NASA Technical Memorandum 86147

A Geographic Comparison of Selected Large-Scale Planetary Surface Features

Stephen Paul Meszaros

JANUARY 1985

NASA

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Goddard Space Flight Center
Greenbelt, Maryland

NASA
National Aeronautics
and Space Administration
Scientific and Technical Information Branch
1985

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ABSTRACT

This publication is a compilation of photographic and cartographic comparisons of large, well-known geographical features on planets and moons in the solar system. Included are structures caused by impacts, volcanism, tectonics, and other natural forces. Each feature is discussed individually and then those of similar origin are compared at the same scale.

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CONTENTS

CONTENTS (continued)

INTRODUCTION

This publication compares a number of large, well-known geographical features on planets and moons in the solar system. Included are structures caused by impacts, volcanism, tectonics, and other natural forces. Each feature is discussed individually and then those of similar origin are compared at the same scale. This will allow size relationships to be studied visually.

The source for each picture is given. Whenever possible original spacecraft photographs were used. However, when this was not feasible because of scale, quality, or availability factors, airbrush maps were substituted. Generally, spacecraft photos are available through the National Aeronautics and Space Administration (NASA) and airbrush maps are obtainable from the U.S. Geological Survey (USGS). For more information write to the following addresses:

NASA

Audio-Visual Branch
(Code LFD-10)
National Aeronautics and Space Administration
Washington, D.C. 20546

USGS

National Cartographic Information Center
U.S. Geological Survey
507 National Center
Reston, Virginia 22092

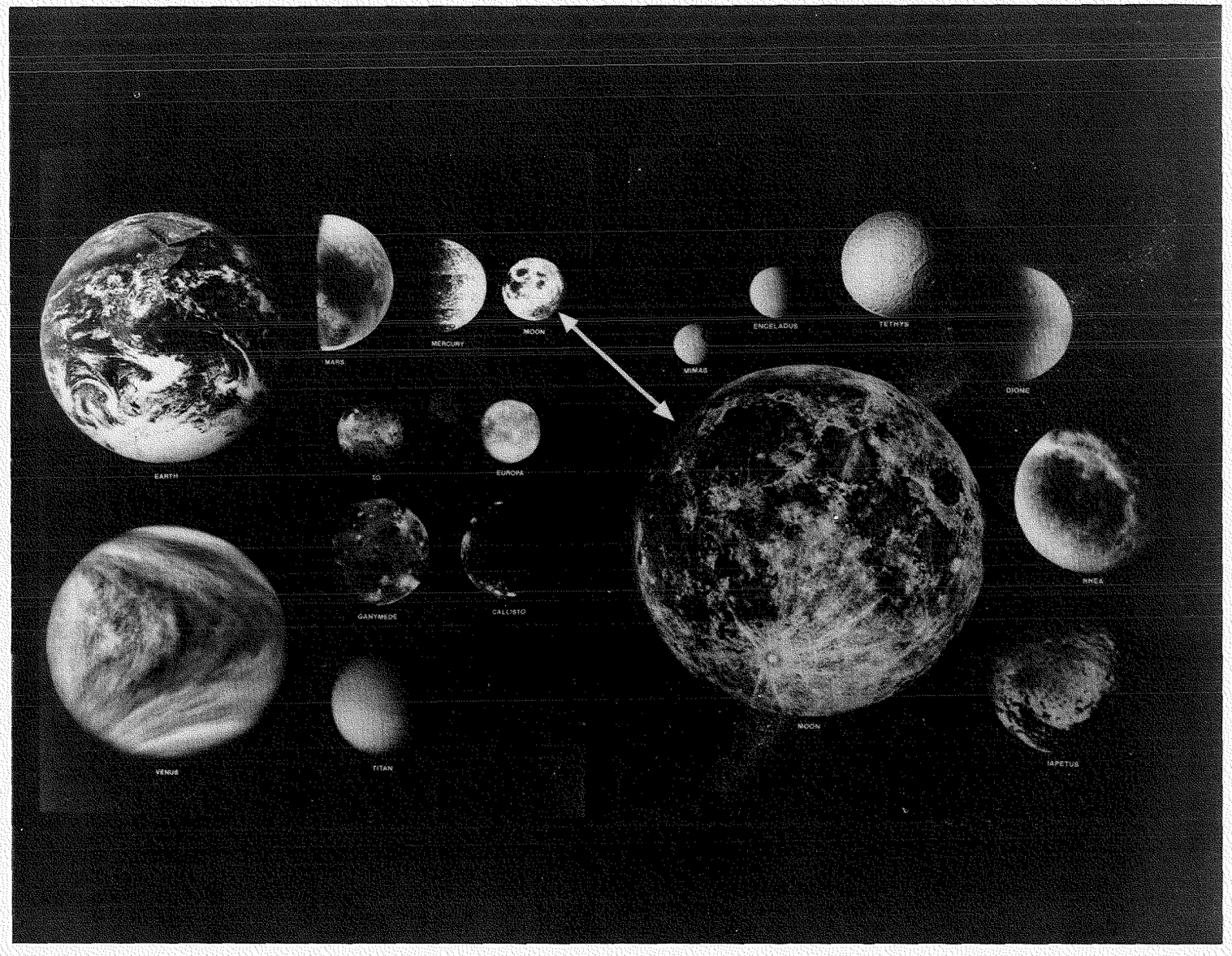
GLOBAL PLANETARY COMPARISONS

Before examining and comparing geographical features on the various planets and moons, it is instructive to consider the overall global sizes of these worlds. The accompanying illustration compares many of the planets and moons that are discussed later in the text. They are shown at the same scale within each grouping. Their sizes are summarized below.

Planet	Diameter
Earth	12,756 km (7,927 mi)
Venus	12,104 km (7,521 mi)
Mars	6,796 km (4,223 mi)
Mercury	4,878 km (3,031 mi)

Moon	Diameter
Earth's moon	3,476 km (2,160 mi)
Moons of Jupiter:	
Ganymede	5,276 km (3,279 mi)
Callisto	4,820 km (2,995 mi)
Io	3,632 km (2,257 mi)
Europa	3,126 km (1,942 mi)
Moons of Saturn:	
Titan	5,150 km (3,200 mi)
Rhea	1,530 km (951 mi)
Iapetus	1,460 km (907 mi)
Dione	1,120 km (696 mi)
Tethys	1,060 km (659 mi)
Enceladus	500 km (311 mi)
Mimas	392 km (244 mi)

Source: NASA photos 83 H 201 (left group)
83 H 222 (right group).


EARTH
MARS
MERCURY
MOON
ENCELADUS
TETHYS
MIMAS
DIONE
IO
EUROPA
RHEA
GANYMEDE
CALLISTO
MOON
VENUS
TITAN
IAPETUS

PART I: IMPACT FEATURES

Impacts by meteoroids, comet nuclei, and asteroids have caused the cratered landscapes so prevalent on many planets and moons. It is difficult to imagine the incredible violence that occurred when these objects—perhaps tens of kilometers in size—crashed into planetary bodies at many kilometers per second. Yet this was a common event billions of years ago, during the early history of our solar system. The craters stand as mute evidence of this fact.

In this section we will look at and compare two categories of impact craters; those of the largest size with morphologically complex interiors (called ''basins'') and those which are large in proportion to the body on which they are located. Impact structures will be selected from the following planets and moons: Mercury, Earth, the moon, Mars, Ganymede, Callisto, Mimas, and Tethys. (Ganymede and Callisto are moons of Jupiter; Mimas and Tethys are moons of Saturn.)

THE CALORIS BASIN

The Caloris Basin is a huge impact structure on the planet Mercury. It has a diameter of approximately 1,300 kilometers (800 miles). The outer ring of mountains that defines its form rises 2 to 3 kilometers (1 to 2 miles) in elevation. On the floor of the basin are numerous ridges and cracks that are concentric and/or radial to the impact center.

In the photo mosaic only about half of the Caloris Basin is visible; the other half was in darkness during the picture-taking flybys of the Mariner 10 spacecraft. It remains for a future spaceprobe to image the unseen part of this vast feature.

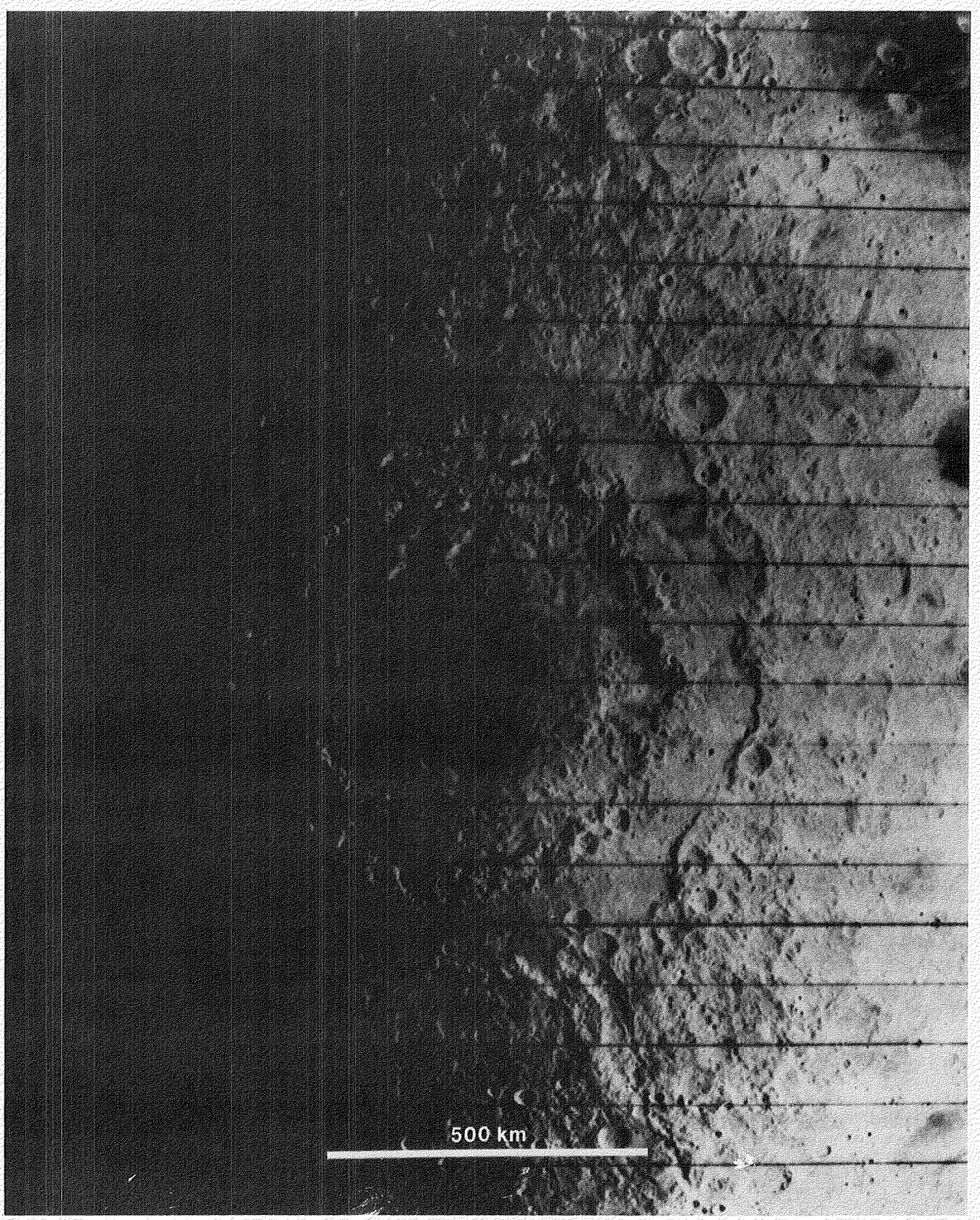
Source: NASA photo 84 H 420.

500 km

THE ORIENTALE BASIN

The Orientale Basin is an impact basin located on the extreme western limb of the moon. Because of this position, it is very difficult to observe from the Earth and only limited studies could be made of the feature. It took a spacecraft to reveal Orientale's true nature. As this lunar orbiter satellite photograph shows, the basin has the form of a huge bull's-eye, 900 kilometers (560 miles) in diameter. The outer ring has been named the Cordillera Mountains while the inner rings are called the Rook Mountains. The center of the basin has been flooded by dark mare lavas. Orientale is the youngest and best-preserved of the large impact basins on the moon.

Source: NASA photo 67 H 934.

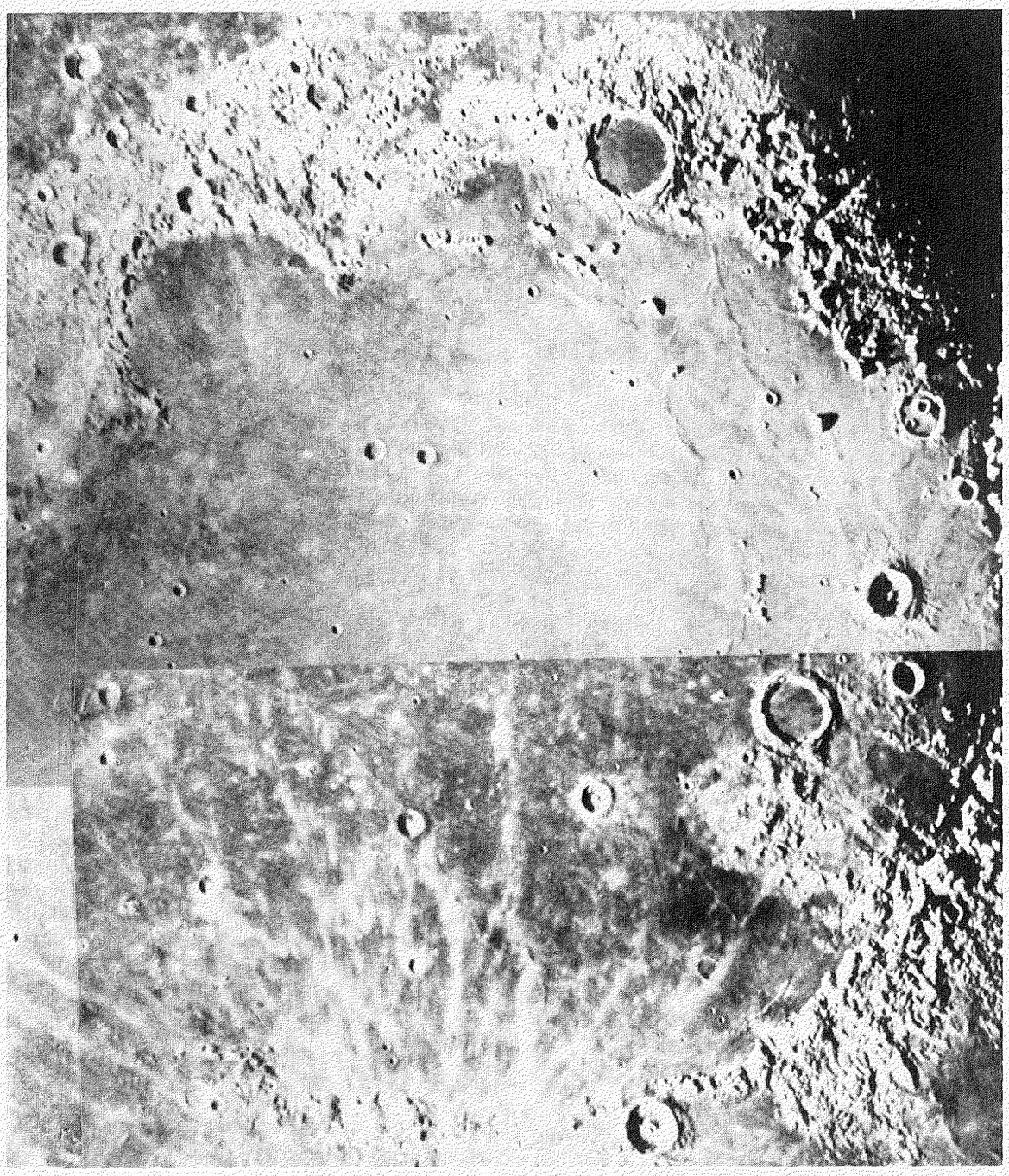

500 km

MARE IMBRIUM

The Imbrium Basin is the most familiar and most frequently studied of the lunar basins. It is also one of the largest basins on the moon, with a diameter of 1,300 kilometers (800 miles). Located in the lunar northern hemisphere, Mare Imbrium was formed 3.9 billion years ago. The huge impact that created it may have come close to destroying the moon. Over a period of several hundred million years following the impact, lava flows gradually filled much of the Imbrium Basin. Finally, cratering on the solidified lava surfaces resulted in the Mare Imbrium that we see today.

Fringing Mare Imbrium on the north are the Alps Mountains, to the east are the Apennines, and on the south are the Carpathians. The largest crater on the floor of the basin is Archimedes, 80 kilometers (50 miles) across. The extreme eastern section of Mare Imbrium—at the foot of the 5.5 kilometer (3.4 mile) high Apennine Mountains— was selected as the landing site for the Apollo 15 mission. Many spectacular photographs and much valuable data about this area of Mare Imbrium were returned by the astronauts.

Source: Rectified Lunar Atlas (USAF).



500 km

THE HELLAS AND ARGYRE BASINS

Two immense basins, Hellas and Argyre, are found in the southern hemisphere of Mars. Hellas is the larger of the two, with a diameter of about 2,000 kilometers (1,200 miles) and a depth of up to 5 kilometers (3 miles). The floor of this basin is often indistinct, being obscured by clouds of blowing dust. Indeed, many of the planet-wide dust storms that periodically occur on Mars appear to have their origin in or near the Hellas Basin. Argyre is a much younger-looking basin. It is 1,200 kilometers (750 miles) in diameter and is located approximately 3,000 kilometers (1,900 miles) from Hellas. It also appears to be a location for Martian dust storms.

Source: USGS map I-810 (Atlas of Mars MM 25M 1R).

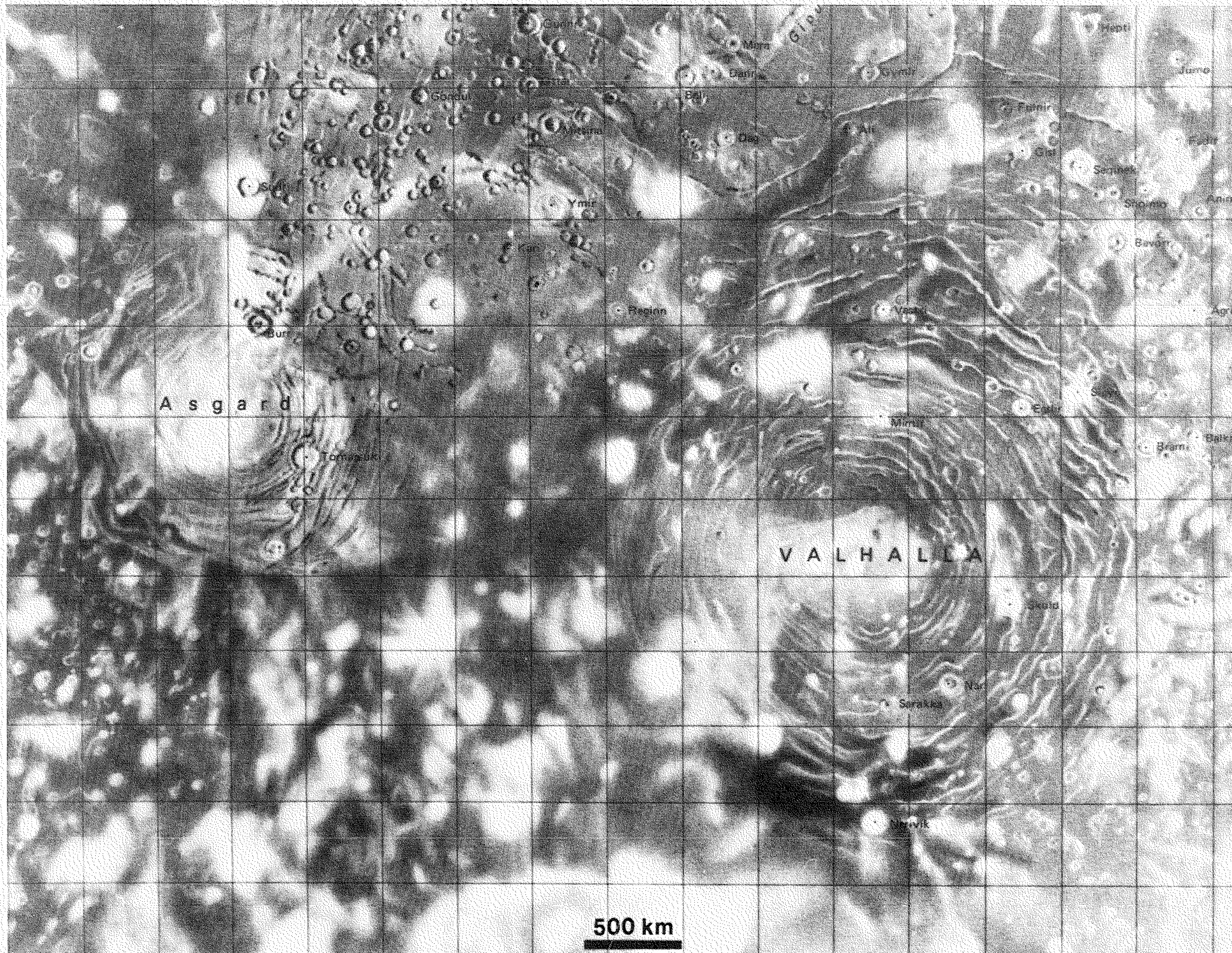
HELLAS
ARGYRE
500 km

VALHALLA AND ASGARD

Valhalla and Asgard are two great impact structures on the surface of Callisto, one of the large moons of Jupiter. Valhalla is the more extensive of the two, with an approximate diameter of 3,000 kilometers (1,900 miles). This makes it one of the largest impact structures in the solar system.

The topography of Valhalla and Asgard is different from that of the basins we have examined on the inner planets. Here we see bright patches at the centers surrounded by discontinuous concentric rings, all of relatively low vertical relief. The apparent cause of this type of terrain is the actual composition of Callisto. The crust of this moon is made up of water ice which over long periods of time flowed like a huge glacier. Thus the surface material was not strong enough to support the high mountains caused by impact. The result is that these ancient impact structures look lower today, like frozen ripples on a pond.

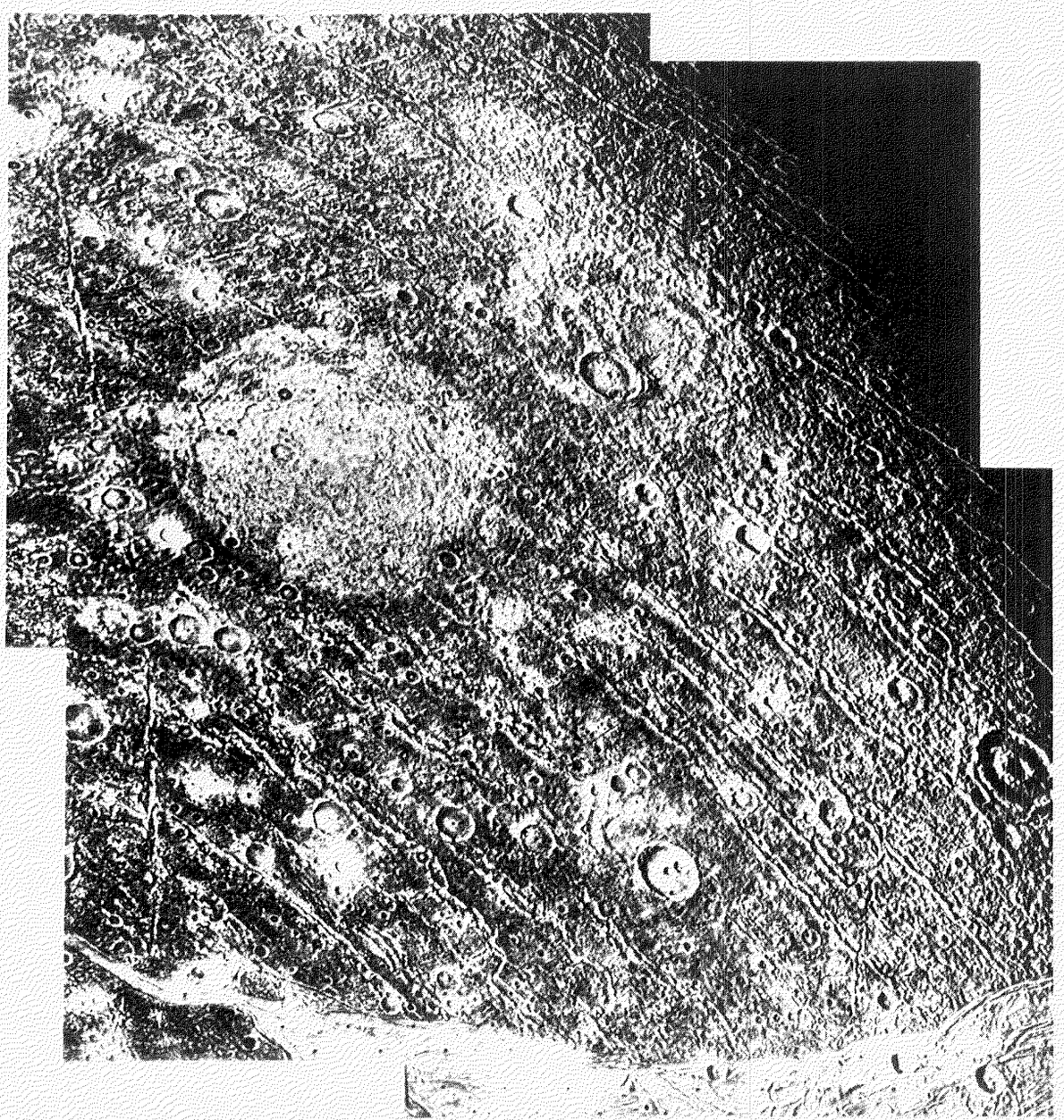
Source: USGS map I-1239 (Atlas of Callisto Jc 25M 2RMN).


Gondul
Ymir
Reginn
Burr
Gymir
Dag
Ali
Mimir
A s g a r d
Tornarsuk
V A L H A L L A
Skuld
Nar
Sarakka
Narvik
500 km

GALILEO REGIO

Galileo Regio is an extensive dark region on the surface of Ganymede, another large moon of Jupiter. This dark area is an older region of crust; the surrounding lighter grooved terrain is somewhat younger. The close-up view of Galileo Regio in the photograph shows a series of curving furrows very reminiscent of the impact features on Callisto. It is impossible to fully trace the form of this structure as the surface has been excessively broken up over geologic time. However, if these furrows do indeed indicate an ancient impact, it must have been even larger than those on Callisto—greater than 3,000 kilometers (1,900 miles) in size. If true, that would make it perhaps the largest known impact feature in the solar system.

Source: NASA photo 79 H 506.



MIMAS AND TETHYS

Mimas and Tethys, two medium-sized moons of Saturn, are compared at the same scale. The diameter of Mimas is 392 kilometers (244 miles) and that of Tethys is 1,060 kilometers (659 miles). Each moon has an immense crater, fully one-third the size of its diameter. The impacts that caused these craters must have come close to destroying the moons. The crater on Mimas is named Herschel and is 140 kilometers (87 miles) in diameter, while the one on Tethys is called Odysseus and is 430 kilometers (267 miles) in size. Herschel has a deep floor and a high central peak. Odysseus, on the other hand, is so large that its floor has rebounded into a more convex shape—to match the curvature of the satellite's surface.

Source: NASA photo 84 H 421.

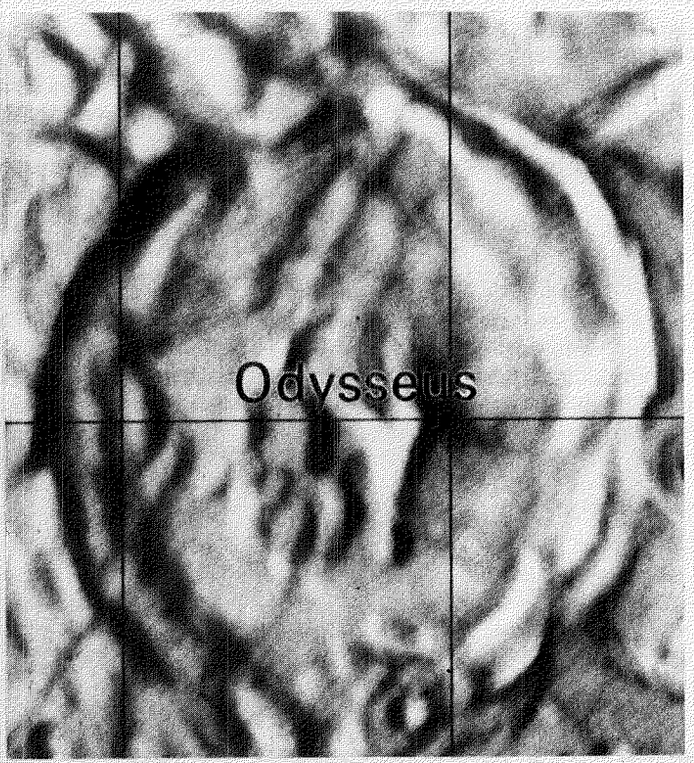
MIMAS
TETHYS

CRATER COMPARISONS

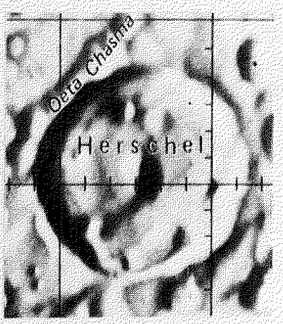
This visual compares several large craters in the solar system. The craters Herschel and Odysseus are solitary features on Saturn's moons Mimas and Tethys. Herschel has a diameter of 140 kilometers (87 miles) while the diameter of Odysseus is 430 kilometers (267 miles). (See the section on Mimas and Tethys.) The other two craters, Copernicus and Clavius, are well-known features on the near side of the Earth's moon. Copernicus is 90 kilometers (56 miles) in diameter. Clavius has an overall size of 234 kilometers (145 miles). Also shown, at the same scale, is the Manicouagan structure of Canada. This is believed to be an ancient impact scar formed about 210 million years ago. Visible in the photograph is the ice-covered surface of its circular lake, approximately 66 kilometers (41 miles) in diameter.

Source: NASA photo 84 H 422.

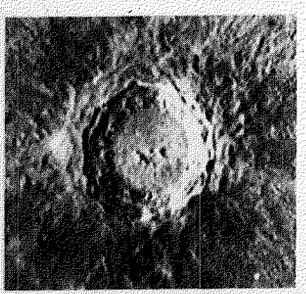
CRATER COMPARISONS



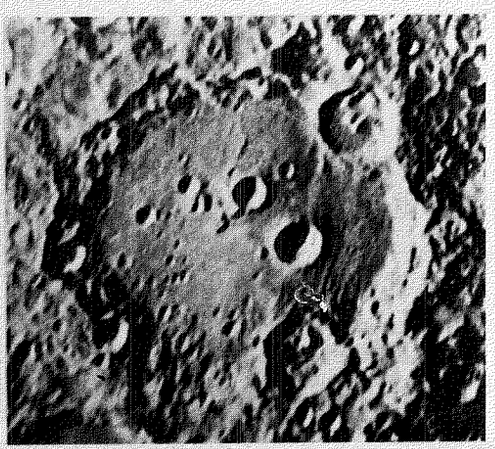
ODYSSEUS
(TETHYS)



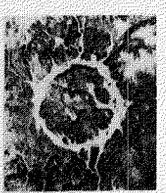
HERSCHEL
(MIMAS)



COPERNICUS
(MOON)



CLAVIUS
(MOON)



MANICOUAGAN
(EARTH)

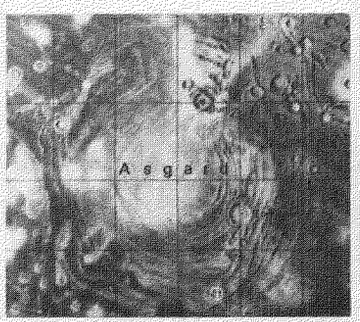
100 km

IMPACT BASINS COMPARED

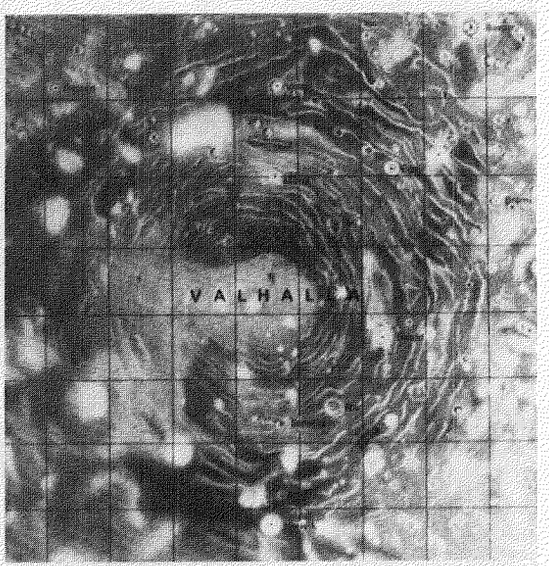
Large impact basins of the solar system are compared at the same scale. (For more detailed information on each basin, see the preceding pages.)

Source: NASA photo 84 H 423.

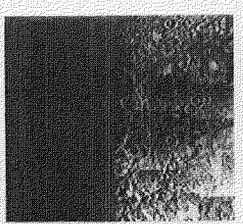
IMPACT BASINS COMPARED



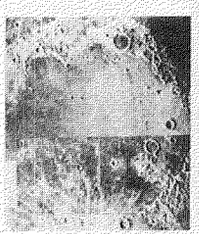
ASGARD
(CALLISTO)



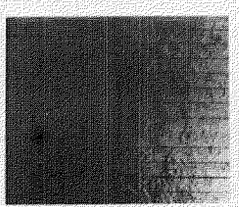
VALHALLA
(CALLISTO)



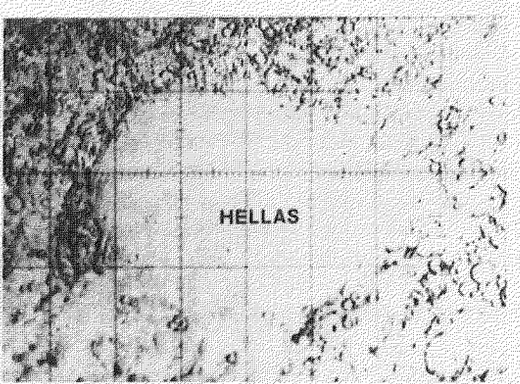
CALORIS
(MERCURY)



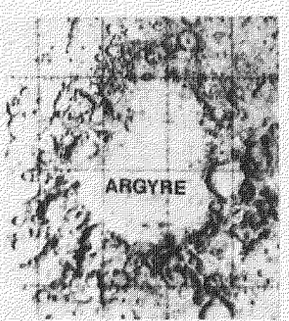
IMBRIUM
(MOON)



ORIENTALE
(MOON)



HELLAS
(MARS)



ARGYRE
(MARS)

1000 km

PART II: VOLCANIC FEATURES

Though less common than large impact structures, large scale volcanic features are present on a number of worlds. In some cases these volcanic features are of remarkable size. The presence of volcanism indicates a body that is internally active, heated by such energy sources as radioactive decay, body tides, and/or by residual heat of formation.

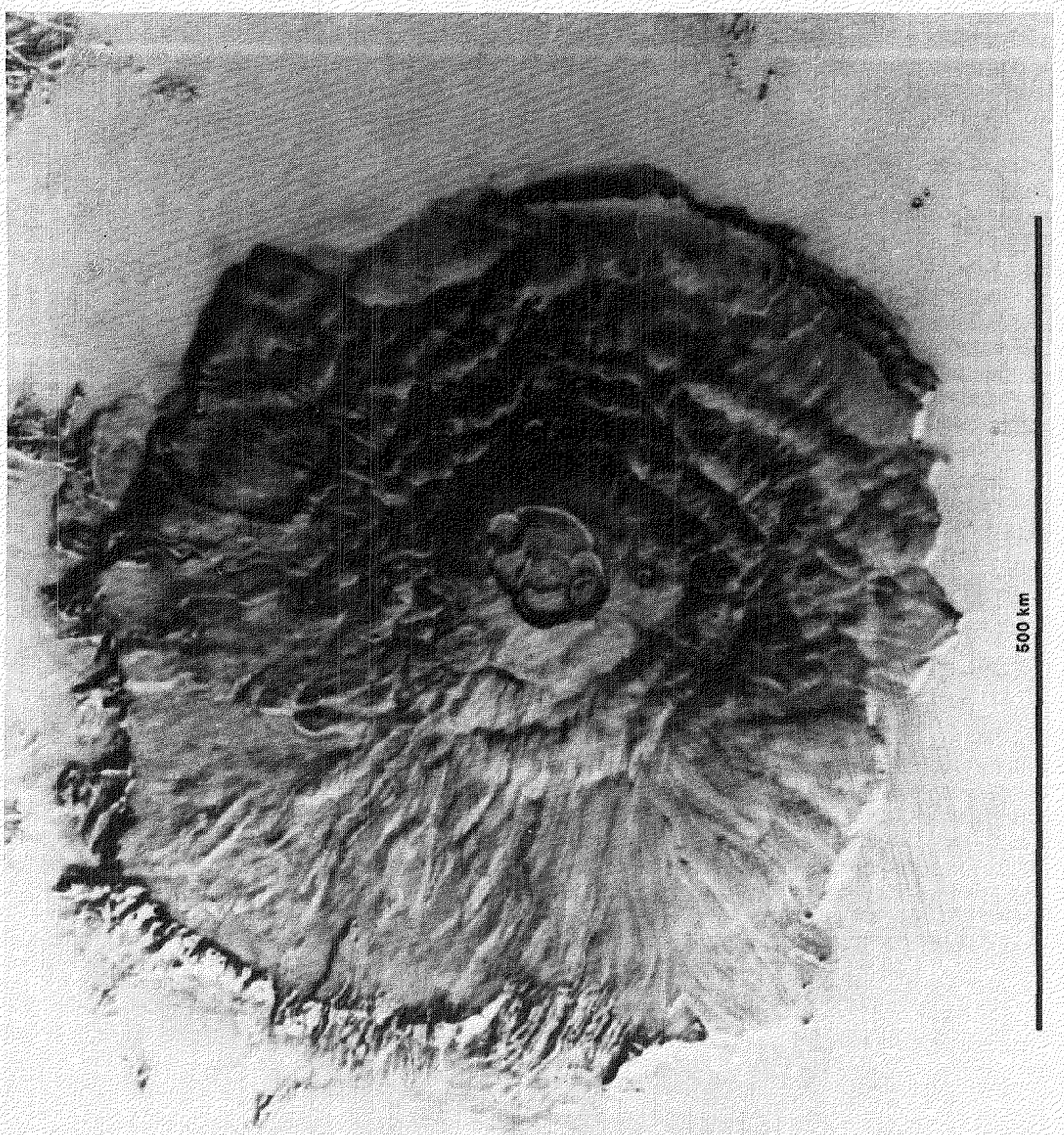
The volcanic mountain is the most obvious and spectacular result of internal planetary heating. This section will consider and compare the largest volcanic structures on several of the planets and moons in the solar system including Venus, Earth, Mars, and Io (a moon of Jupiter).

OLYMPUS MONS

Olympus Mons is the largest single volcano in the known solar system. Located on Mars, this huge mountain is approximately 650 kilometers (400 miles) wide and rises 26 kilometers (16 miles) into the thin Martian atmosphere. At its top is a complex caldera 80 kilometers (50 miles) across. Lava flows may be traced down its sides and over a 4 kilometer (2.5 mile) high scarp at its base. The origin of this scarp is unknown. Beyond the scarp, lava flows and other types of terrain associated with the volcano extend for hundreds of kilometers across the Martian plains.

It is thought that Olympus Mons has grown so large because it has remained stationary over its lava source. (On the Earth plate movement does not allow this; terrestrial volcanoes, such as the Hawaiian Islands, can only achieve moderate size before they are shifted from their source regions and become extinct.) Thus, Olympus Mons has been able to slowly increase in size for perhaps over a billion years.

Source: NASA photo 84 H 424.

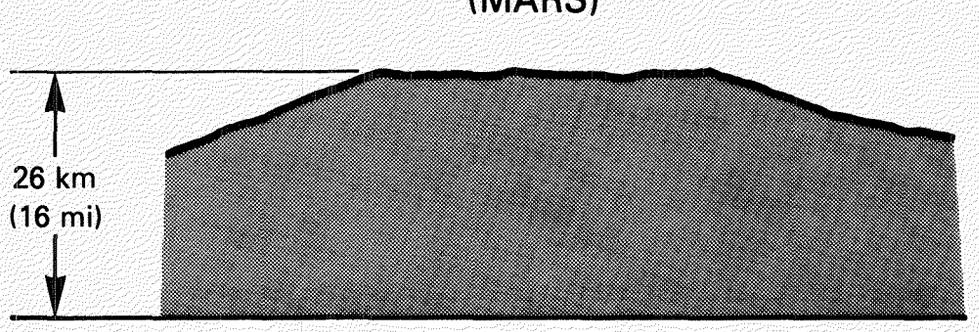

500 km

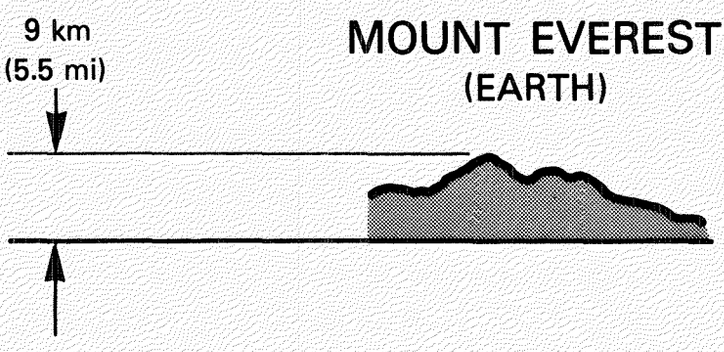
MAJOR MOUNTAINS COMPARED: EARTH AND MARS

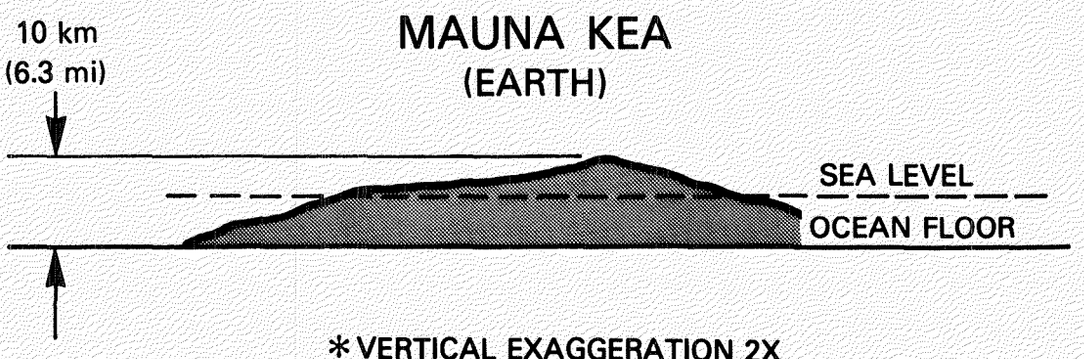
The highest mountains on the Earth and Mars are compared in this diagram. Olympus Mons is the huge volcano on Mars that may be the highest vertical relief mountain in the solar system (see the section on Olympus Mons). Mount Everest is Earth's loftiest peak when measured from sea level. However, the volcano Mauna Kea on Hawaii is the Earth's highest, when measured from base to top. Much of Mauna Kea lies under the Pacific Ocean, with only 4 kilometers (2.5 miles) above sea level.

Source: NASA photo 84 H 425.

MAJOR MOUNTAINS COMPARED:* EARTH AND MARS







*VERTICAL EXAGGERATION 2X

BETA REGIO

The first global view of the cloud-shrouded surface of Venus was acquired in the late 1970's. The Pioneer Venus orbiter spacecraft used a radar altimeter to penetrate the dense cloud layers. A low resolution topographic map was produced of the surface (excluding the polar regions). One of the most interesting features discovered was a large volcanic area called Beta Regio, which extends for 2,400 kilometers (1,500 miles) in length. Two probable volcanoes, named Rhea Mons and Theia Mons, rise 4 to 5 kilometers (2.5 to 3 miles) in elevation here. They appear to be youthful in age and may still be active. Lightning strikes detected in their immediate vicinity (a characteristic feature of volcanic eruptions on the Earth) lend credence to this theory. In the late 1980's the Venus Radar Mapper mission is planned to accomplish a high-resolution radar study of the surface of Venus. When this occurs we should learn much more about these potentially active volcanoes.

This photograph of Beta Regio is a new high-resolution radar image obtained using the world's largest radio telescope at Arecibo Observatory in Puerto Rico. Both Rhea Mons and Theia Mons are shown, as well as a series of rifts that lie between them.

Photograph courtesy of James W. Head, Brown University,
Providence, Rhode Island 02912.


RHEA MONS
BETA REGIO
THEIA MONS

PELE

The Voyager spacecraft found Jupiter's moon Io to be the most active volcanic body in the solar system. The largest erupting feature of the many observed was named Pele, which appears as a heart-shaped feature in the center of the photograph. In size it is approximately 700 x 1,000 kilometers (400 x 600 miles). Actually a large volcanic landform is not present; what we see is a dark-colored vent of relatively low relief in the center. The heart-shaped feature is the plume of material being erupted at high velocity from the vent and falling back to the surface of Io. When photographed by the Voyater 1 spacecraft, this plume reached elevations of 280 kilometers (175 miles) above the surface. Io is extremely active geologically because of tidal stretching. This is caused by its somewhat elliptical orbit, a result of perturbations by the nearby moon Europa. The volcanoes apparently erupt such materials as sulfur and sulfur dioxide. This constant activity by a dozen or more vents keeps the surface very young in character. Indeed, no impact craters have been discovered; they have all been rapidly buried by the erupted material.

Source: NASA photo 79 HC 88.


500 km

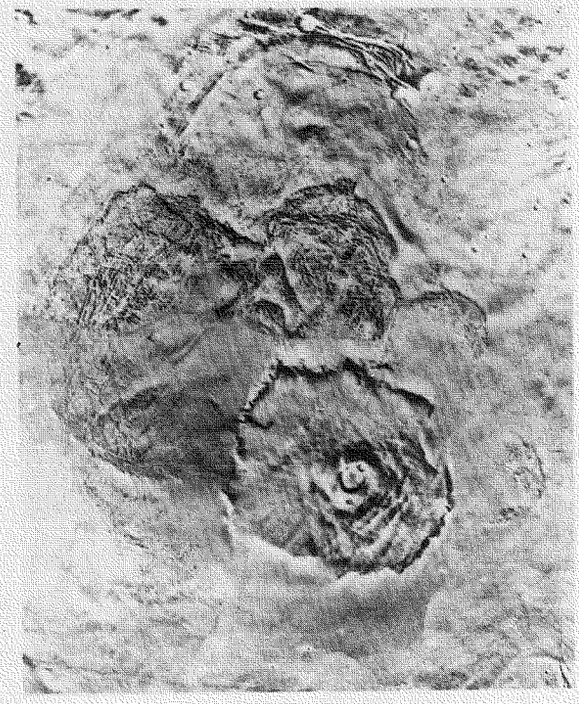
VOLCANOES COMPARED

The huge volcanoes of Mars and Io (a moon of Jupiter) are shown at the same scale. (For more detailed information, see the preceding pages.) They are compared with the Hawaiian Islands, one of the largest volcanic features on the Earth.

Source: NASA photo 84 H 426.

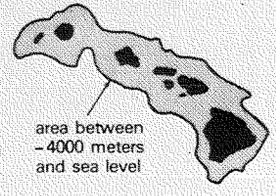
VOLCANOES COMPARED

PELE
(IO)



OLYMPUS MONS
(MARS)

HAWAIIAN ISLANDS



500 km

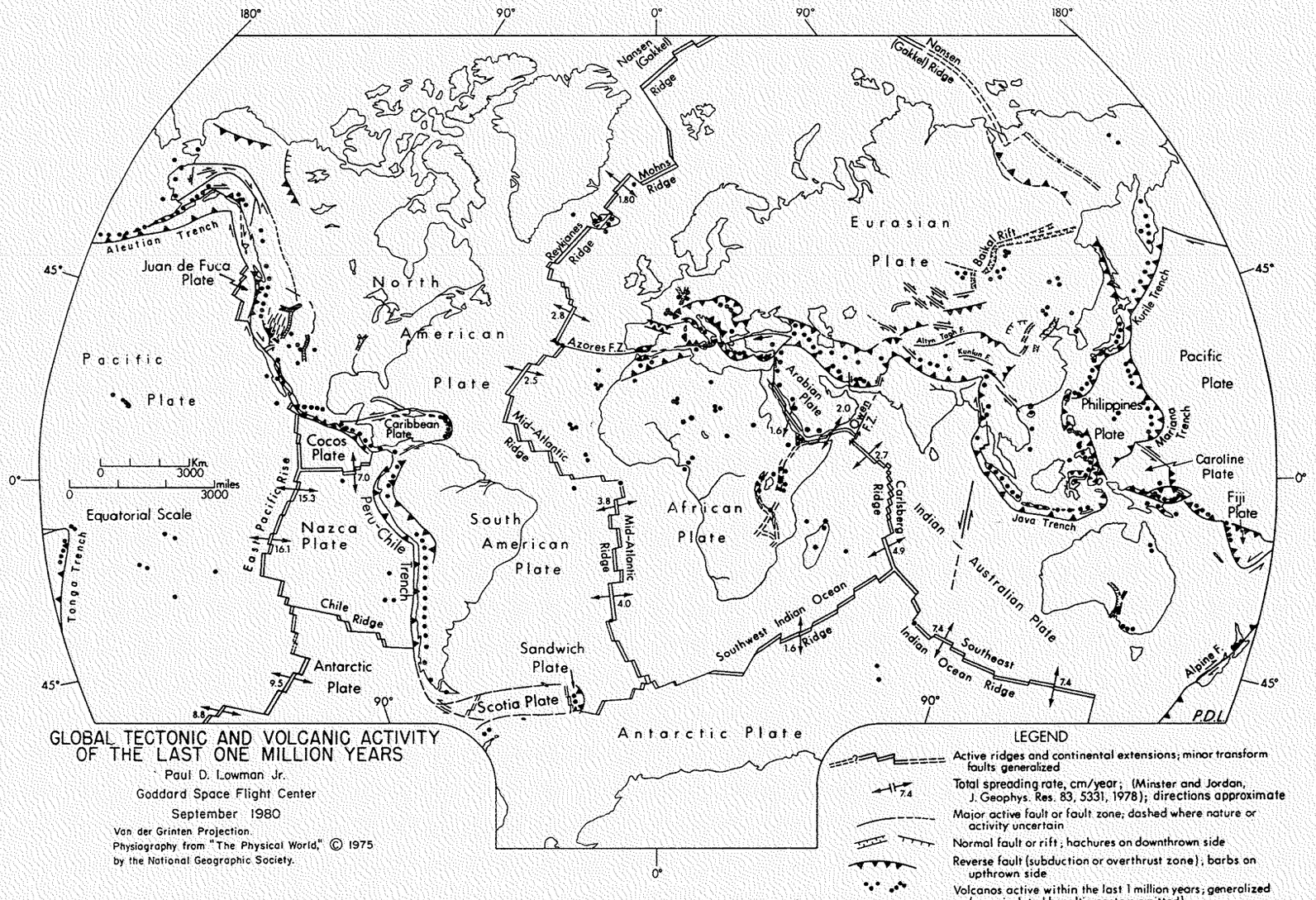
PART III: TECTONIC FEATURES

Tectonic features on the planets and moons are those caused by deformation of the crustal rocks, such as fractures and faults. These may be given geographical expression in a number of ways, including great rift canyons. This section looks at two of the largest of these rift canyons, on Mars and on Saturn's moon Tethys, and then compares their lengths with comparable features on Earth. Several other tectonic features of interest are also examined.

GLOBAL TECTONIC ACTIVITY ON THE EARTH

This map depicts tectonic and volcanic activity of the past one million years, including the present. Features shown include actively-spreading ridges, spreading rates, major active faults, subduction zones, well-defined plates, and volcanic areas active within the past one million years. Activity within this period has been inferred from seismicity (instrumental and historic), physiography, and published literature. The tectonic activity map has been used for planning global geodetic programs of satellite laser ranging and very long base line interferometry, and for geologic education. It illustrates several aspects and problems of global tectonic and volcanic activity not shown on conventional plate maps: the large areas of crustal deformation not susceptible to treatment as parts of rigid plates, the wide occurrence of volcanoes on the upper blocks of continent-continent convergence zones, areas of little-known volcanism and tectonism, intraplate rifts, and the bilateral across-strike symmetry of young fold belts.

Map and caption courtesy of Dr. Paul D. Lowman, Goddard Space Flight Center, Greenbelt, Maryland 20771.



GLOBAL TECTONIC AND VOLCANIC ACTIVITY OF THE LAST ONE MILLION YEARS

Paul D. Lowman Jr.
Goddard Space Flight Center

September 1980

Van der Grinten Projection.

LEGEND

- Active ridges and continental extensions; minor transform faults generalized
- 7.4 Total spreading rate, cm/year; (Minster and Jordan, J. Geophys. Res. 83, 5331, 1978); directions approximate
- Major active fault or fault zone; dashed where nature or activity uncertain
- Normal fault or rift; hachures on downthrown side
- Reverse fault (subduction or overthrust zone); barbs on upthrown side
- Volcanos active within the last 1 million years; generalized (some isolated basaltic centers omitted)

THE THARSIS BULGE

The Tharsis Bulge (also known as the Syria Rise) is an enormous elevated region of the Martian crust. It is roughly 5,000 kilometers (3,000 miles) across and has an elevation of around 7 kilometers (4 miles). The Bulge fills much of the accompanying picture. Fractures radiate outward from it in all directions, including the Valles Marineris canyon system (to the east). Above the Tharsis, in a line, rise the huge volcanoes Ascraeus Mons, Pavonis Mons, and Arsia Mons (north-east to south-west). Olympus Mons lies on the northwest edge of the Bulge. All four of these great volcanoes penetrate approximately 26 kilometers (16 miles) into the Martian sky. The reason for the existence of the Tharsis Bulge is not well understood, but as a massive tectonic feature, it undoubtedly has had a major influence upon Mars as a planet.

Source: NASA photo 84 H 427.


1000 km

VALLES MARINERIS

Named after the Mariner 9 spacecraft that discovered it, Valles Marineris is a huge canyon system on Mars. It extends in an easterly direction for about 5,000 kilometers (3,000 miles). If placed on the United States, Valles Marineris would stretch from New York City to Los Angeles. It has a width of approximately 240 kilometers (150 miles) and depths up to 6.5 kilometers (4 miles).

The origin of Valles Marineris is not known, but it is apparently a tectonic feature of vast proportions. Perhaps it represents an area of incipient plate tectonics which occurred during an earlier period in Martian history.

Source: NASA photo 80 H 288.


500 km

VALLES MARINERIS AND THE GRAND CANYON

The Valles Marineris canyon system on Mars (see the Valles Marineris section) is compared with the Grand Canyon in Arizona. As is readily apparent, the Grand Canyon is only the size of one of the tributary canyons of Valles Marineris.

Source: NASA photo 75 H 495.


GRAND CANYON OF ARIZONA

ITHACA CHASMA

Ithaca Chasma is a canyon located on Tethys, one of the moons of Saturn. It has an approximate length of 1,900 kilometers (1,200 miles) and consequently stretches two-thirds of the way around the circumference of this small world. Since Tethys is composed primarily of water ice, Ithaca Chasma may have formed when the moon froze, expanded, and split open. The accompanying map shows the central section of the canyon.

Source: USGS map I-1487 (Atlas of the Saturnian Satellites - Tethys Ste 10M 2AN).

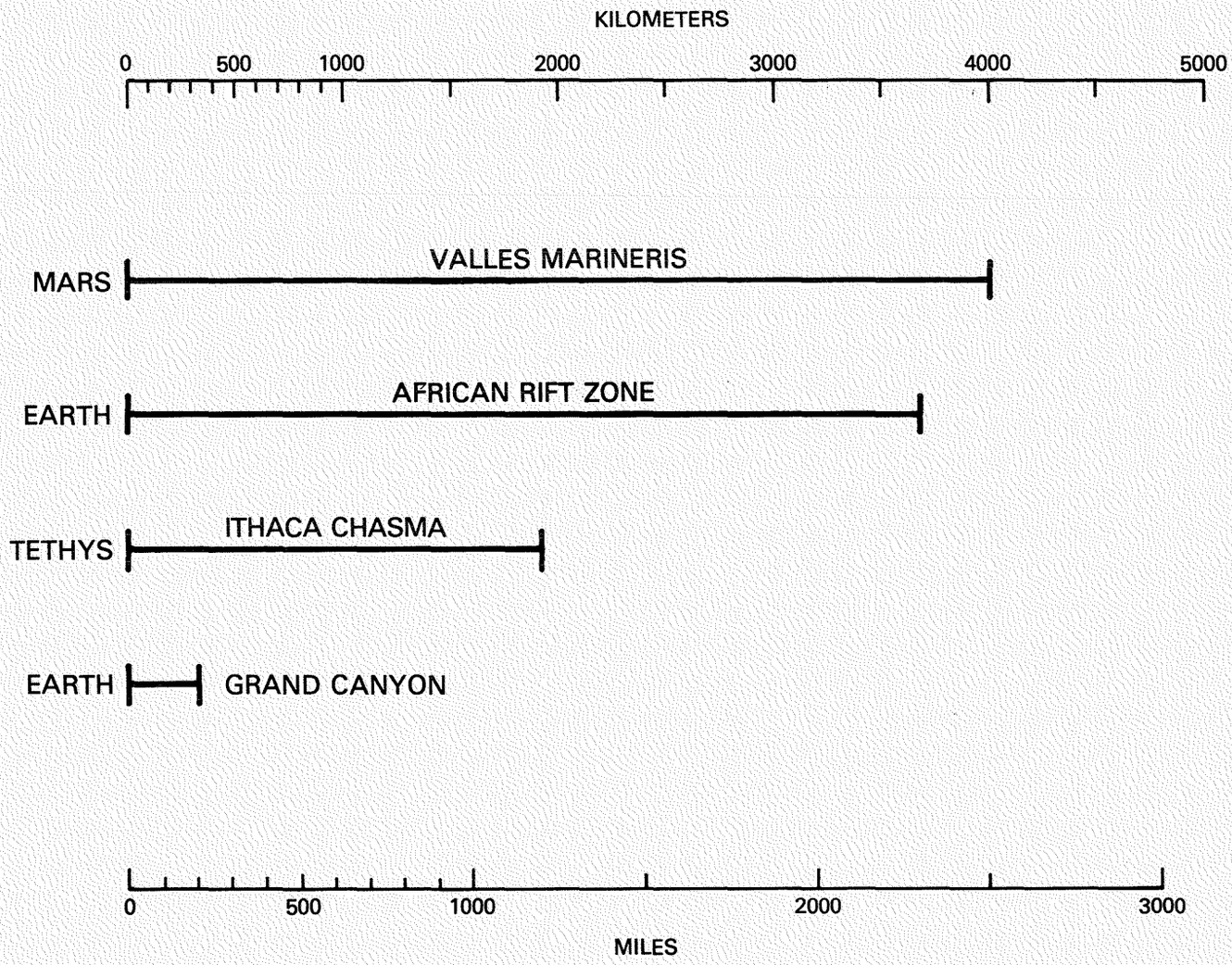
Anticleia
Eumaeus
Circe
Laertes
ITHACA
CHASMA
Arete
Ajax
500 km

TECTONIC FEATURE COMPARISONS

This graph compares the lengths of several canyons and rift zones in the solar system. Valles Marineris, the great canyon system of Mars, is probably the largest such feature in the solar system. The African Rift Zone is a series of faults that run generally north and south in East Africa. Ithaca Chasma is the canyon that stretches around much of the circumference of Tethys, a moon of Saturn. The Grand Canyon of Arizona, while basically a fluvial rather than structural feature, is included for comparison because it is so well-known. (For more information on Valles Marineris and Ithaca Chasma, see the preceding pages.)

Source: NASA photo 84 H 428.

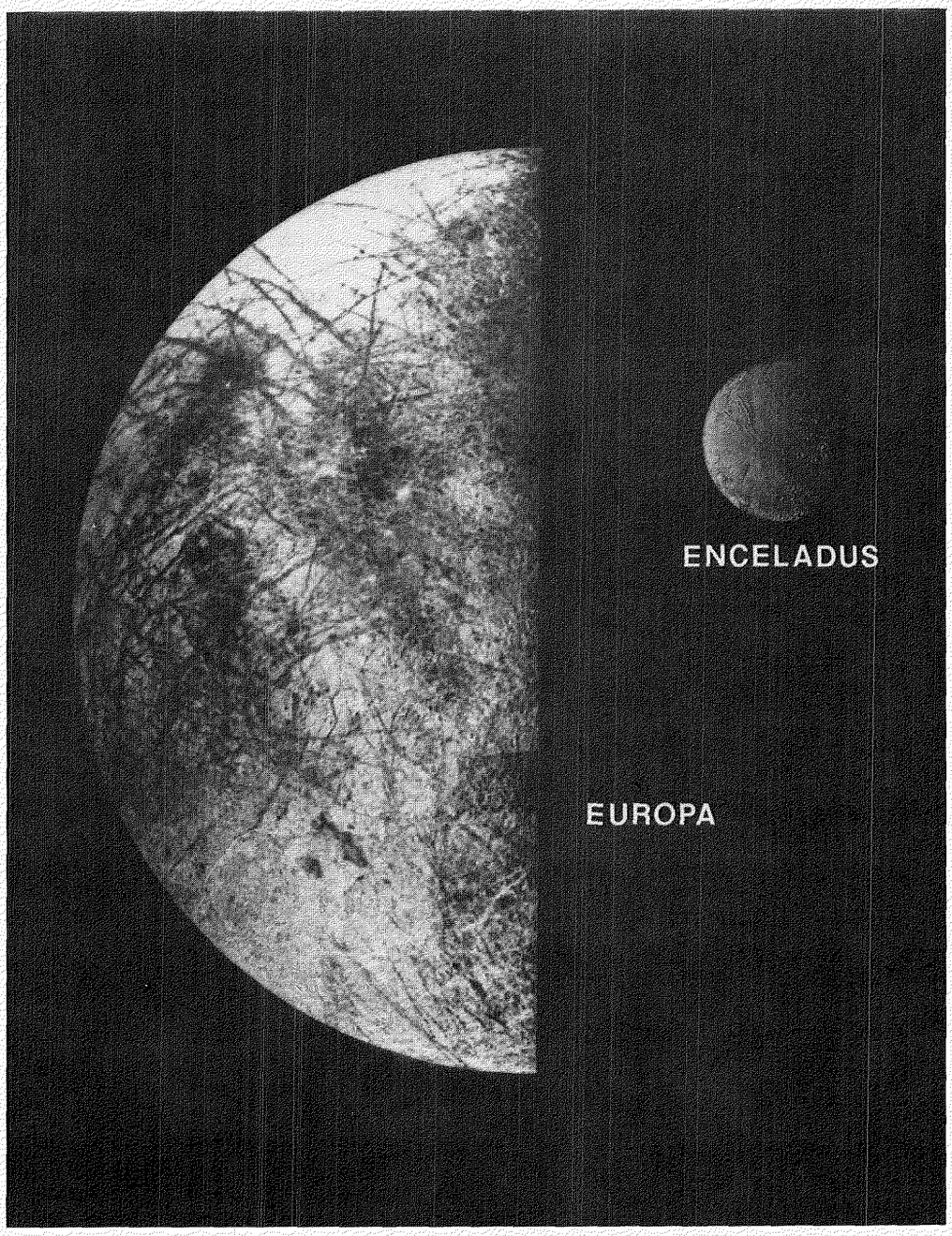
A COMPARISON OF CANYONS AND RIFT ZONES IN THE SOLAR SYSTEM



EUROPA AND ENCELADUS

Europa, a moon of Jupiter, and Enceladus, a moon of Saturn, are shown at the same scale. Europa has a diameter of 3,126 kilometers (1,942 miles) while the diameter of Enceladus is 500 kilometers (311 miles). The surface of Europa is crisscrossed by hundreds of long thin lines. It is thought that they are cracks in an icy surface which may overlie an ocean up to 100 kilometers (60 miles) deep. There are very few craters present. Enceladus is primarily water ice in composition. It has some cratered regions but it also has areas with flow features that are essentially devoid of craters. The scarcity of craters on Europa and parts of Enceladus indicates that they have been resurfaced. Such resurfacing might be the result of interior heating caused by radioactive decay. This, however, is questionable for Europa and especially so for Enceladus because of their small size. Perhaps heating due to tidal forces—similar to that which causes the volcanoes on Io (see the section on Pele)—is the process that renews the surfaces of the moons. This is only one of the mysteries to be solved about these worlds which have the highest albedos (reflected brightness) yet discovered in the solar system.

Source: NASA photo 84 H 429.


ENCELADUS
EUROPA

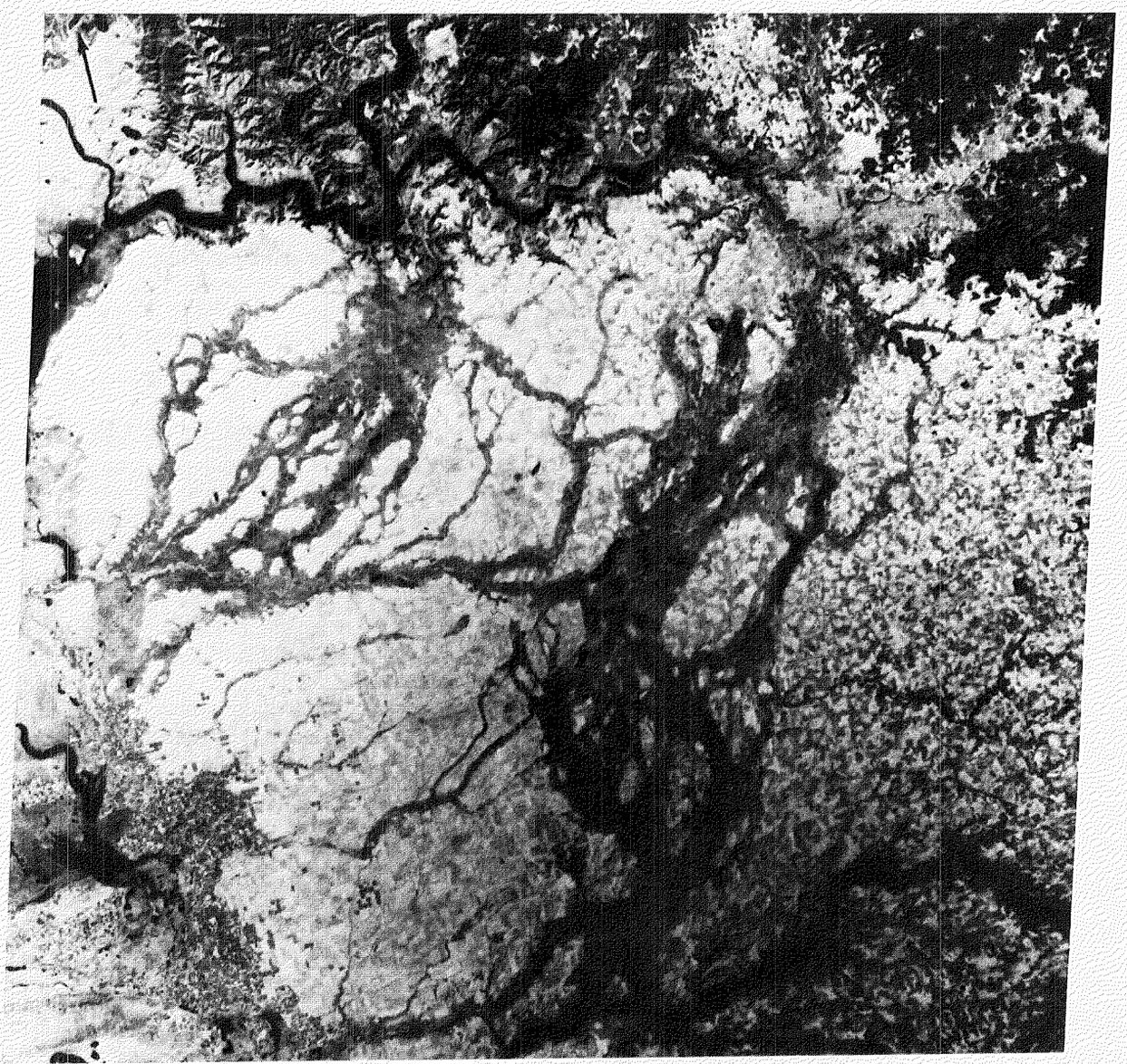
PART IV: OTHER PLANETARY FEATURES

This section examines other features on the planets and moons that do not fit within the categories already discussed.

THE CHANNELED SCABLANDS

The Channeled Scablands occur in the eastern part of the State of Washington. They are characterized by scoured terrain, indicative of one of the greatest floods ever known on Earth. The Spokane Flood, which created the Scablands, had its origin 18,000 to 20,000 years ago during the Great Ice Age. At that time the ice sheet dammed several rivers, creating a number of lakes, the largest being glacial Lake Missoula. This lake grew to a depth, at the ice dam, of almost 600 meters (2,000 feet) and had a volume equal to half that of present-day Lake Michigan. When the dam gave way, an immense amount of water coursed downstream. It has been calculated that the maximum rate of flow was 65 times the rate of flow of the world's largest river, the Amazon. Water poured across the landscape in depths of 180 meters (600 feet) or more and made its way to the Pacific Ocean over a distance of 885 kilometers (550 miles). Lake Missoula was probably drained in just a few days and the scoured terrain the flood produced is readily apparent in the Channeled Scablands today. The photograph shows this area as seen from a Landsat satellite in Earth orbit.

Source: NASA photo 76 HC 226.



100 km

CATASTROPHIC FLOODS

One of the great discoveries of the Mariner 9 spacecraft was the existence of channels on Mars. There are several types, but the largest and most impressive are the outflow channels. These are features that generally start in jumbled terrain, emerge full size, and flow out onto the plains where they gradually disappear. The unusual thing about these channels is their vast size. They may achieve widths of over 200 kilometers (125 miles) and lengths in excess of 2,000 kilometers (1,200 miles). Although several theories have been put forward concerning their origin, the leading one proposes that these channels were caused by catastrophic floods of liquid water. How this could have happened is not clear, although it may have involved the sudden melting of permafrost and release of large volumes of underground water. Many of the outflow channels are geologically quite old and consequently indicate a greater amount of water available in the past. This could be a sign of long-term climatic changes on Mars.

The accompanying picture is a mosaic of Viking spacecraft photographs showing an area of typical outflow channel terrain. The inset photo shows the Channeled Scablands on Earth, a similarly flooded area, at the same scale (see the section on The Channeled Scablands).

Source: NASA photo 84 H 430.


200 km

IAPETUS

Iapetus, with a diameter of 1,460 kilometers (907 miles), is one of the medium-sized moons of Saturn. It is also one of the most enigmatic bodies in the solar system. This is because of its strange duality of albedo. One hemisphere is as dark as asphalt while the other is as bright as newly-fallen snow. Since the dark hemisphere is exactly centered on the forward-facing side of Iapetus, one possibility is that its material is external in origin, having been swept up in orbit. On the other hand, some of the dark material seems to be located at the bottom of craters on the bright hemisphere. This indicates an internal origin, for material dropping onto the surface would not collect only in specific areas (like crater bottoms). Whatever the answer to this question may be, Iapetus remains one of the most mysterious of moons.

The map of Iapetus on the accompanying page is centered on its dark forward-facing hemisphere, named Cassini Regio.

Source: USGS map I-1486 (Atlas of the Saturnian Satellites - Iapetus Si 10M 1AN).

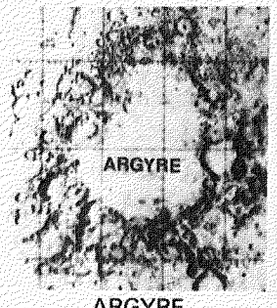
RONCEVAUX
TERRA
CASSINI REGIO
500 km

CONCLUSION: OVERALL COMPARISONS

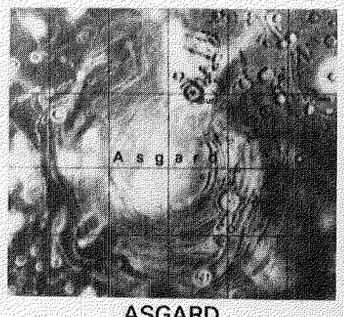
This final comparison shows many of the larger geographical features that have been discussed in this publication at the same scale. Since several different processes were responsible for the creation of these features, this might be considered comparing "apples with oranges." It is interesting, however, to look at the size relationships of different landforms together, irrespective of their origin.

Source: NASA photo 84 H 431.

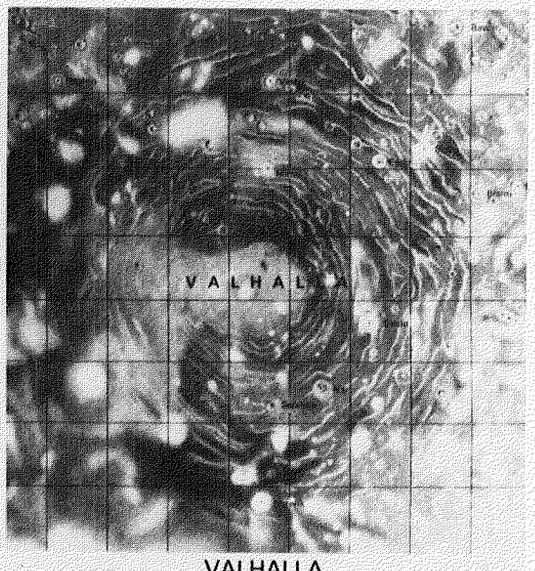
OVERALL COMPARISONS



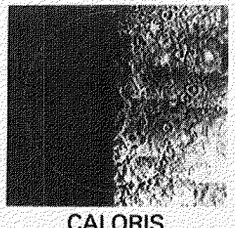
ARGYRE
(MARS)



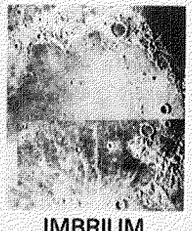
ASGARD
(CALLISTO)



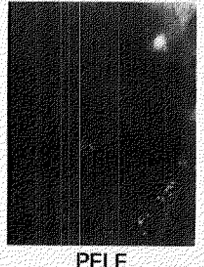
VALHALLA
(CALLISTO)



CALORIS
(MERCURY)

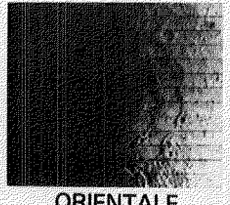


IMBRIUM
(MOON)



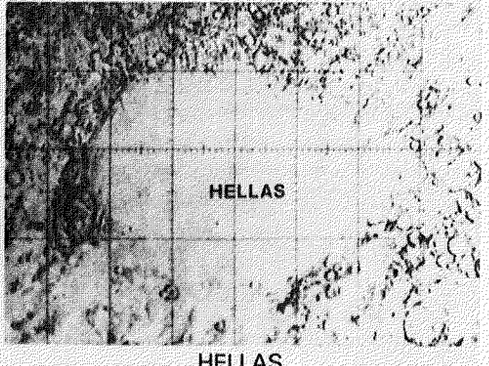
PELE
(IO)

OLYMPUS
MONS
(MARS)



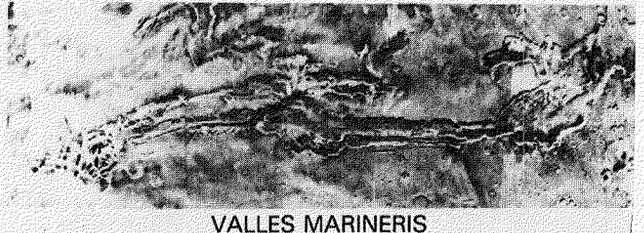
ORIENTALE
(MOON)

1000 km



HELLAS
(MARS)

CASSINI REGIO
(IAPETUS)



VALLES MARINERIS
(MARS)

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1. Report No. NASA TM-86147	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle A GEOGRAPHIC COMPARISON OF SELECTED LARGE-SCALE PLANETARY SURFACE FEATURES		5. Report Date January 1985 6. Performing Organization Code
7. Author(s) Stephen Paul Meszaros		8. Performing Organization Report No.
9. Performing Organization Name and Address Goddard Space Flight Center Greenbelt, Maryland 20771		10. Work Unit No. 11. Contract or Grant No. 13. Type of Report and Period Covered Technical Memorandum
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, D.C. 20546		14. Sponsoring Agency Code
15. Supplementary Notes		

16. Abstract

This publication is a compilation of photographic and cartographic comparisons of large, well-known geographical features on planets and moons in the solar system. Included are structures caused by impacts, volcanism, tectonics, and other natural forces. Each feature is discussed individually and then those of similar origin are compared at the same scale.

17. Key Words (Selected by Author(s))	18. Distribution Statement
Planetary Geographical Comparisons Impact Features Volcanic Features Tectonic Features	Unclassified - Unlimited Subject Category 91

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	70	A03

For sale by the National Technical Information Service, Springfield, Virginia 22161

NASA-Langley, 1985

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