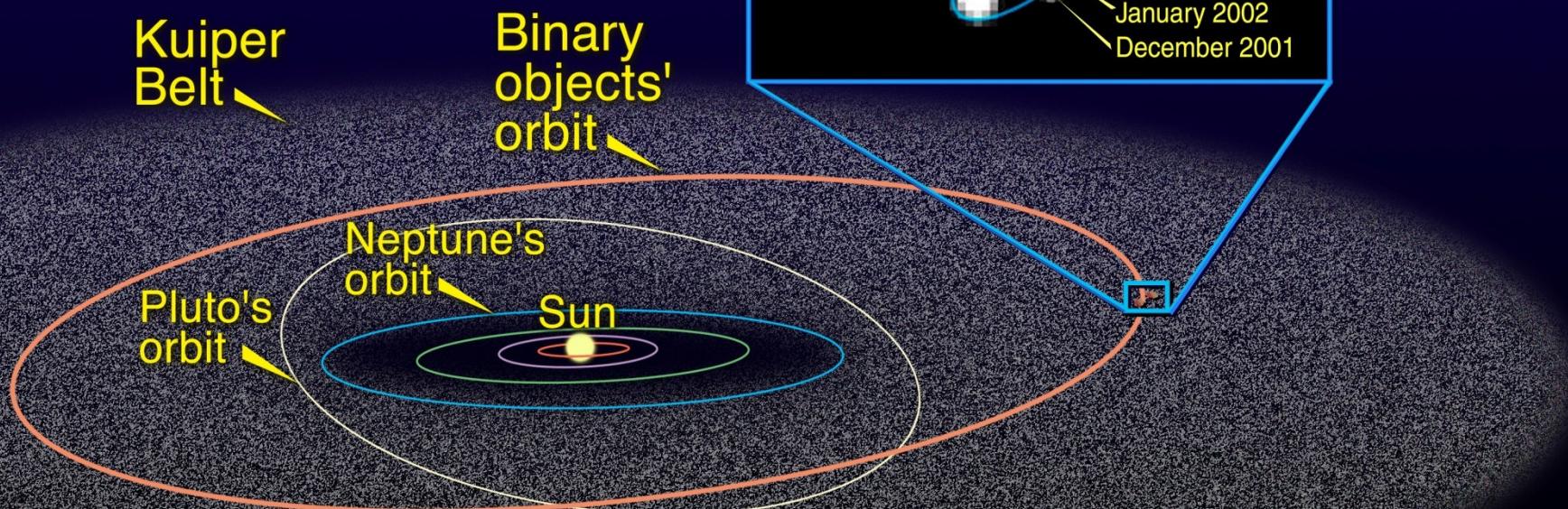
Plutonas



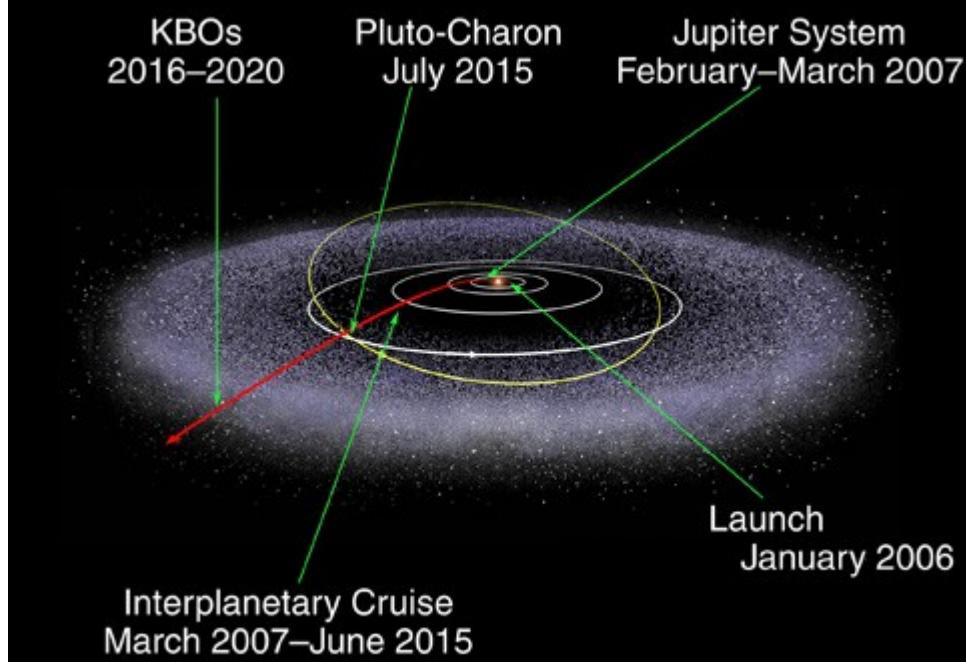
Plutonas



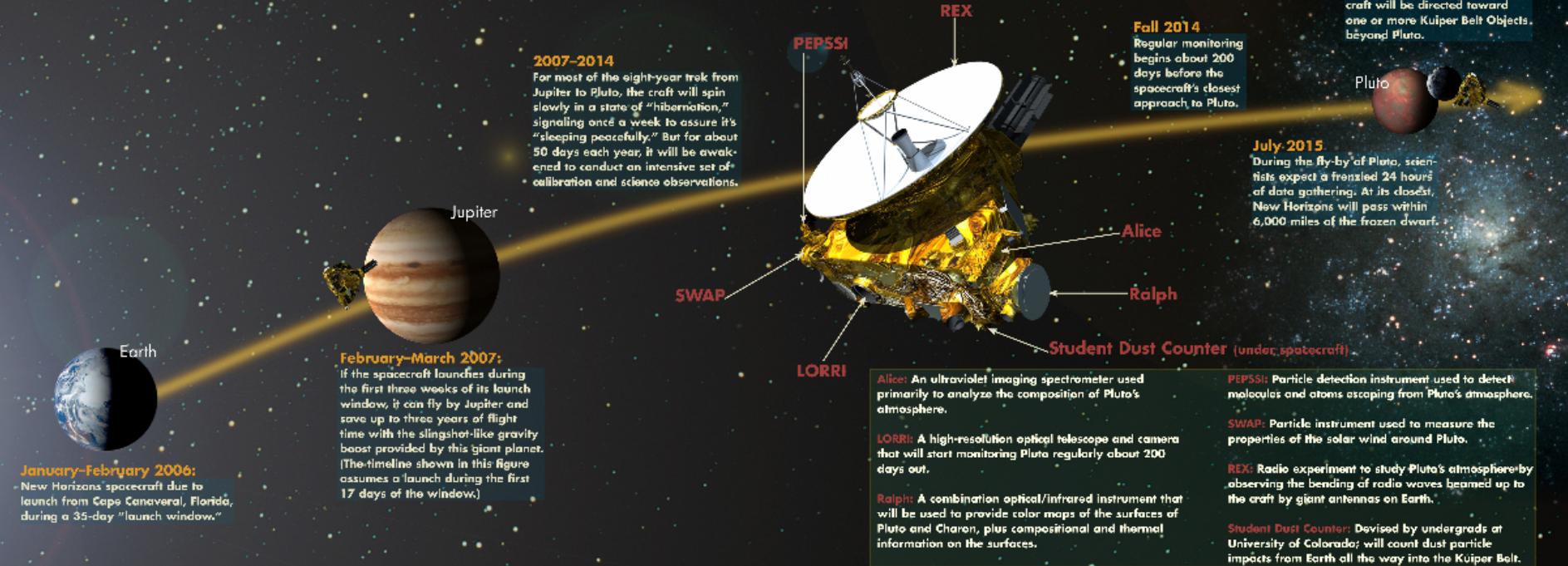
Kuiper Belt Object 1998 WW31



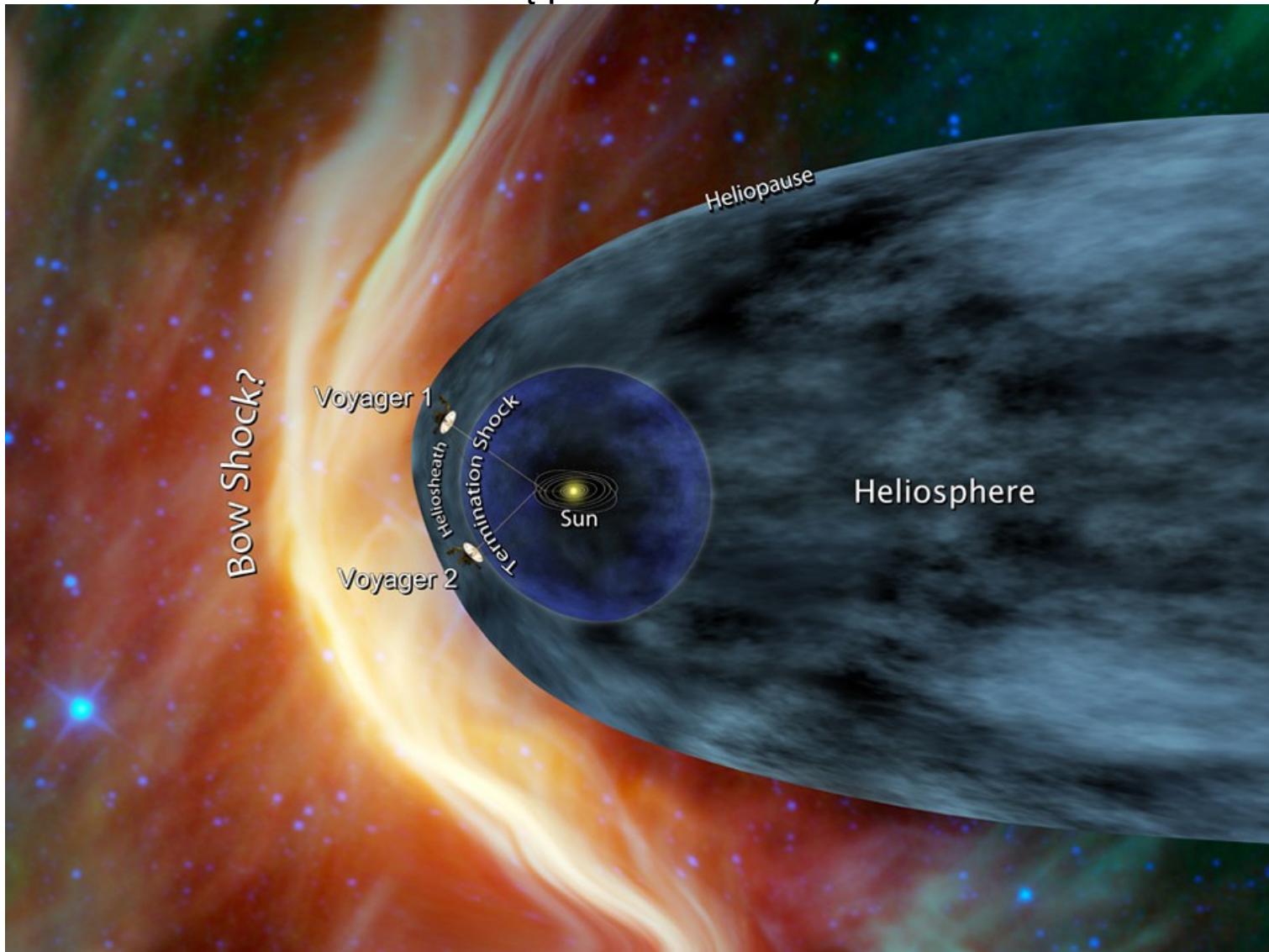
NASA “New Horizons” misija: Plutonas, Charonas ir Kuperio juosta



Ten Years and Three Billion Miles . . .



Kosminiai laivai artėja prie Saulės sistemos ribos (Voyager 1 ir 2, paleisti į kosmosą prieš 35 metus).

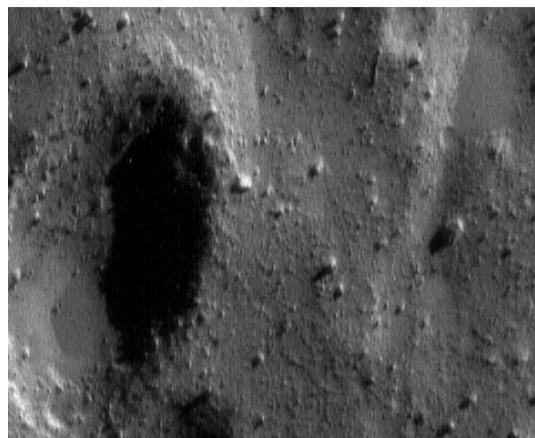
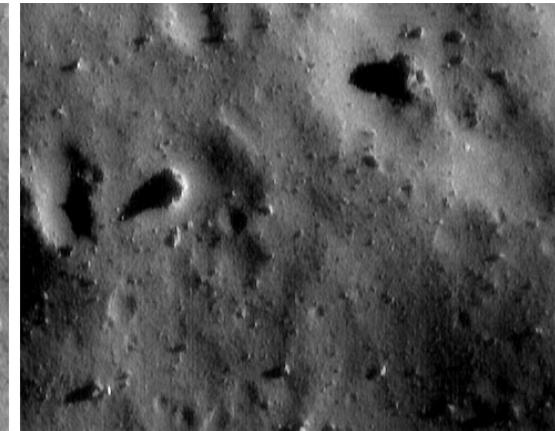
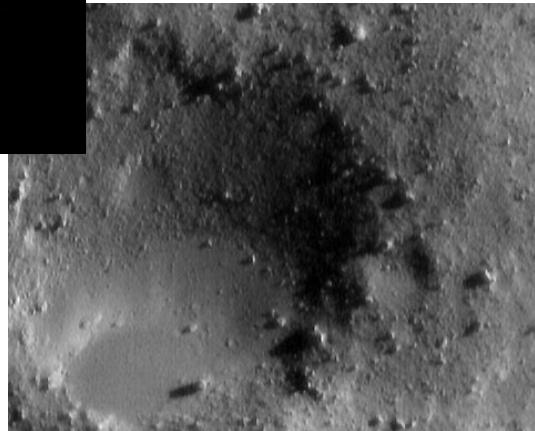
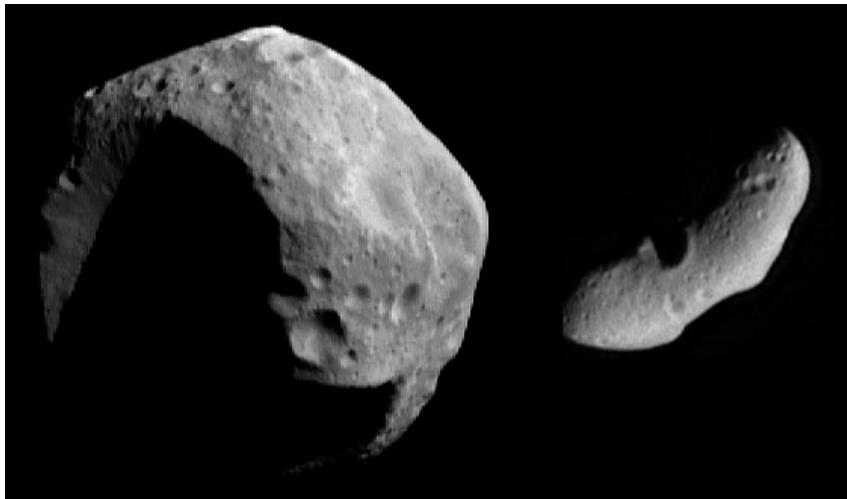


Jau regis**truojamas** priimamos spinduliuotės kitimas

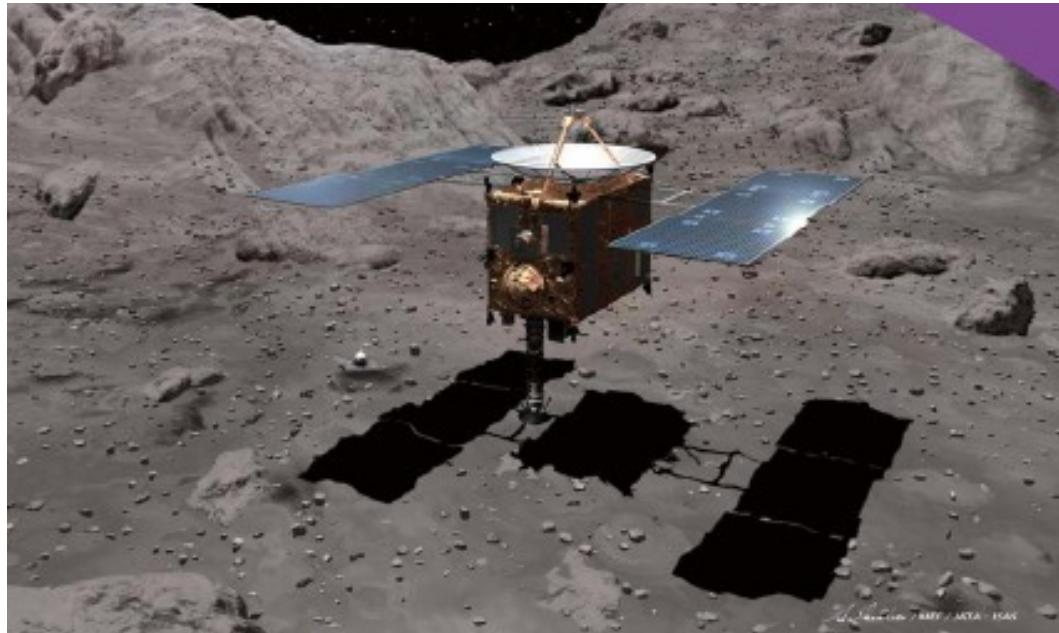
Asteroidai – mažosios planetos



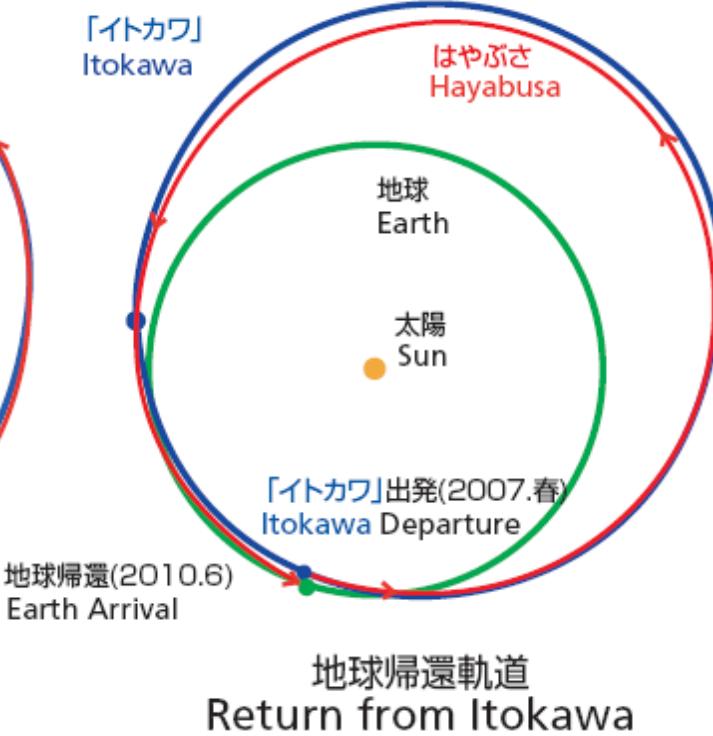
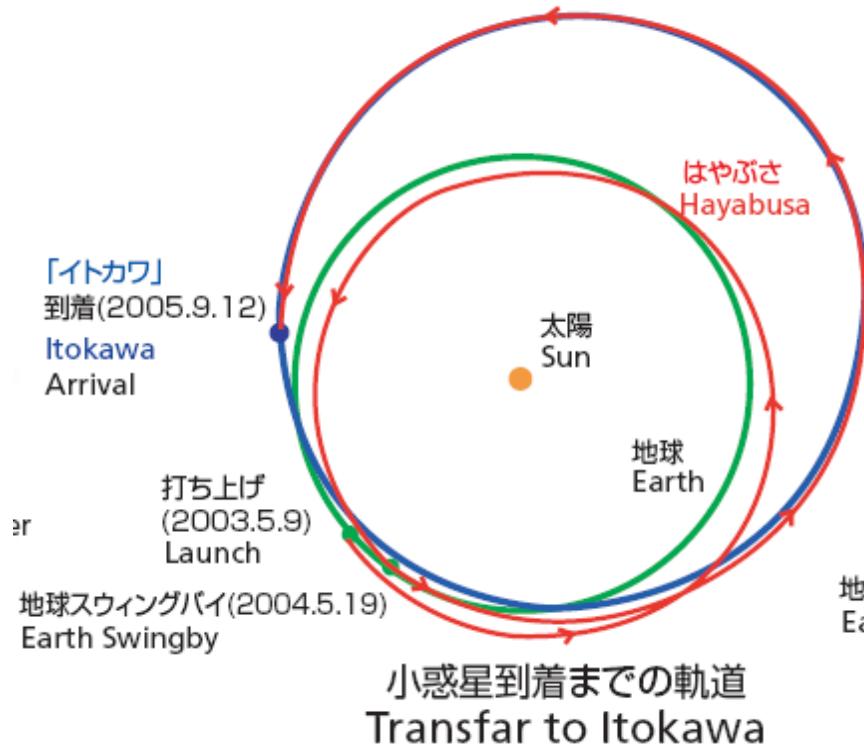
Asteroidai: Mathilde, Eros



Japonų kosminio zondo „Hayabusa“ nusileidimas asteroide



Hayabusa misija



回収カプセルとその耐熱材料の地上加熱試験

The Reentry Capsule and the Arc Heating Test of the Thermal Protection Material

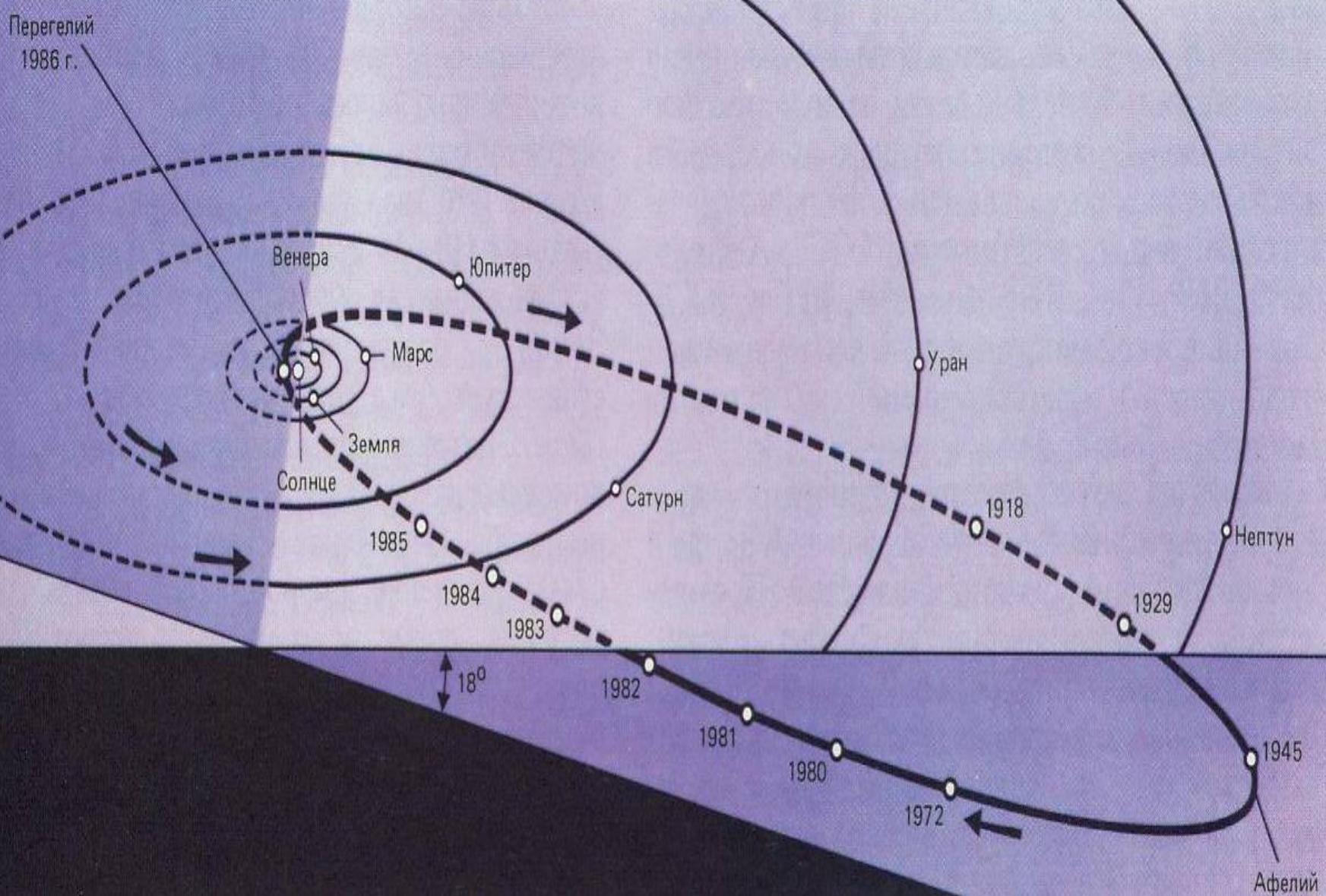


着地した再突入カプセル
The reentry capsule landed on the ground

Halėjaus kometa



Halley kometa

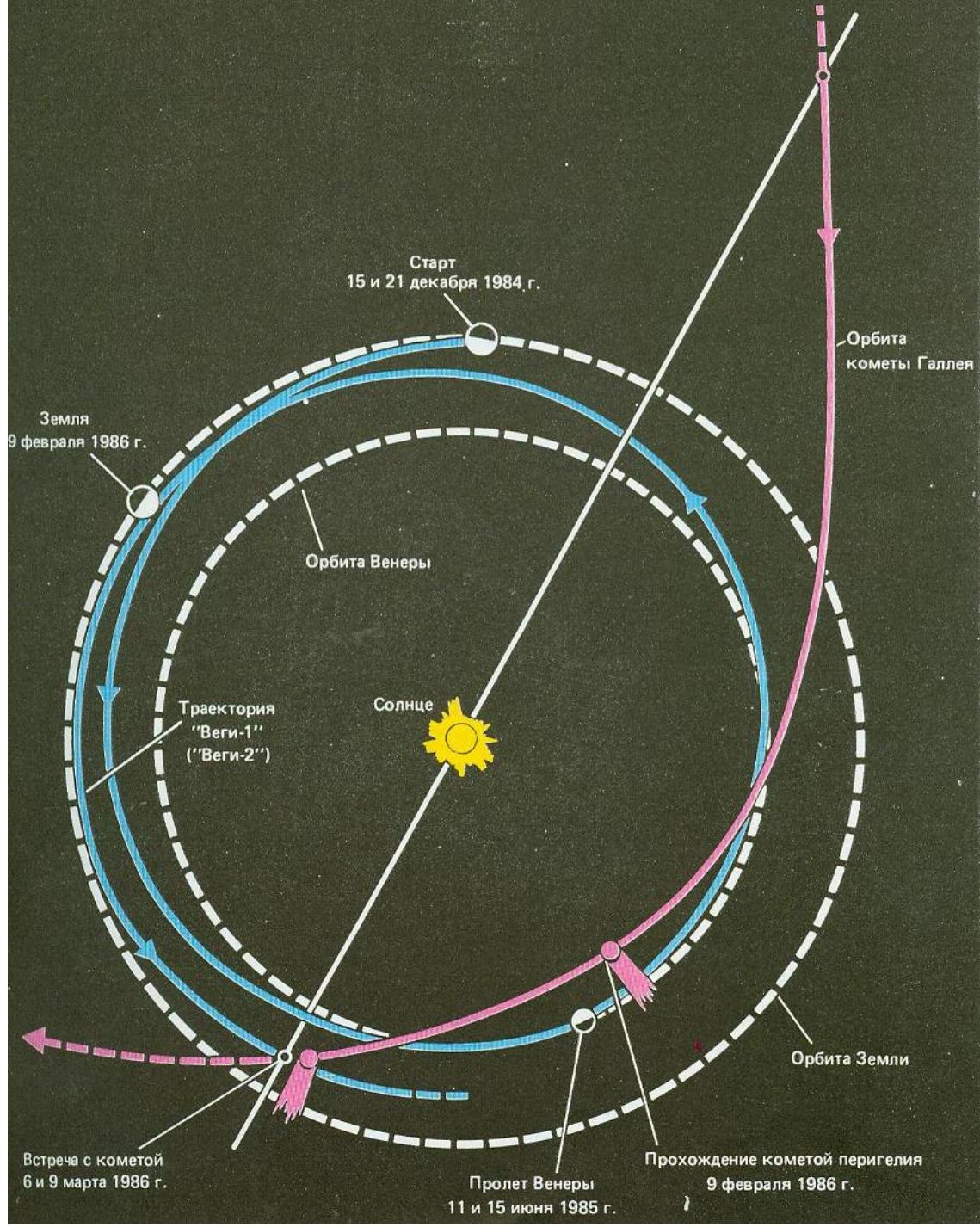


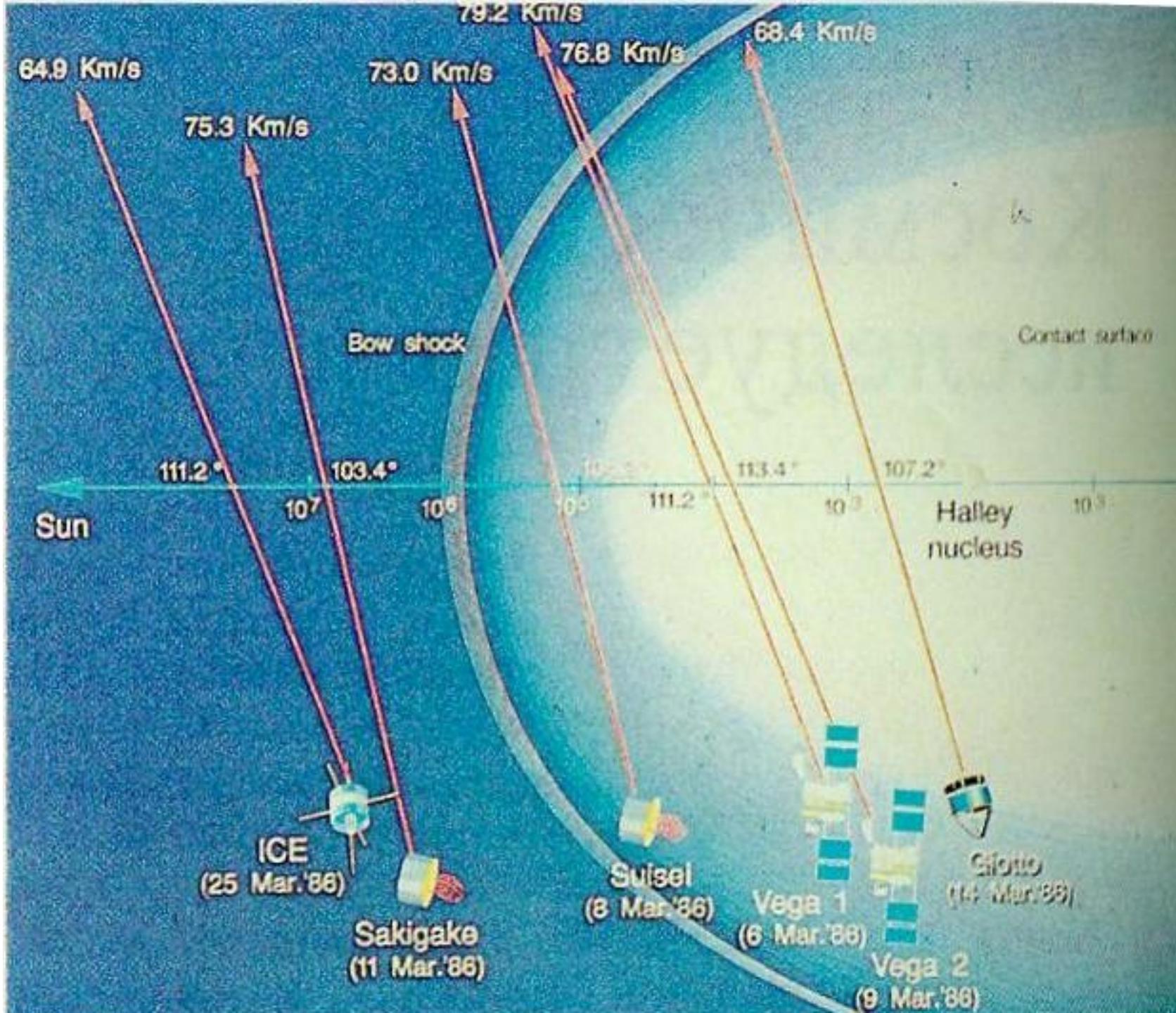
Halley kometos aplankymas

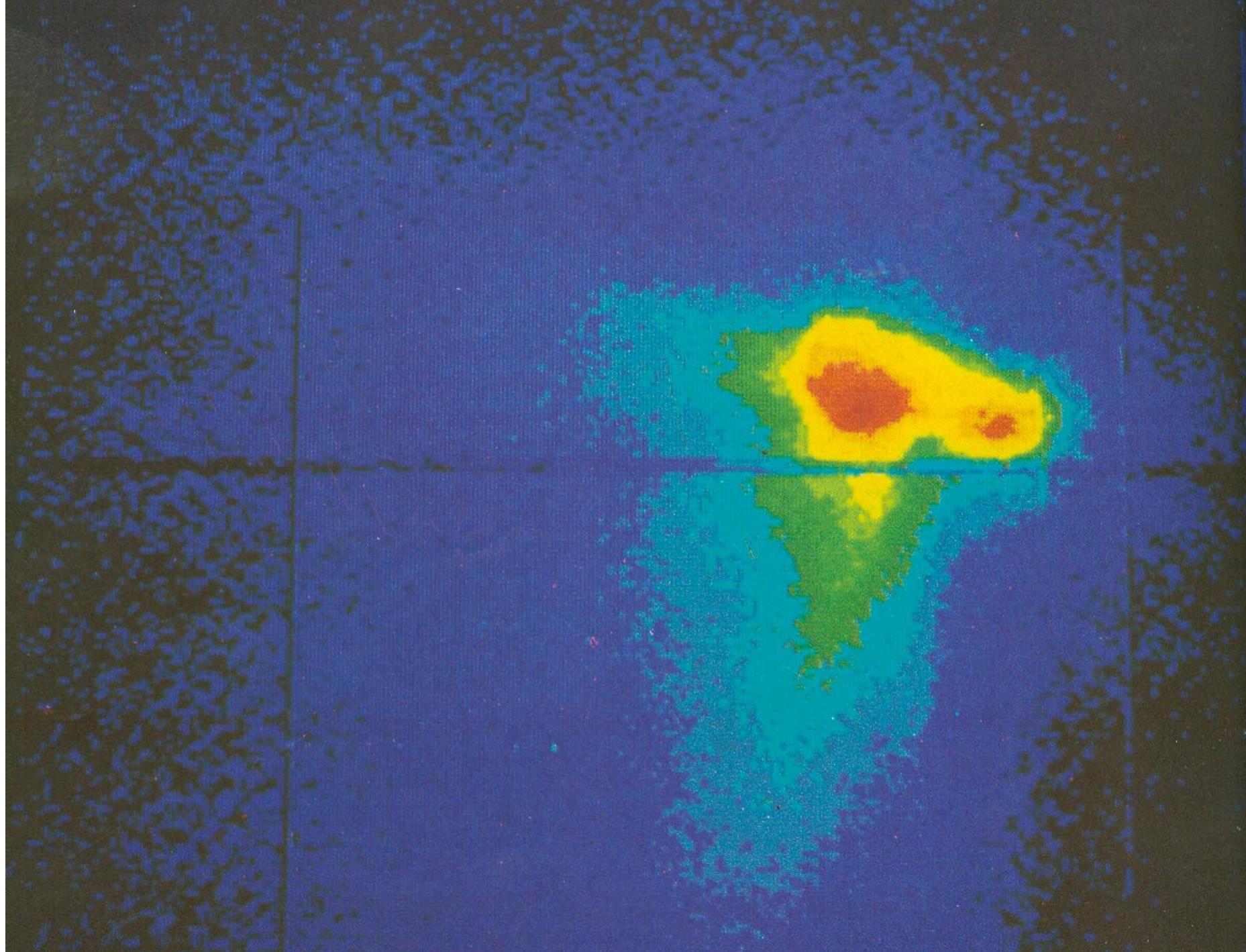
- **Vega 1** - SSSR Venera/Halėjaus laivas - 4,000 kg - (Gruodžio 15, 1984)
- Vega 1 flew past Venus on June 11, 1985 on its way for a flyby with comet Halley. It dropped off a balloon to investigate the Venusian middle cloud layer. The balloon floated in the atmosphere for about 48 hours at an altitude of 54 kilometers. Between Vega 1 and 2, downward gusts of 1 meter/second were encountered and wind velocities of up to 240 kilometers/hour. The Comet Halley flyby took place on March 6, 1986. The Vega 1 probe is now in a solar orbit.
- **Vega 2** - USSR Venera/Halėjus laivas - 4,000 kg - (Gruodžio 21, 1984)
- Vega 2 flew past Venus on June 15, 1985 on its way for a flyby with comet Halley. It dropped off a Venera style lander and a balloon to investigate the Venusian middle cloud layer. The lander's soil experiment sampled anorthosite-troctolite which is found in the lunar highlands but is rare on Earth. The balloon floated in the atmosphere for about 48 hours at an altitude of 54 kilometers. Between Vega 1 and 2, downward gusts of 1 meter/second were encountered and wind velocities of up to 240 kilometers/hour. The Comet Halley flyby took place on March 9, 1986. The Vega 2 probe is now in a solar orbit.
- **Sakigake** - Japan Comet Flyby - 141 kg - (January 7, 1985)
 - Comet Halley flyby took place on March 1, 1986.
- **Giotto** - Europe Comet Flyby - 512 kg - (July 2, 1985)
 - Comet Halley flyby took place on March 13, 1986.
- **Suisei** - Japan Comet Flyby - 141 kg - (August 18, 1985 - February, 1991)
 - Comet Halley flyby took place on March 8, 1986.

Halley kometos aplankymas

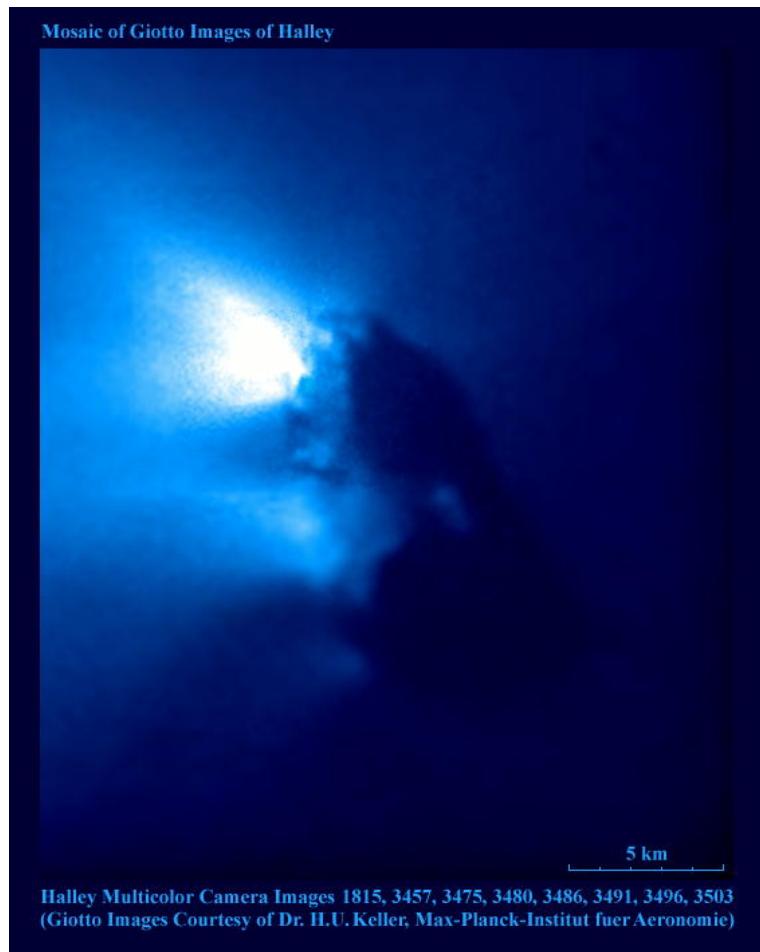
Kosminj laivą pagreitina Venera, po to Žemė ir nukreipia link Halėjaus kometos.







Kometos



Nucleus of Comet Halley

P.J. Stooke, 1996



Longitude
120 side

Longitude
300 side

Morphographic Conformal Projection

ИНСТИТУТ КОСМИЧЕСКИХ ИССЛЕДОВАНИЙ АН СССР



(C) 9-MAR-86

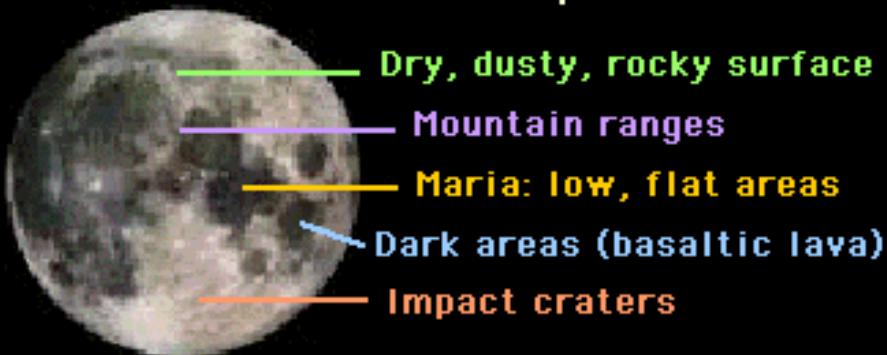
* T V S *

VEGA - 2

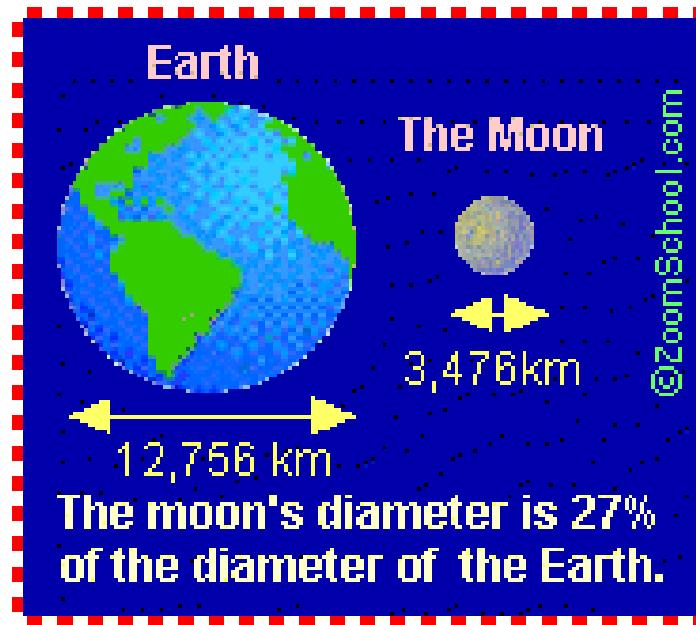


Mēnulis

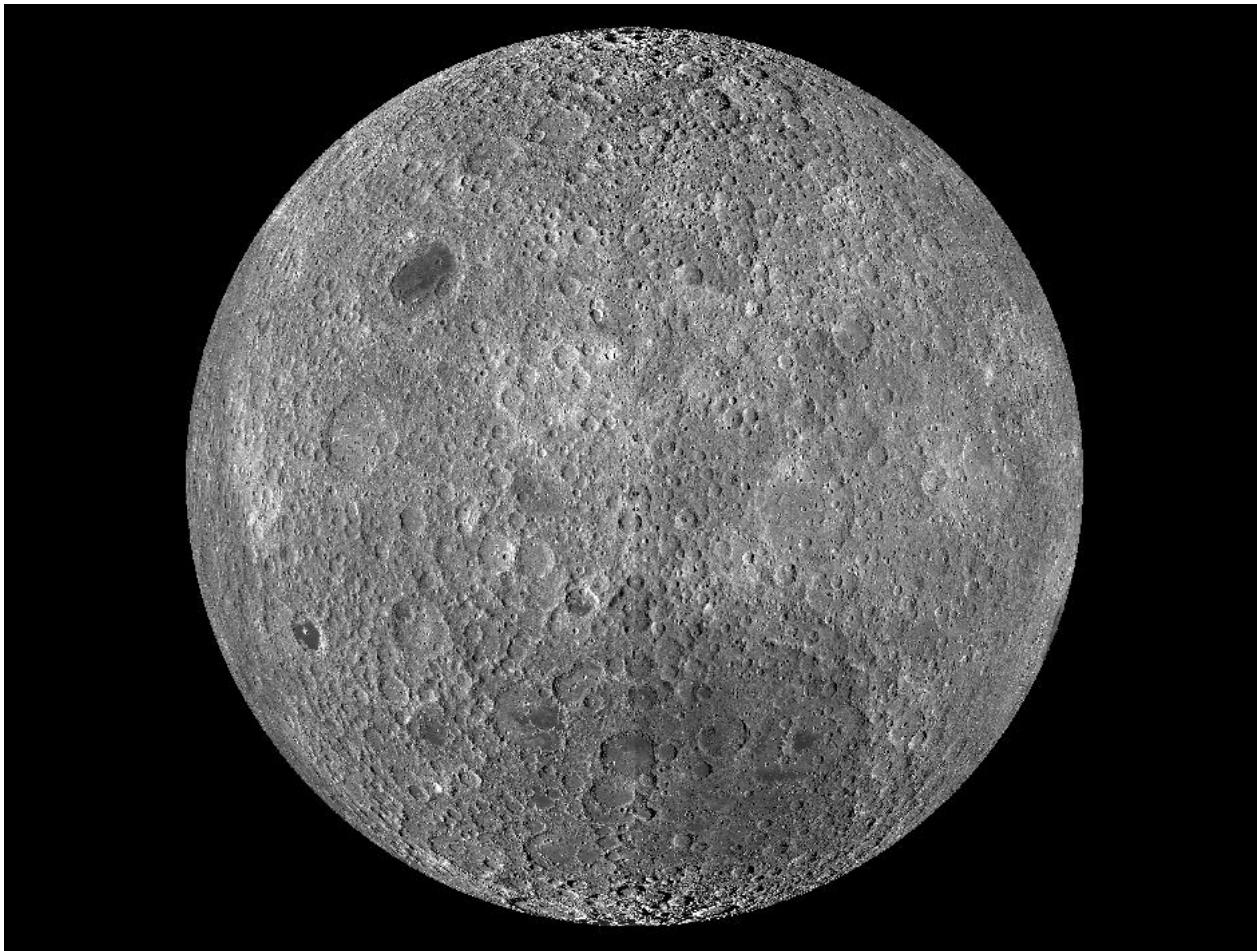
Lunar Features

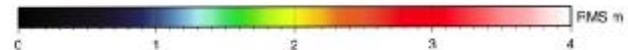


©ZoomSchool.com

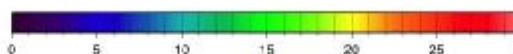


Mènulio kita puse

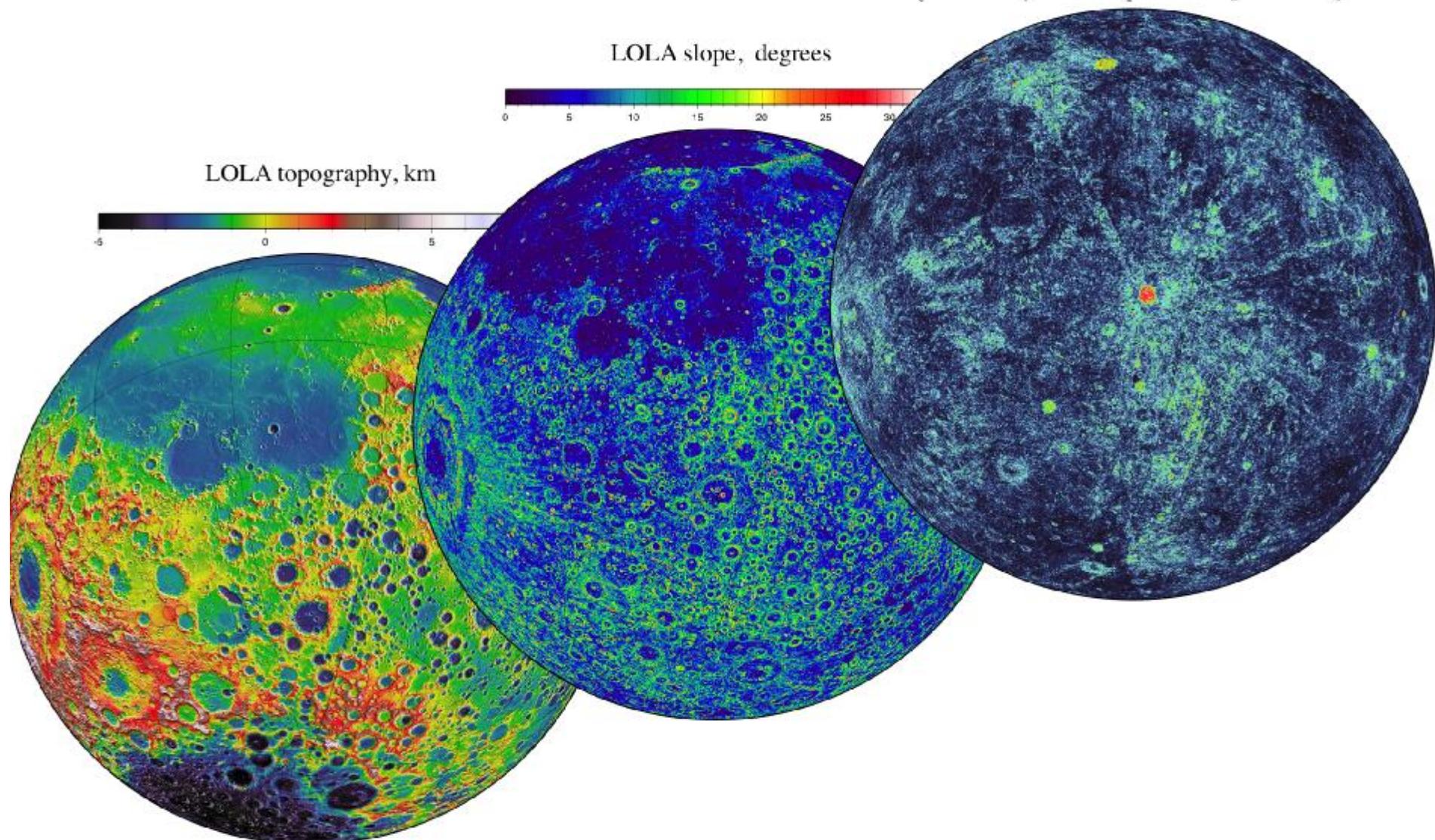




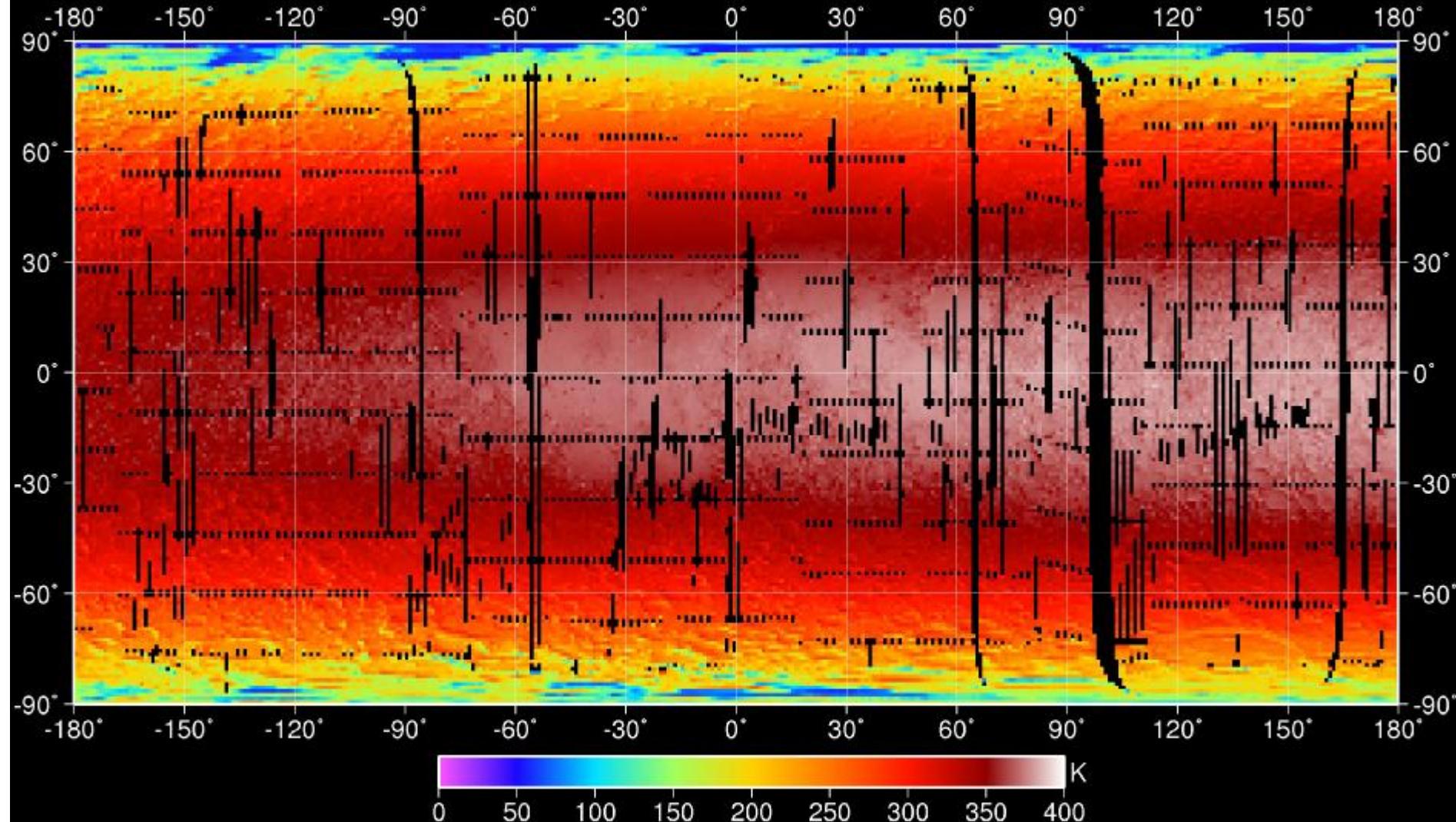
LOLA slope, degrees



LOLA topography, km



LOLA data give us three complementary views of the near side of the moon: the contours of the landscape, or topography (left), along with new maps of the surface slope values (middle) and the roughness of the topography (right). All three views are centered on the relatively young impact crater Tycho, with the Orientale basin on the left side. The slope magnitude indicates the steepness of terrain, while roughness indicates the presence of large blocks, both of which are important for surface operations.



- Diviner Channel 7 gridded daytime brightness temperatures for October, 2009. Red and white colors represent warmer temperatures; green and blue colors represent cooler temperatures. Credit: NASA/Goddard/DIVINER

Mėnulio ir Žemės istorijos dar viena versija

Greta Mėnulio kilmės modelio, įskaitančio susidūrimą su ne Saulės sistemos, o gal ir ne mūsų galaktikos kūnu, yra išnagrinėta ir koks modelis:

Mėnulio susidarymo galimybė susiduriant su hipotetine planeta Tėja, kuri buvo maždaug Marso dydžio ir jos orbita buvo artima Žemės orbitai. Maždaug prieš 4.533 mlrd. metų jos susidūrė, Tėja paskendo Žemėje, o išmuštas purslas virto Mėnuliu.

Smūgis (Tėjos ar bet kokio kūno) galėjo:
pakreipti Žemės ašį (iki 23.5°), dėl ko turime išreikštus metų sezonus,
pagreitinti Žemės sukimąsi,
inicijuoti tektoninius procesus.

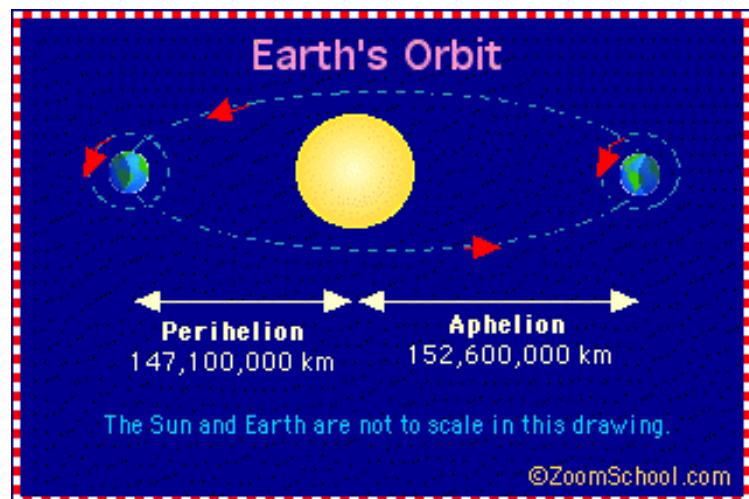
Žemė

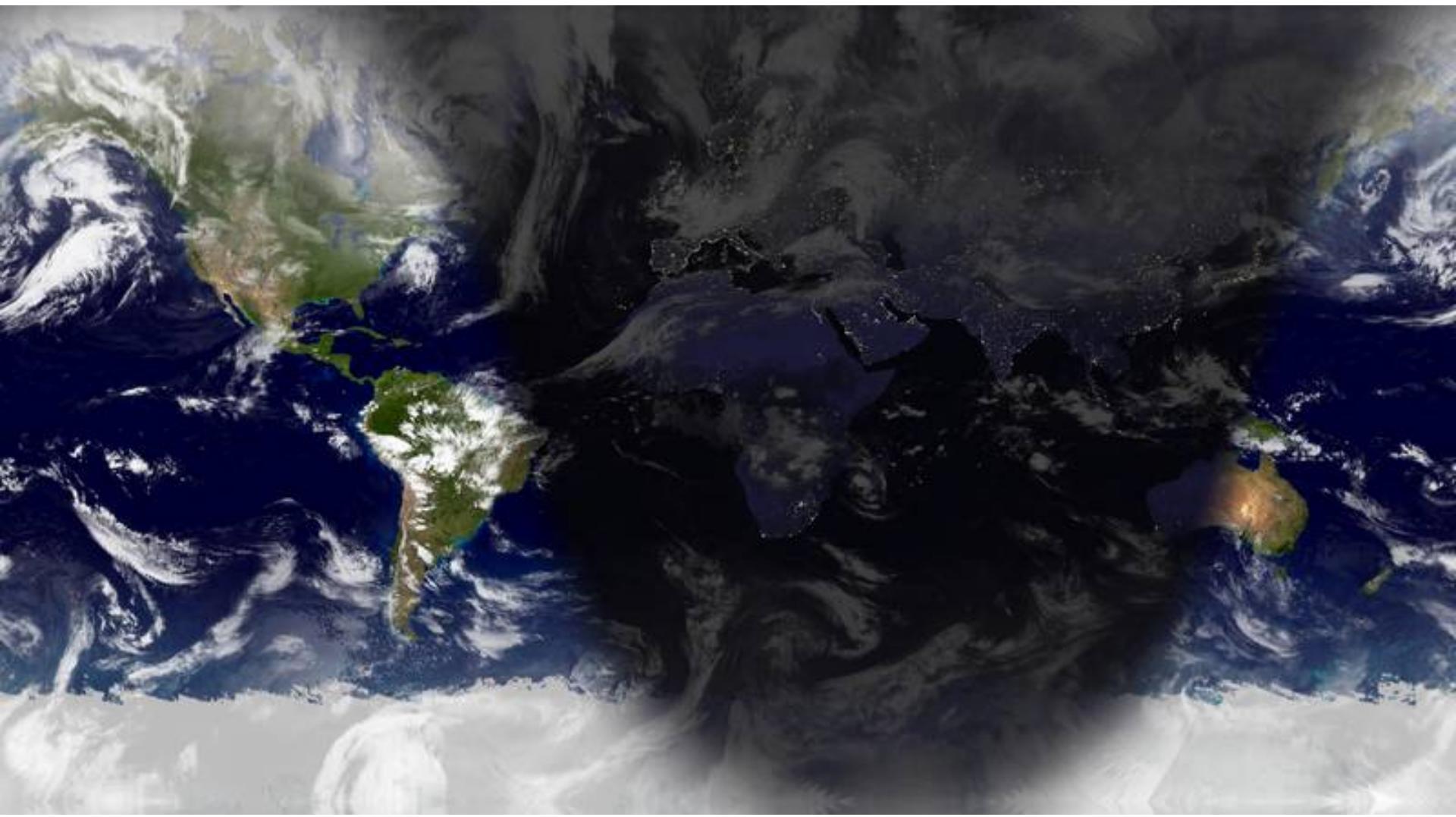


Žemės masė 5.98×10^{24} kg.

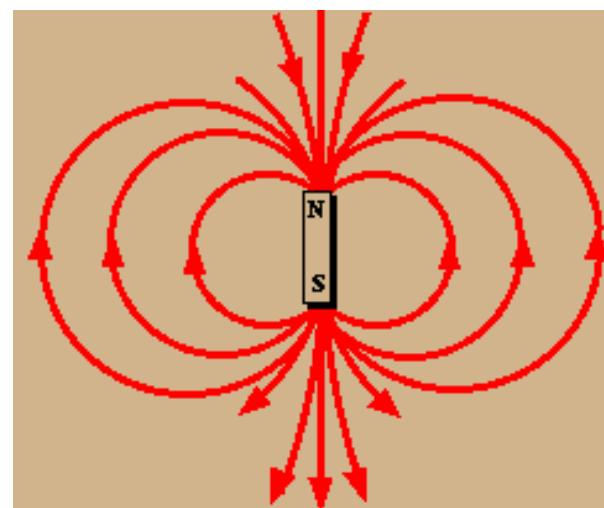
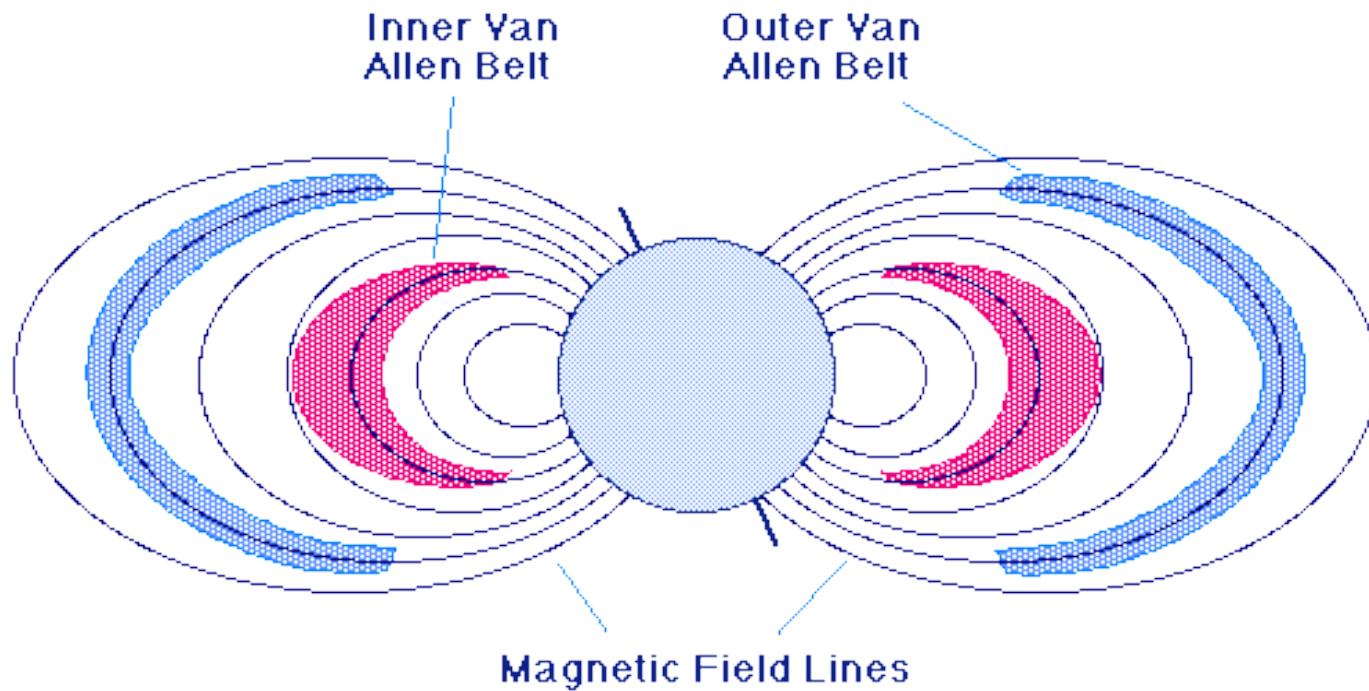
Žemės tankis 5520 kg/m^3 Žemė yra tankiausias kūnas Saulės sistemoje.

Pabėgti iš Žemės galima tik įgijus greitį 11,180 m/s.





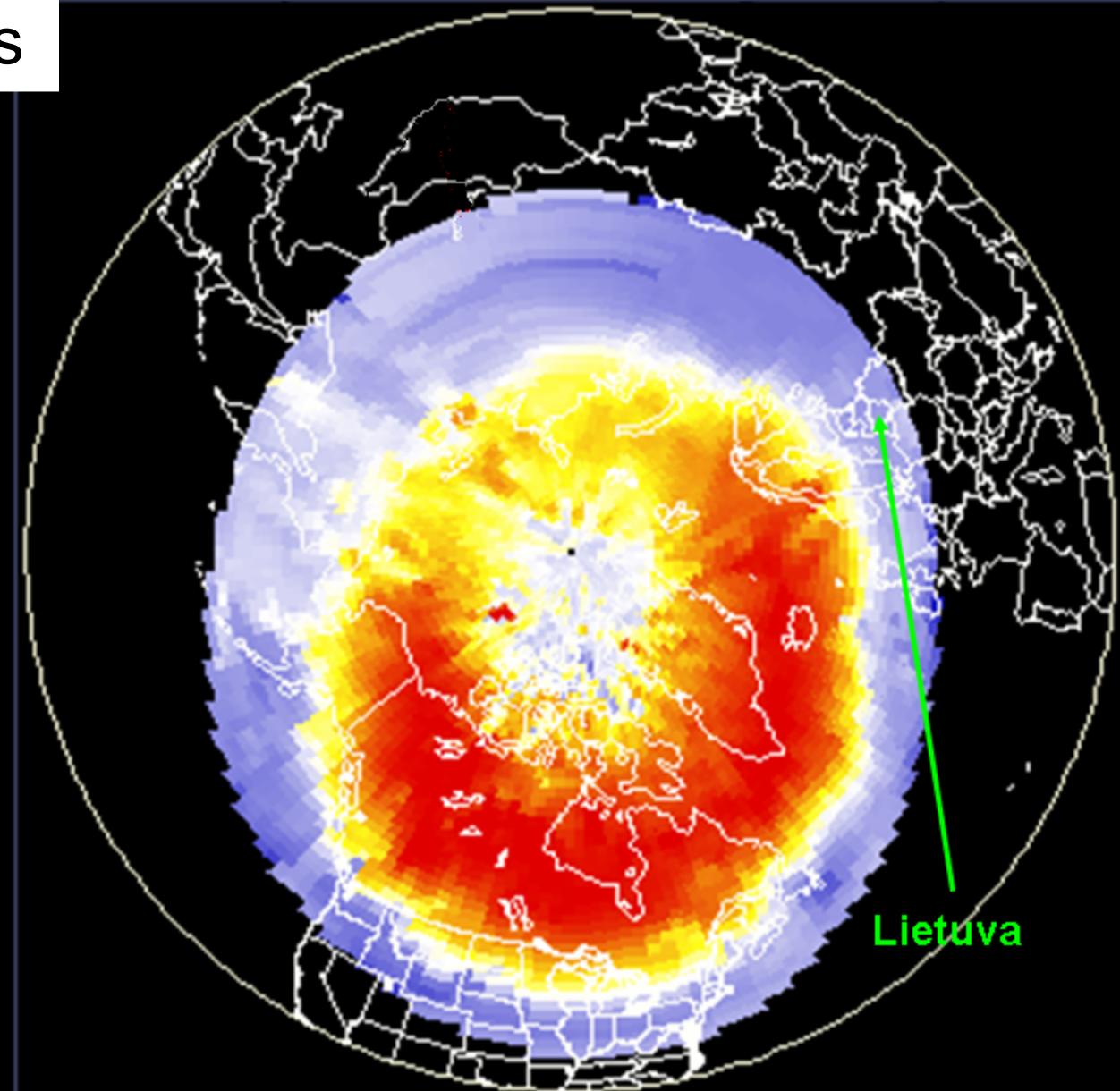
Žemės magnetinis laukas - magnetosfera



STATISTICAL AURORAL OVAL
Extrapolated from NOAA-17
Current time: 2005 April 12 04:52UT
(Color bar is in units of erg - cm⁻² · s⁻¹)

Šiaurės
Pašvaistės

Activity level 10 n=1,19



Pašvaistēs



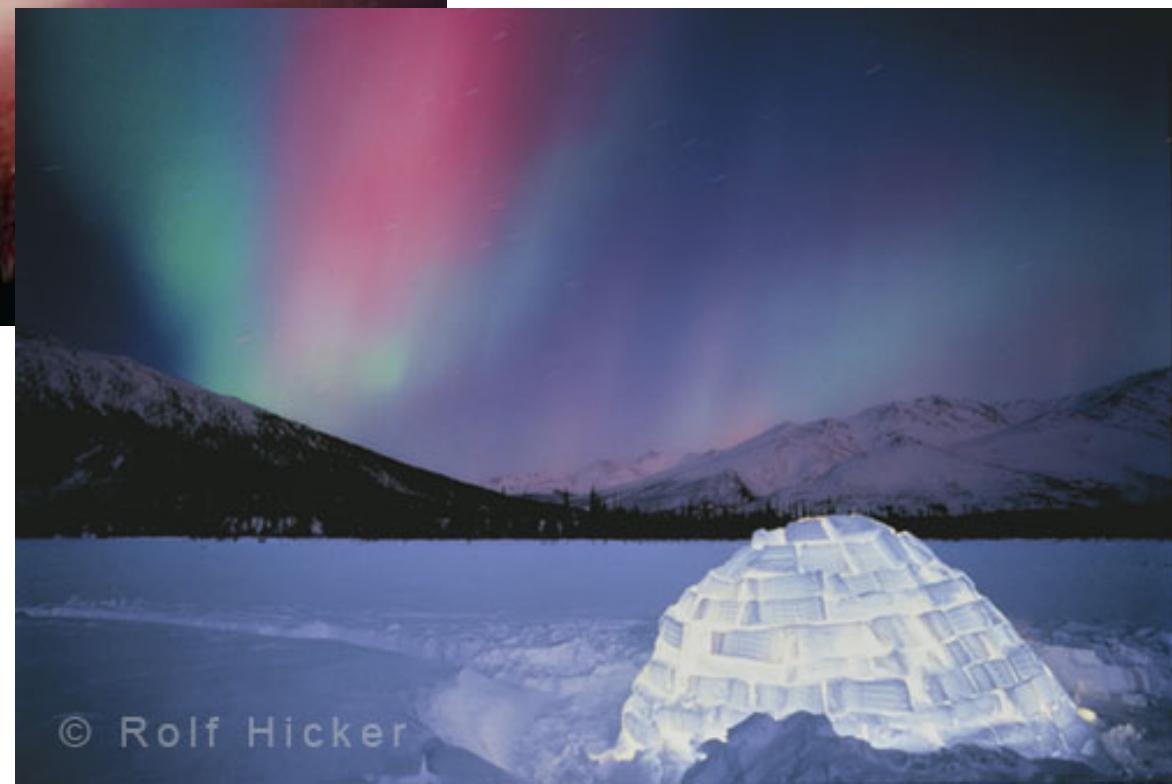
Pašvaistēs



Pašvaistēs



Pašvaistēs

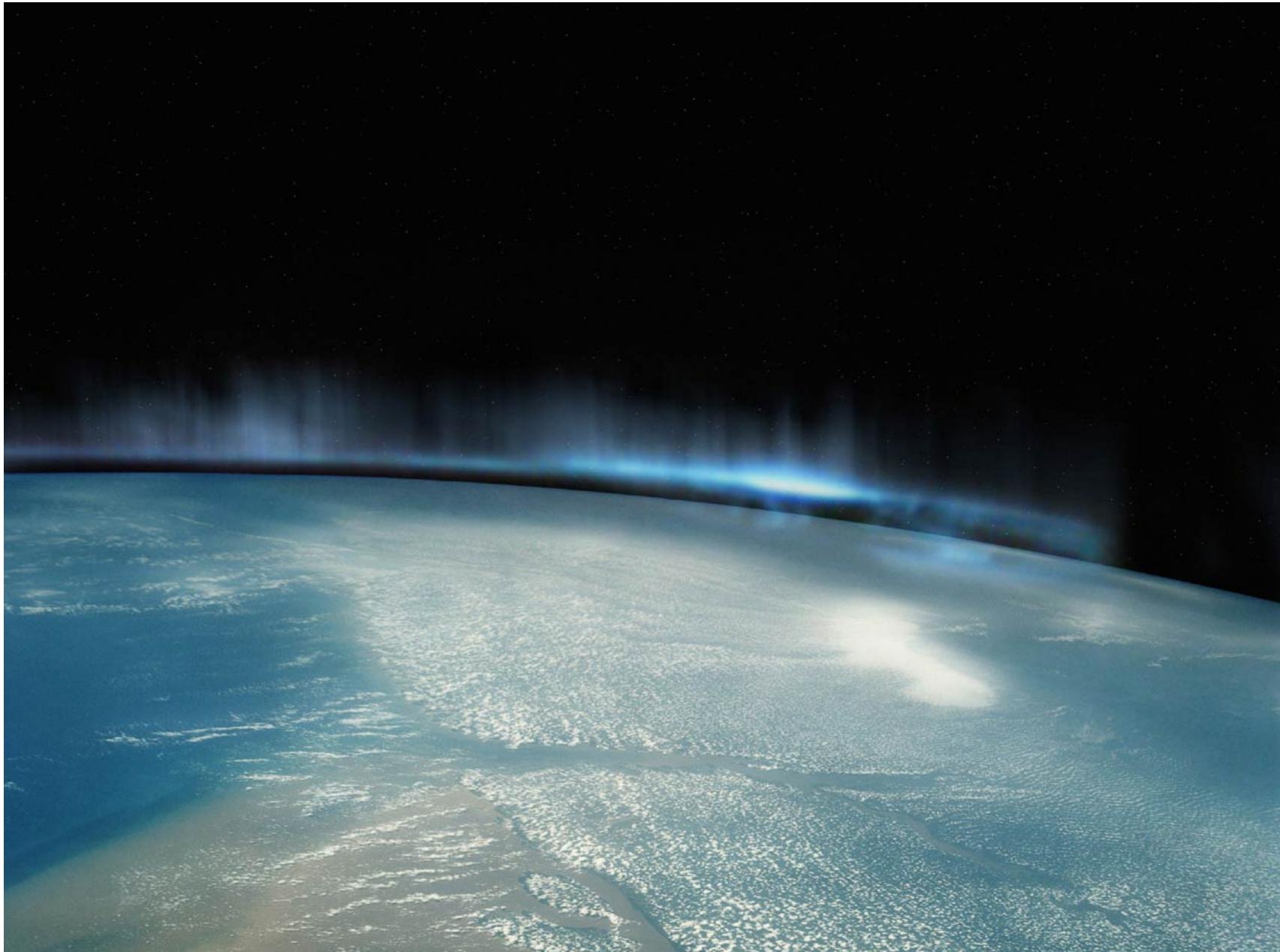


© Rolf Hicker

Pašvaistēs



Pašvaistēs

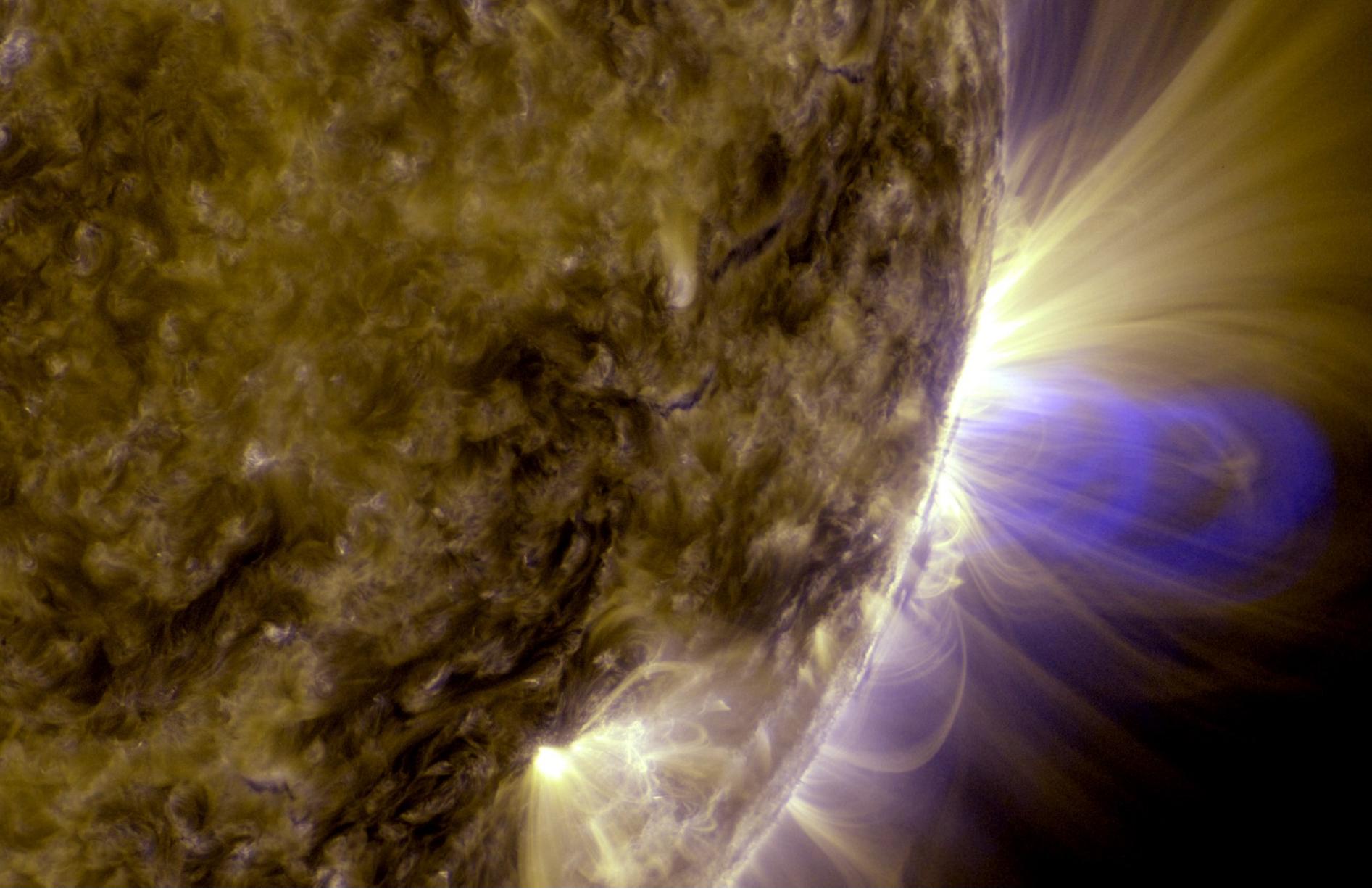


Pašvaistēs



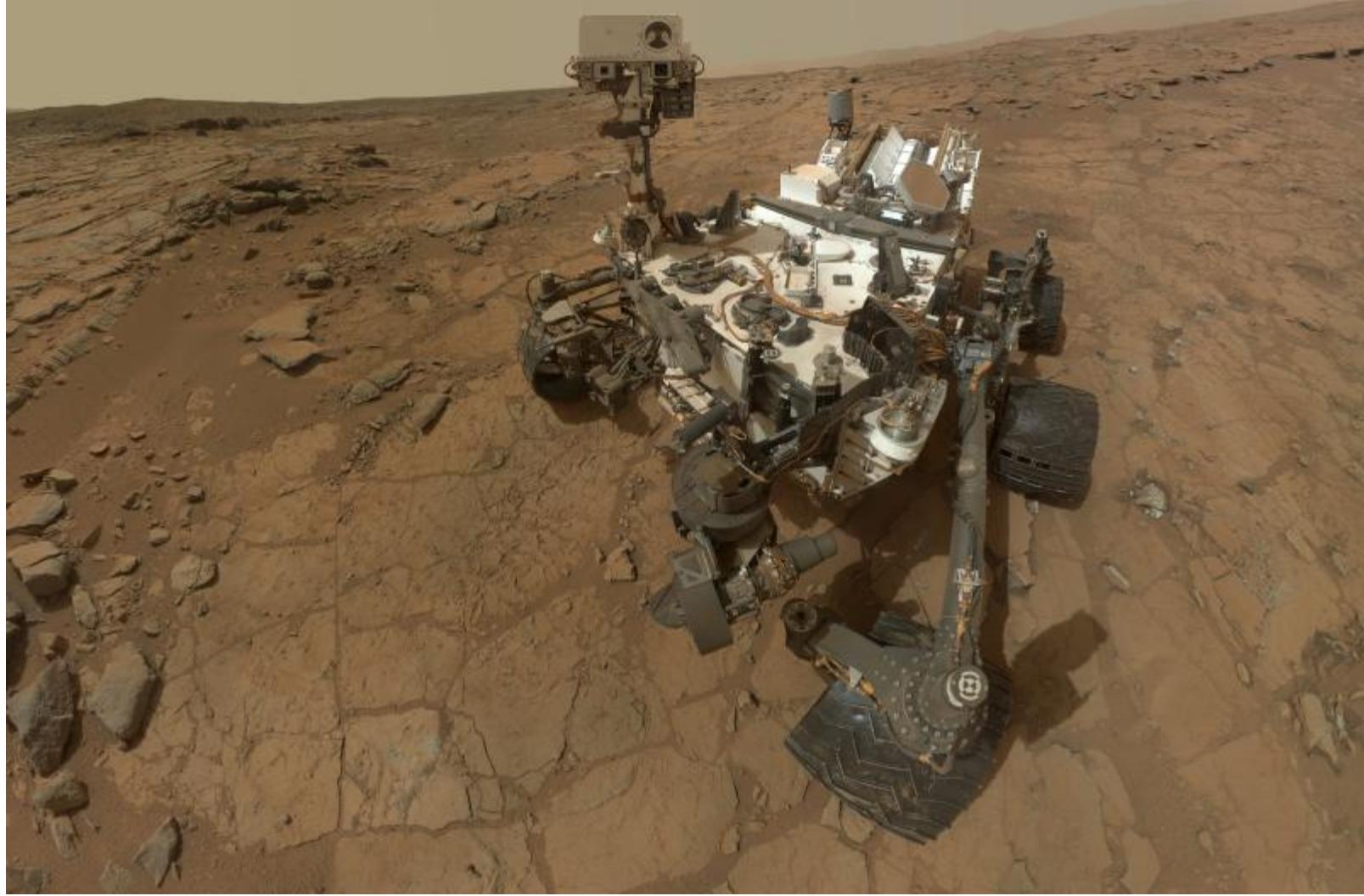
Kas nustatyta tiriant Saulės sistemos kūnus?

- Sudaryta nauja Saulės sistemos sandaros schema. (Svarbiausia – įvesta nauja klasė Saulės palydovų – nykštukinės planetos. Tai dangaus kūnai, skriejantys apie Saulę ne ekliptikos plokščumos artumoje)
- Nustatyti Saulės vėjo ypatumai ir jo poveikis Žemei.
- Nagrinėjamos bendrosios planetų ir jų palydovų savybės, aktualios mąstant apie jų kolonizacijos galimybes
- Sukurtos Mėnulio kilmės hipotezės ir išsiskiriančios tarp kitų planetų Žemės savybės.



It has been processed to highlight the edges of each loop to make the structure more clear.

A series of loops such as this is known as a flux rope, and these lie at the heart of eruptions on the sun known as coronal mass ejections (CMEs.) This is the first time scientists were able to discern the timing of a flux rope's formation. (Blended 131 Angstrom and 171 Angstrom images of July 19, 2012 flare and CME.) Image Credit: NASA/Goddard Space Flight Center/SDO



This rectangular version of a self-portrait of NASA's Mars rover Curiosity combines dozens of exposures taken by the rover's Mars Hand Lens Imager during the 177th Martian day, or sol, of Curiosity's work on Mars (2013.02.03).

The rover is positioned at a patch of flat outcrop called "John Klein," which was selected as the site for the first rock-drilling activities by Curiosity. The self-portrait was acquired to document the drilling site.