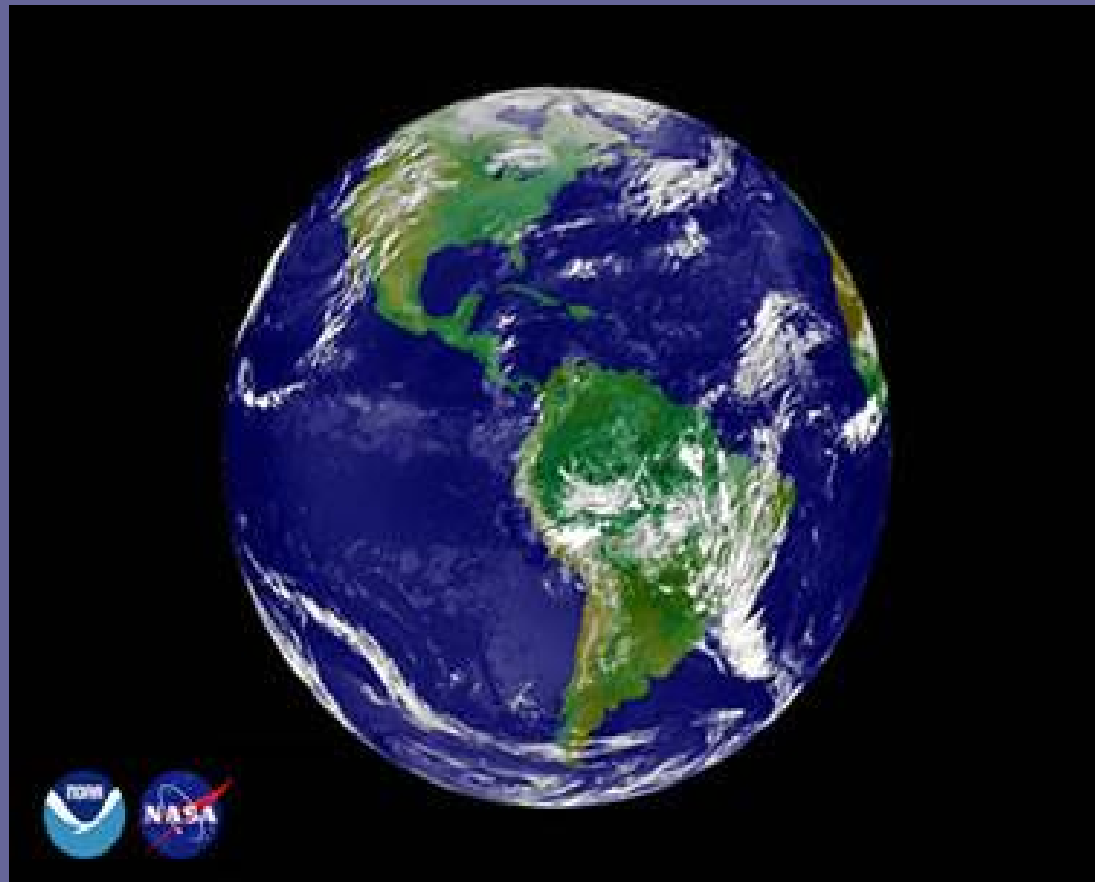


Night Sky over Reading

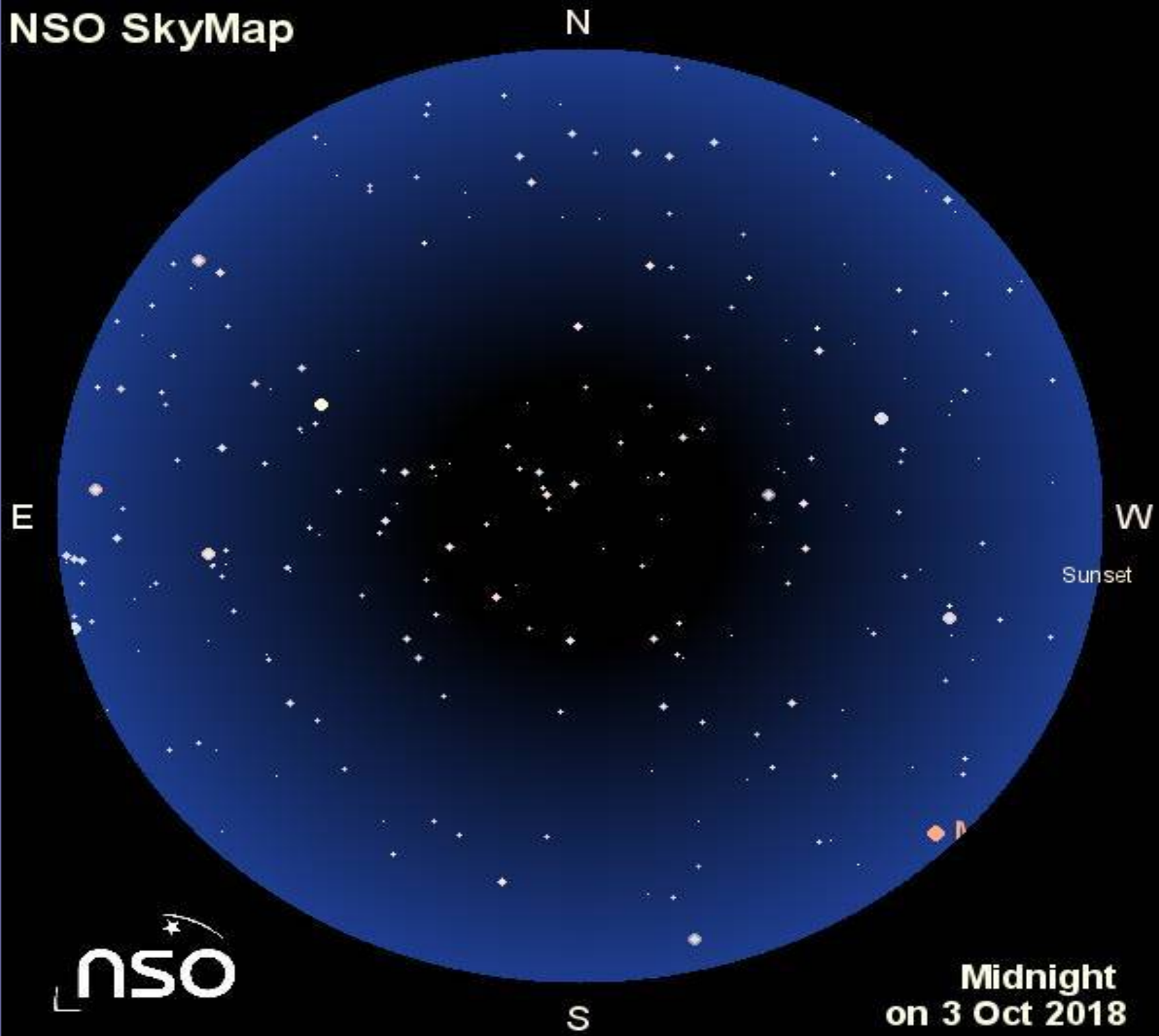
Iwan Williams

Queen Mary University of London

The Earth is our home planet. It is 7900 miles across. $\frac{2}{3}$ of its surface is covered by sea and $\frac{1}{3}$ land. It has an atmosphere. I want to look at what we can see from it with the naked eye and what these look like through big telescopes or from space vehicles.



NSO SkyMap



NSO

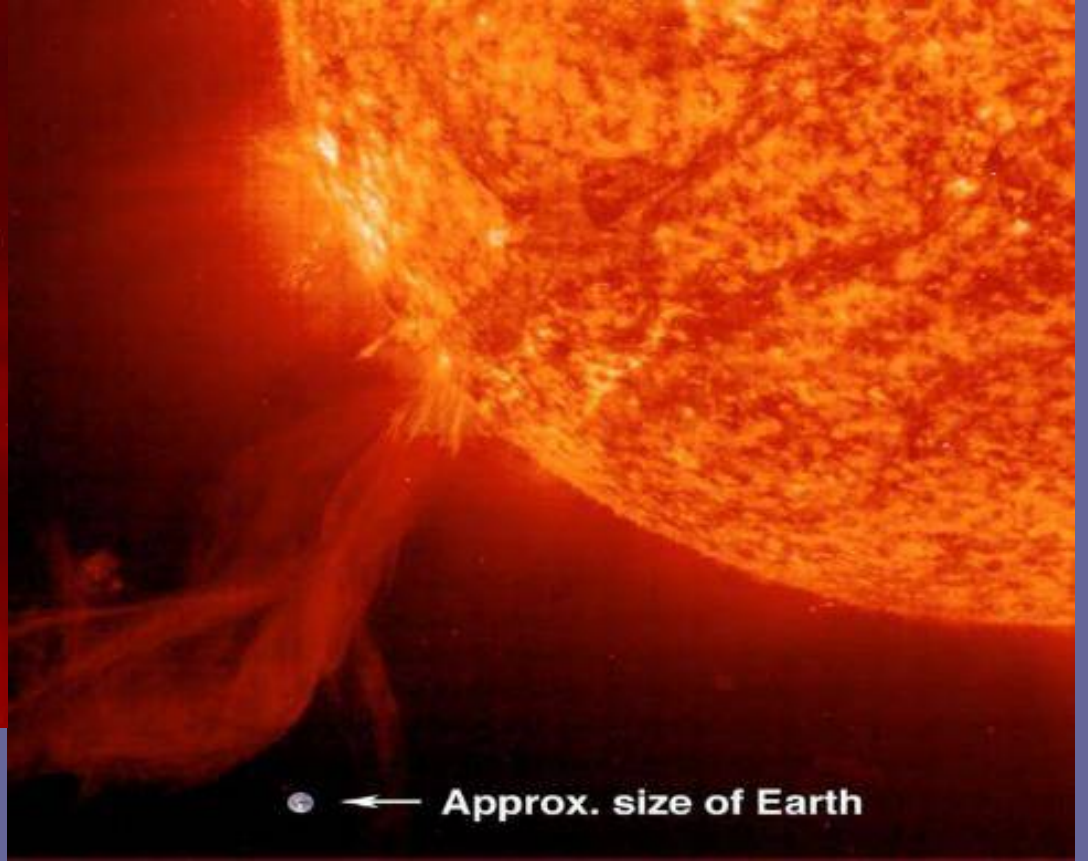
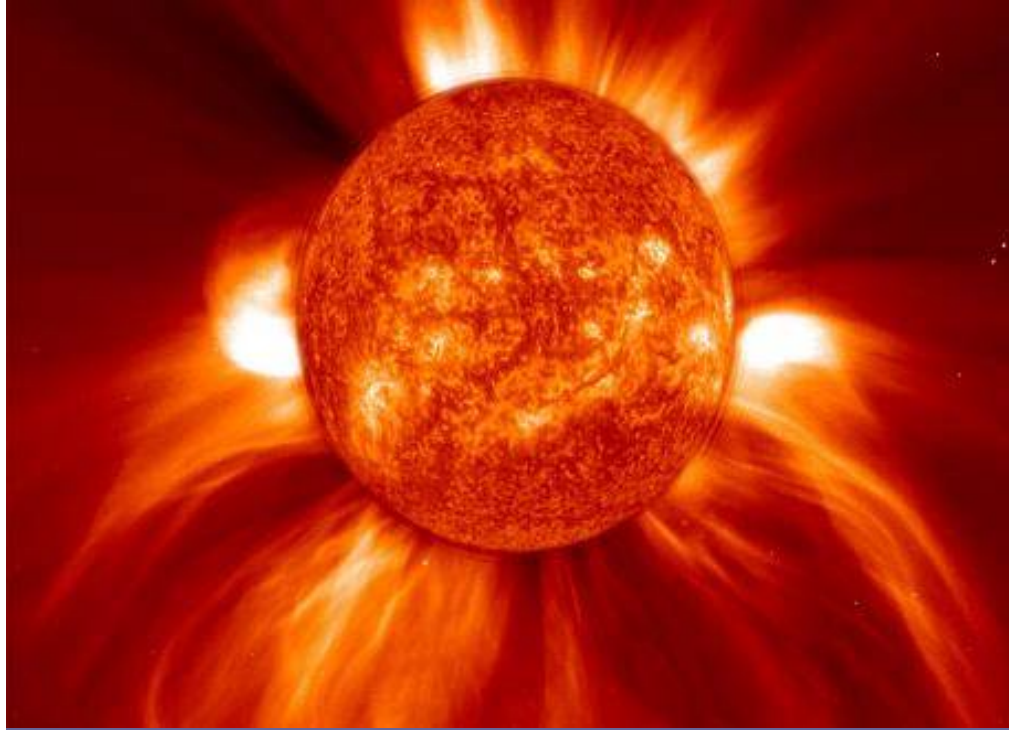
Midnight
on 3 Oct 2018

Stars look much the same through big telescopes, more of them are visible and more colours, but nothing else startling.



The Sun is the nearest star, a fairly average star. The Earth moves around the Sun on a near perfect circle of radius 93 million miles, taking 1 year to go round.





- Sun is over 100 times larger than the Earth, and is composed of 70% hydrogen and 26% helium. It is also very hot, 6000° , with lots of storms throwing out material into space. It provides us with our heat and light.

The Moon is also a bright object visible to the naked eye. It goes around the Earth on a near circle of radius 236000miles, taking 28 days to go around, hence the basis of a month.



The Moon only reflects sunlight, so that the half facing the Sun is bright and the other half dark. As the Moon moves around the Earth, we sometimes see all of the face that is lit and sometimes only a bit of it.



The Moon is also a sphere, 2200 miles across, 1/4 the size of the Earth. It has a solid surface with many craters caused by impacts as it has no atmosphere.

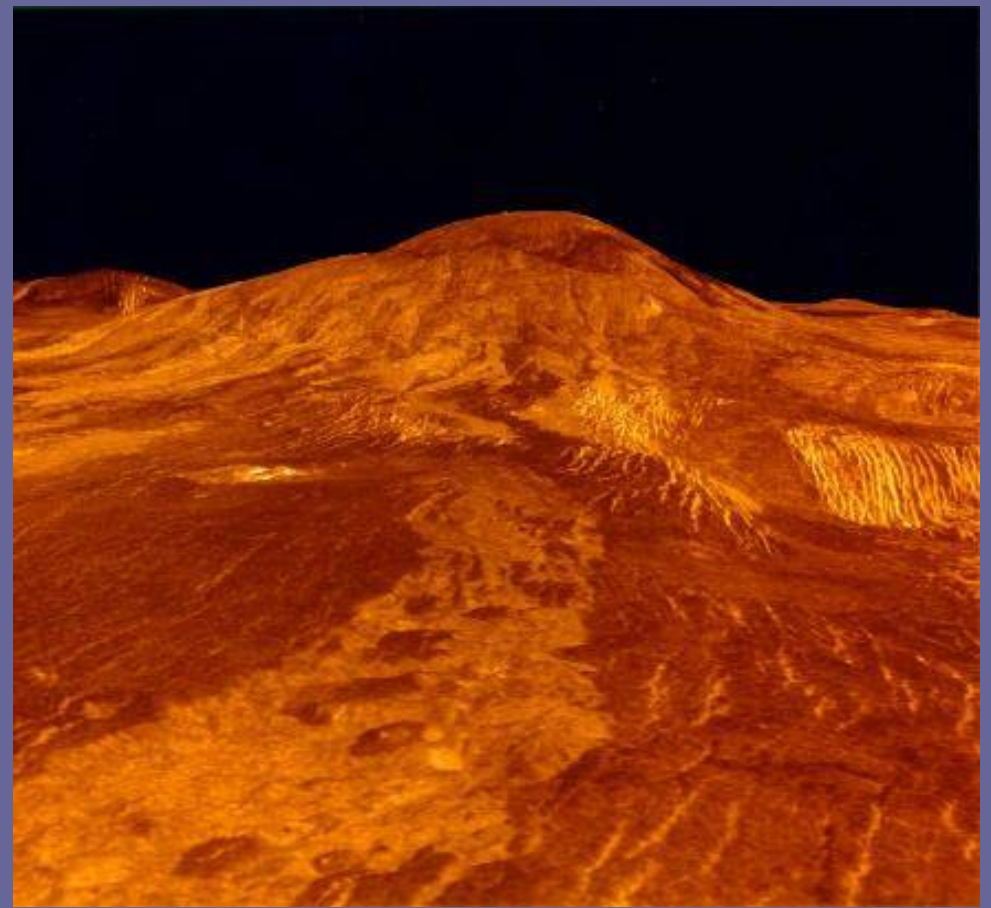
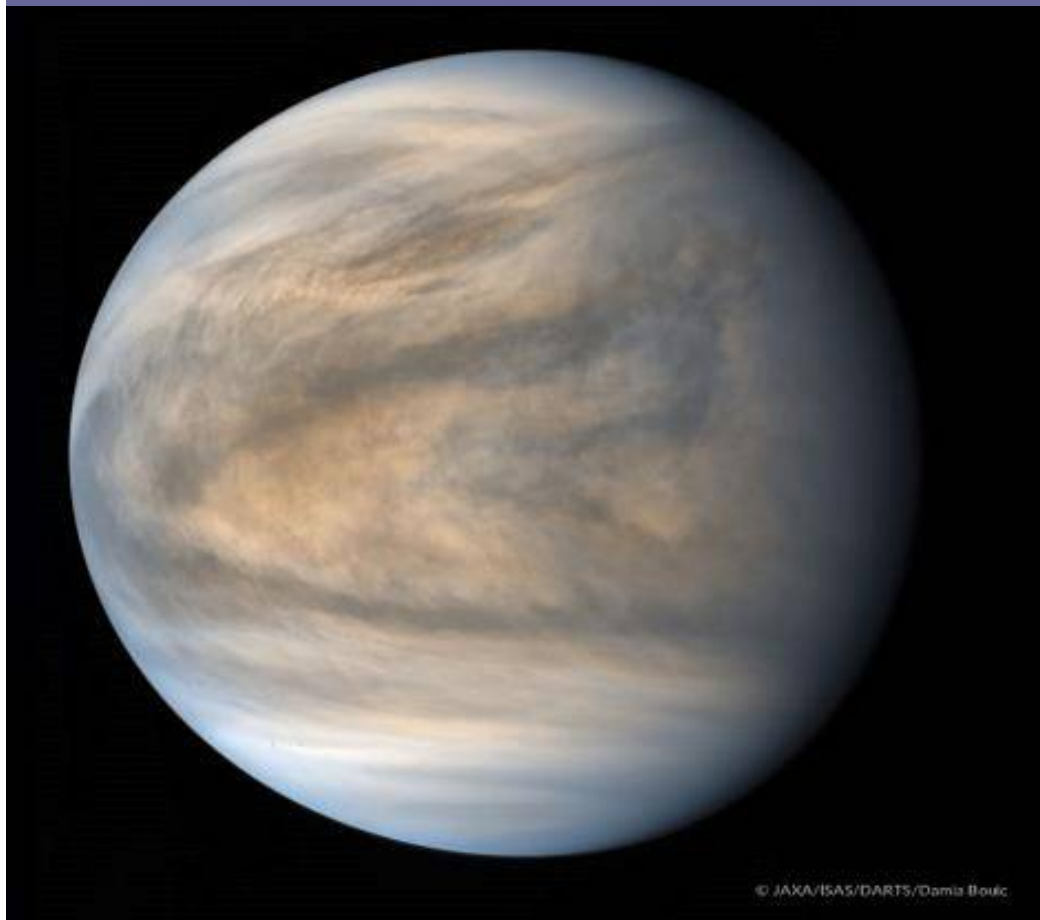


Five planets can be seen with the naked eye, all of them in this photograph. These are Mercury, Venus, Mars, Jupiter and Saturn.



- Mercury is the hardest to see, often faint and near the horizon. It is the nearest planet to the Sun.
- It is a small rocky planet about 1/3rd the size of the Earth. It has no atmosphere and so, like the Moon has many impact craters.



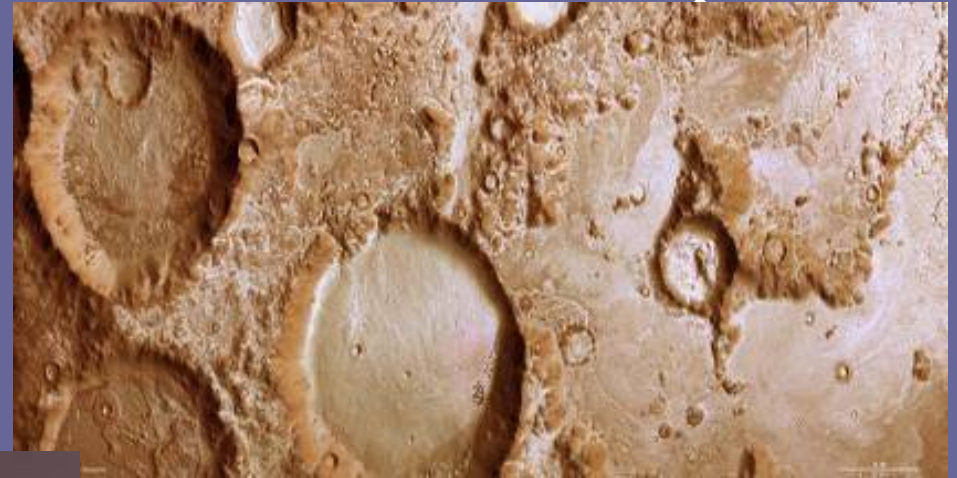
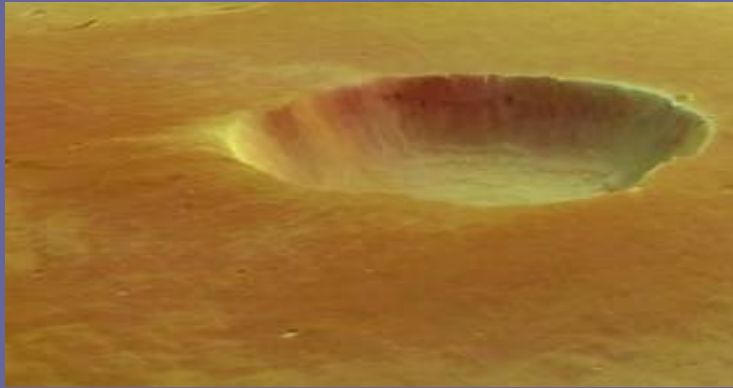


- Venus is next out from the Sun, very similar to Earth in size but has a very thick Carbon Dioxide atmosphere so the Greenhouse effect makes Venus is very hot (500C).It also prevents us being able to see its surface with telescopes.

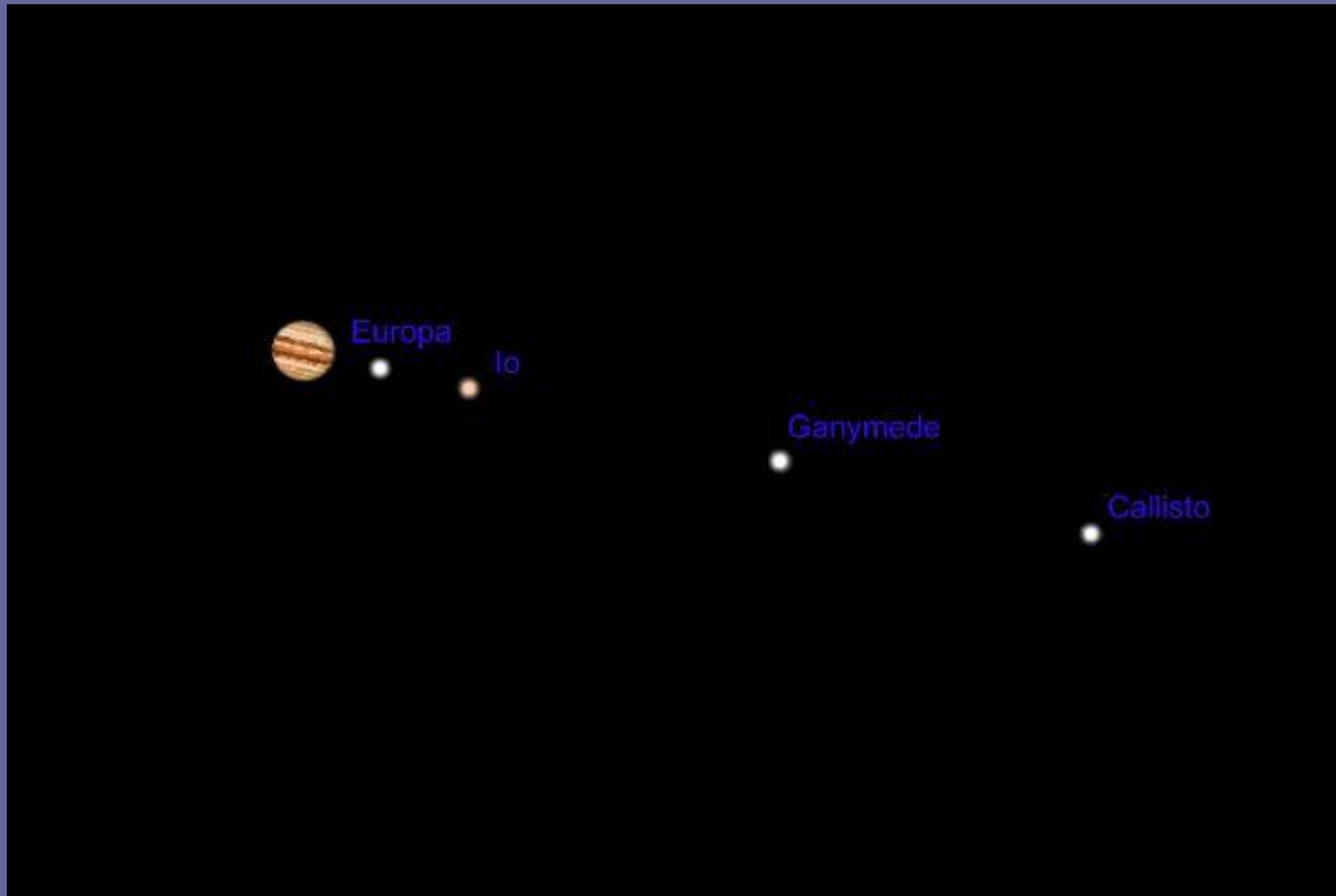
Mars is often called the red planet. It is about half the size of the Earth. At present it has a very thin atmosphere and no running water though some ice, There may have been in the past.



The very thin atmosphere can blow dust about, but not protect Mars from collisions so it has a very cratered surface. There is ice near the poles.



Jupiter is the largest planet in the Solar system, 11 times larger than the Earth. It has many Moons, 4 of which are similar in size to our Moon and can be seen through binoculars or a small telescope.





Io



Europa



Ganymede



Callisto

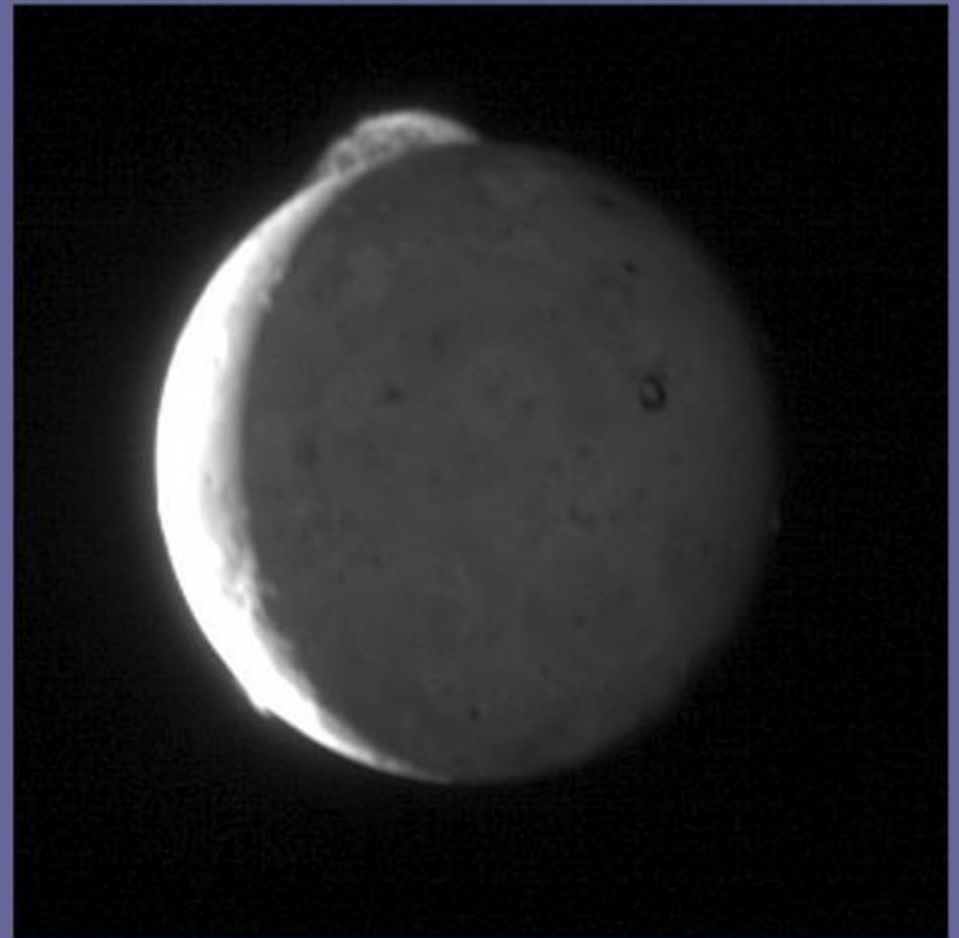
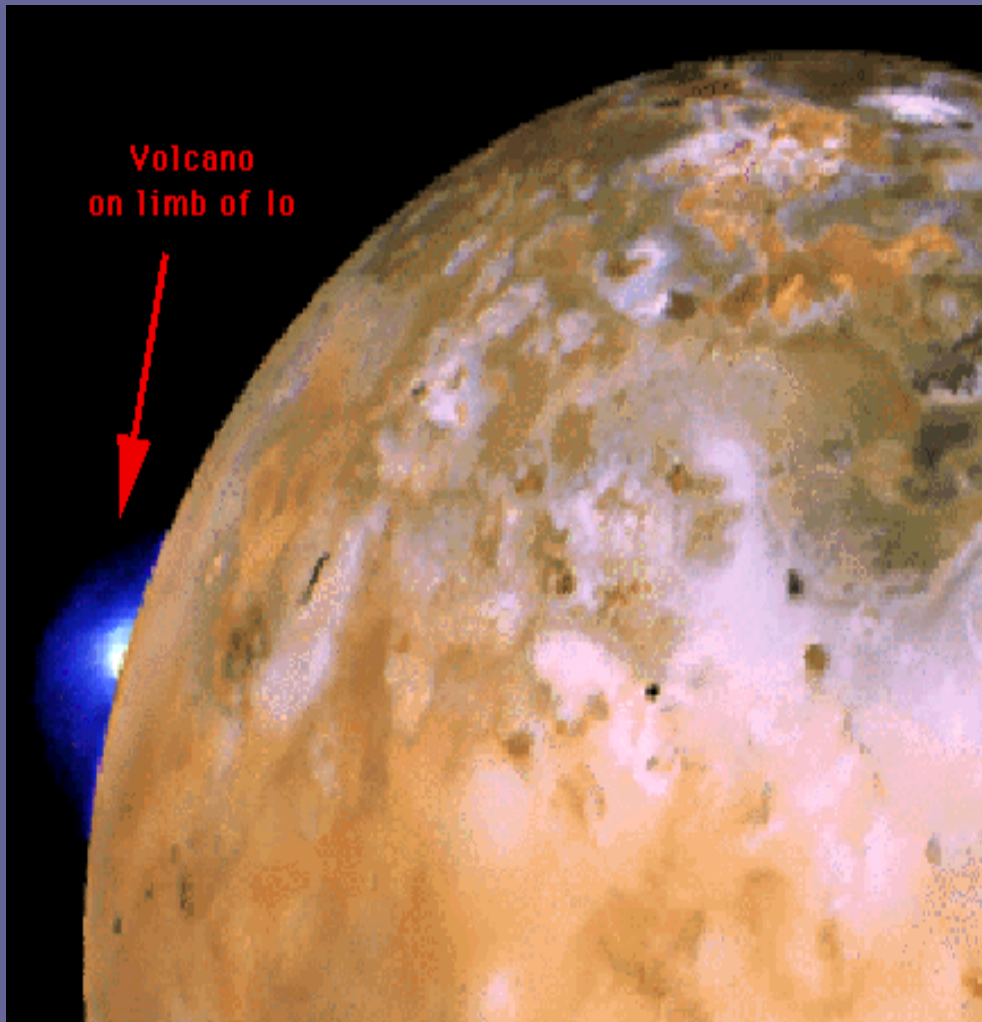


"Jupiter's four largest satellites and
the Earth and the Moon compared"

Copyright © Walter Myers

<http://www.arcadiastreet.com>

One of these Moons, Io, has active volcanoes on its surface.



Saturn is almost as large as Jupiter, and is most famous for its extensive ring system, possibly formed by a moon breaking up. Again, the rings can be seen through binoculars.



Saturn holds the record for having the largest number of moons, over 60, but only 13 are larger than 30 miles. Titan is the largest moon in the Solar System, slightly larger than the planet Mercury.

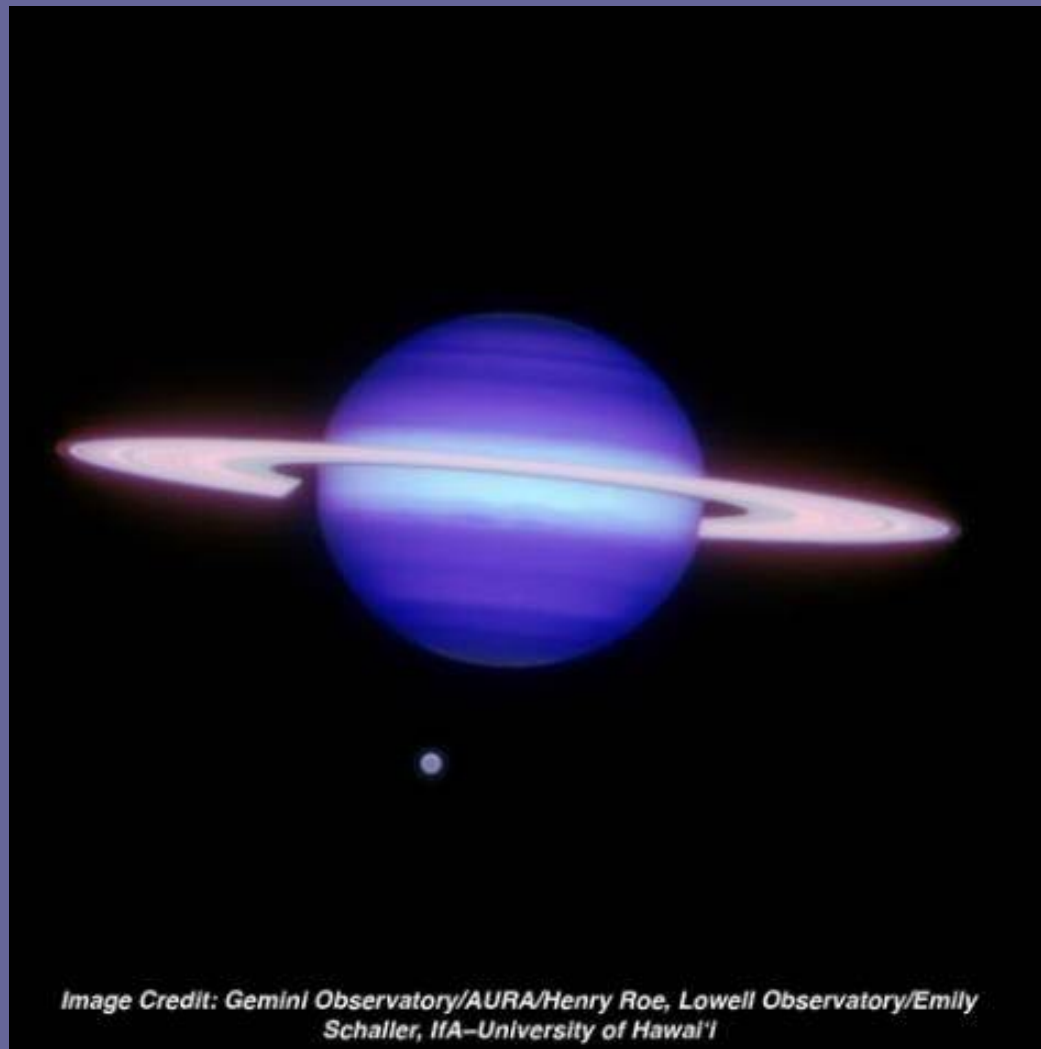
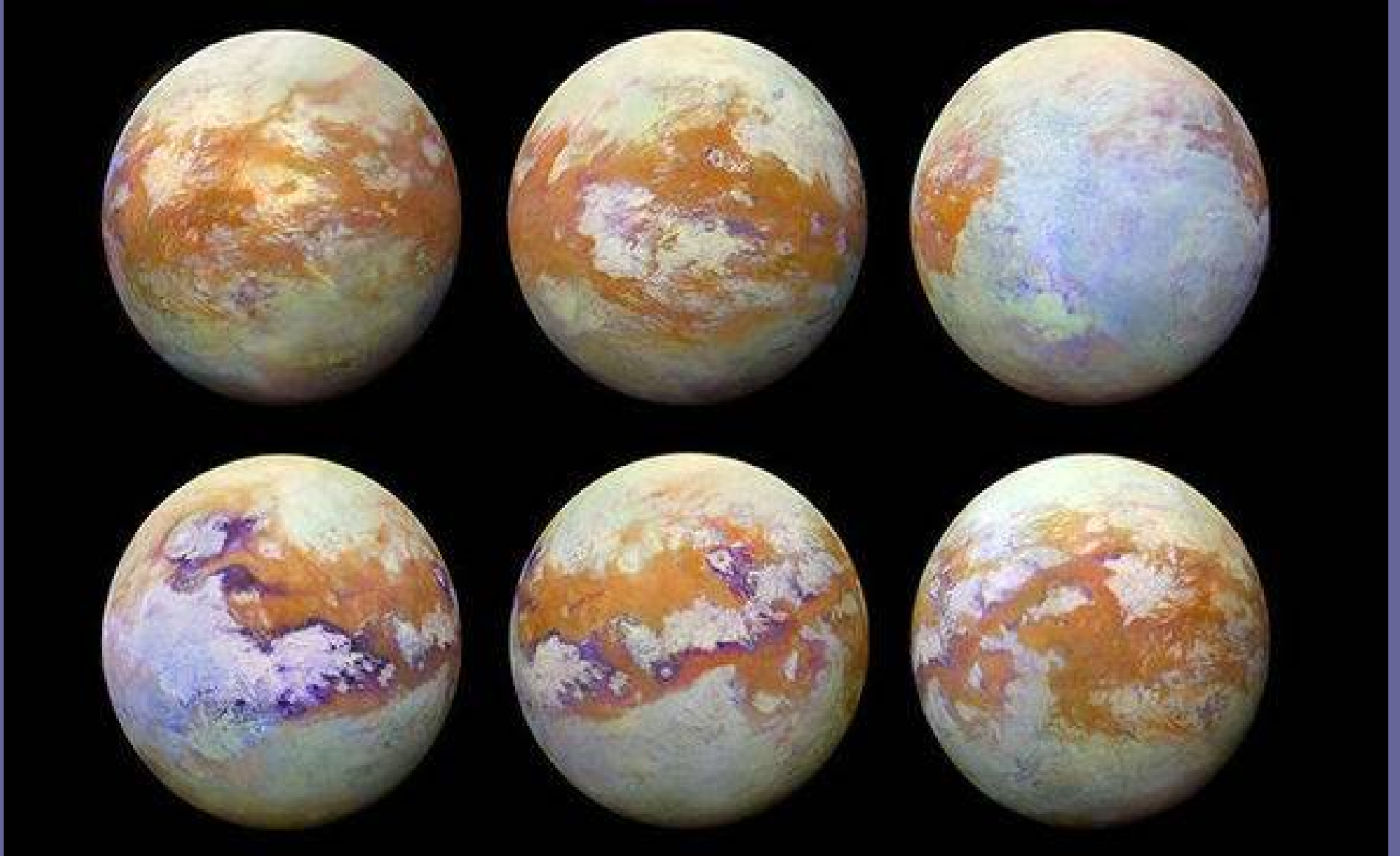
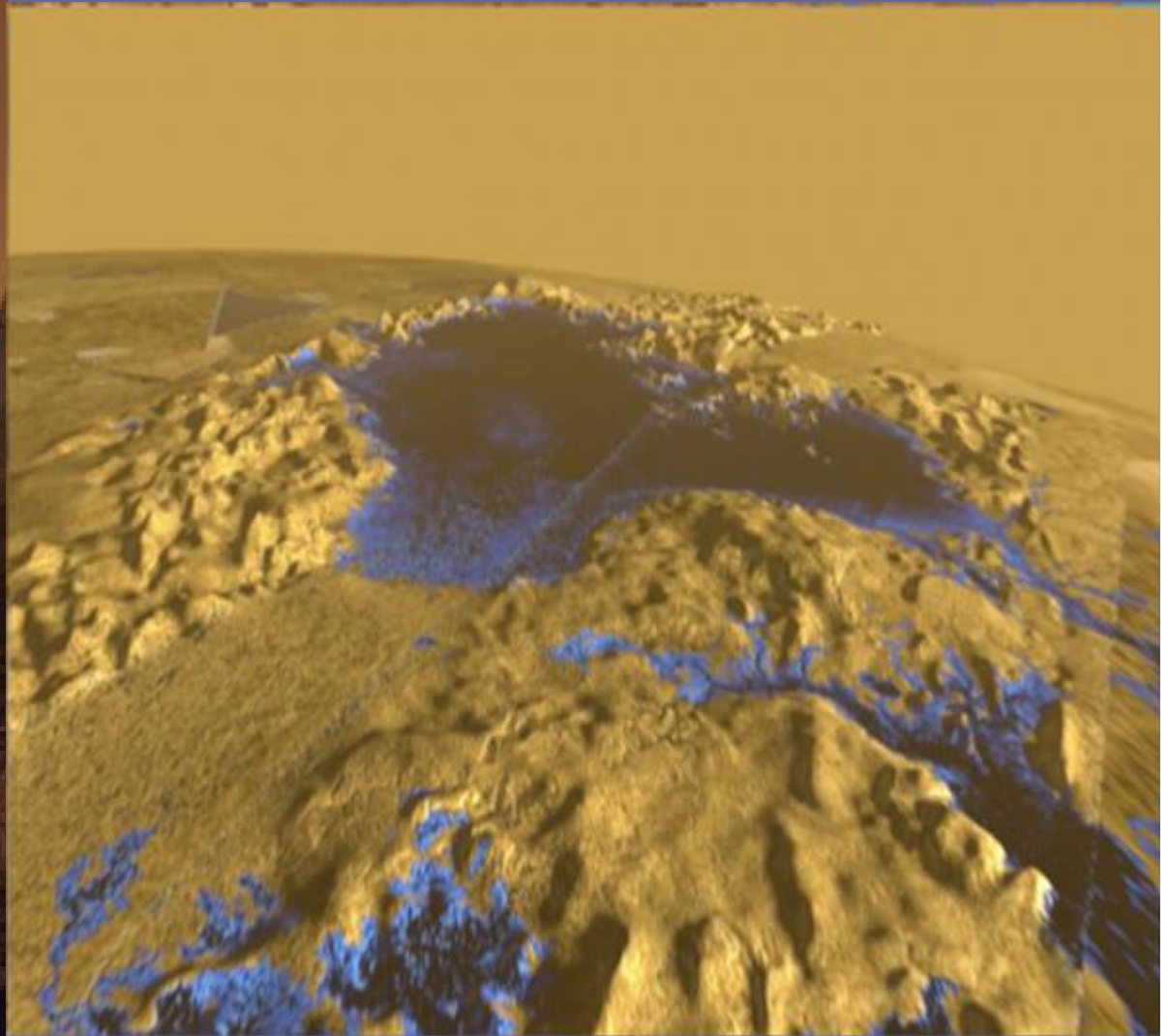


Image Credit: Gemini Observatory/AURA/Henry Roe, Lowell Observatory/Emily Schaller, IFA-University of Hawai'i

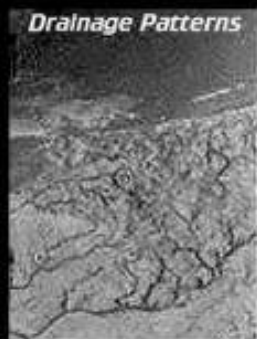
Titan has an atmosphere.



Titan's Surface has mountains and liquid lakes (Ethane and methane).



A space-craft called Huygens landed on Titan.



15 cm (6 inches)

Sharpened-Contrast Enhanced

Edge of Channel

Flow Patterns

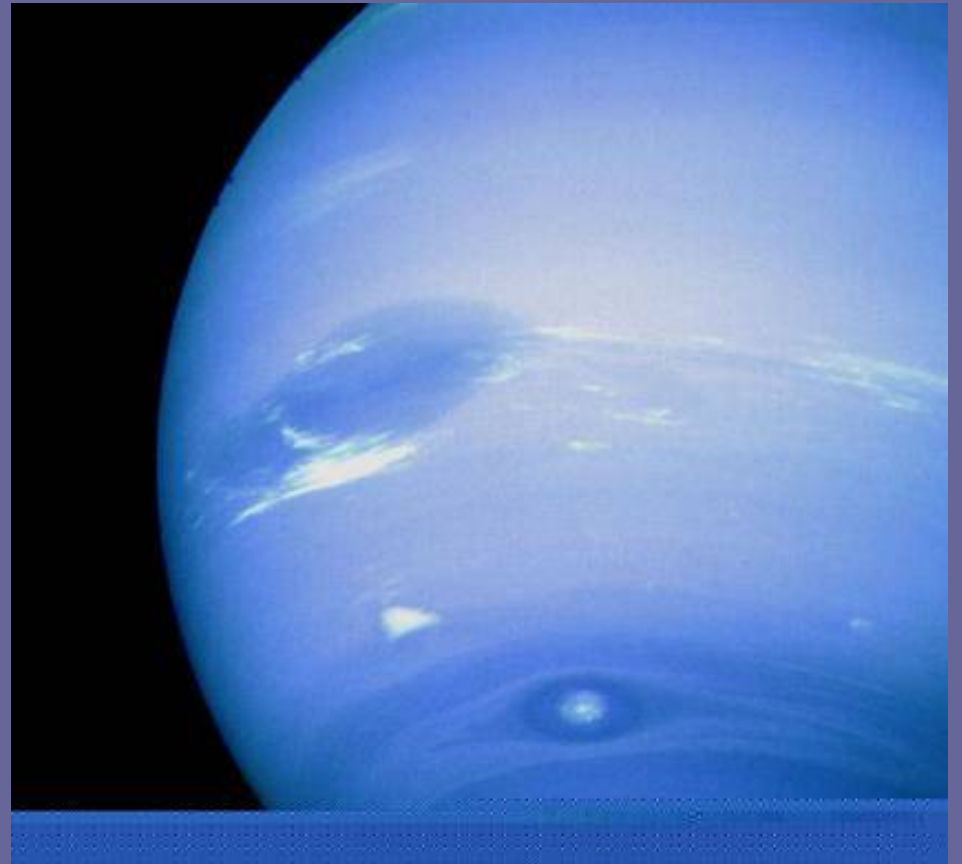
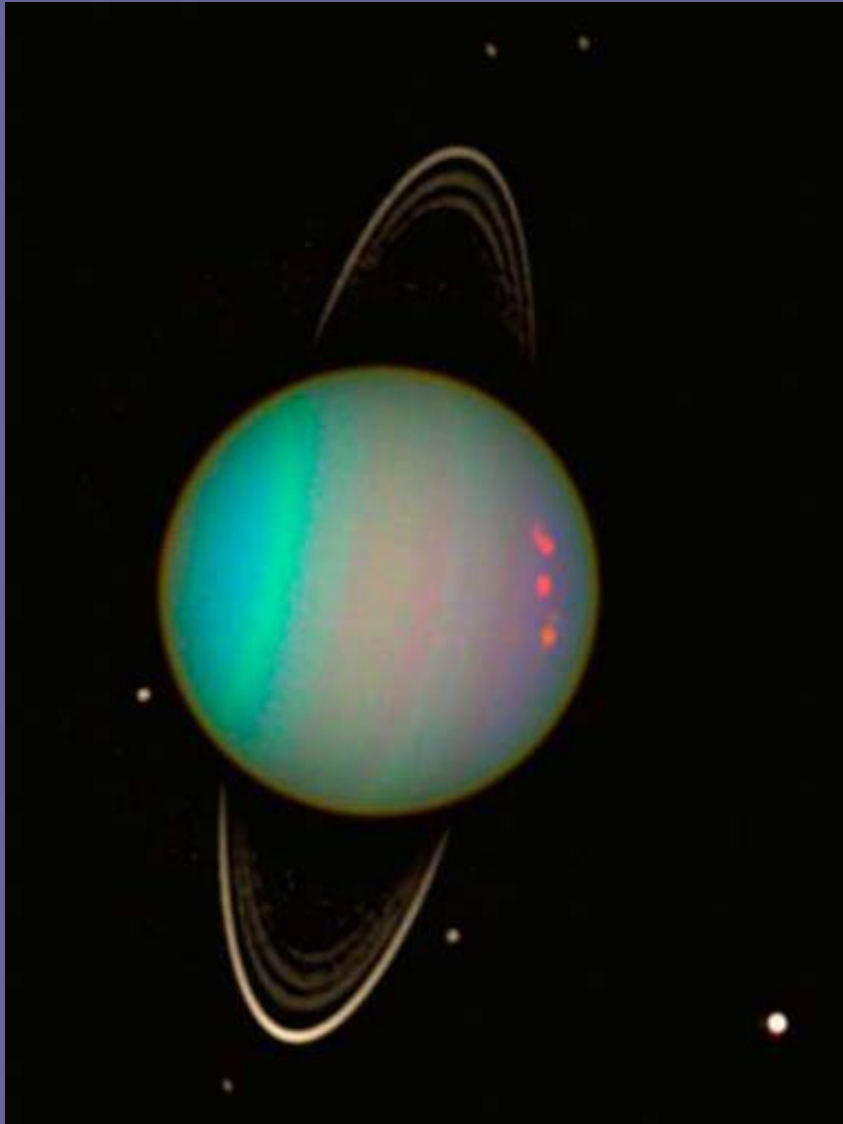
Drainage Channel

Released by ESA

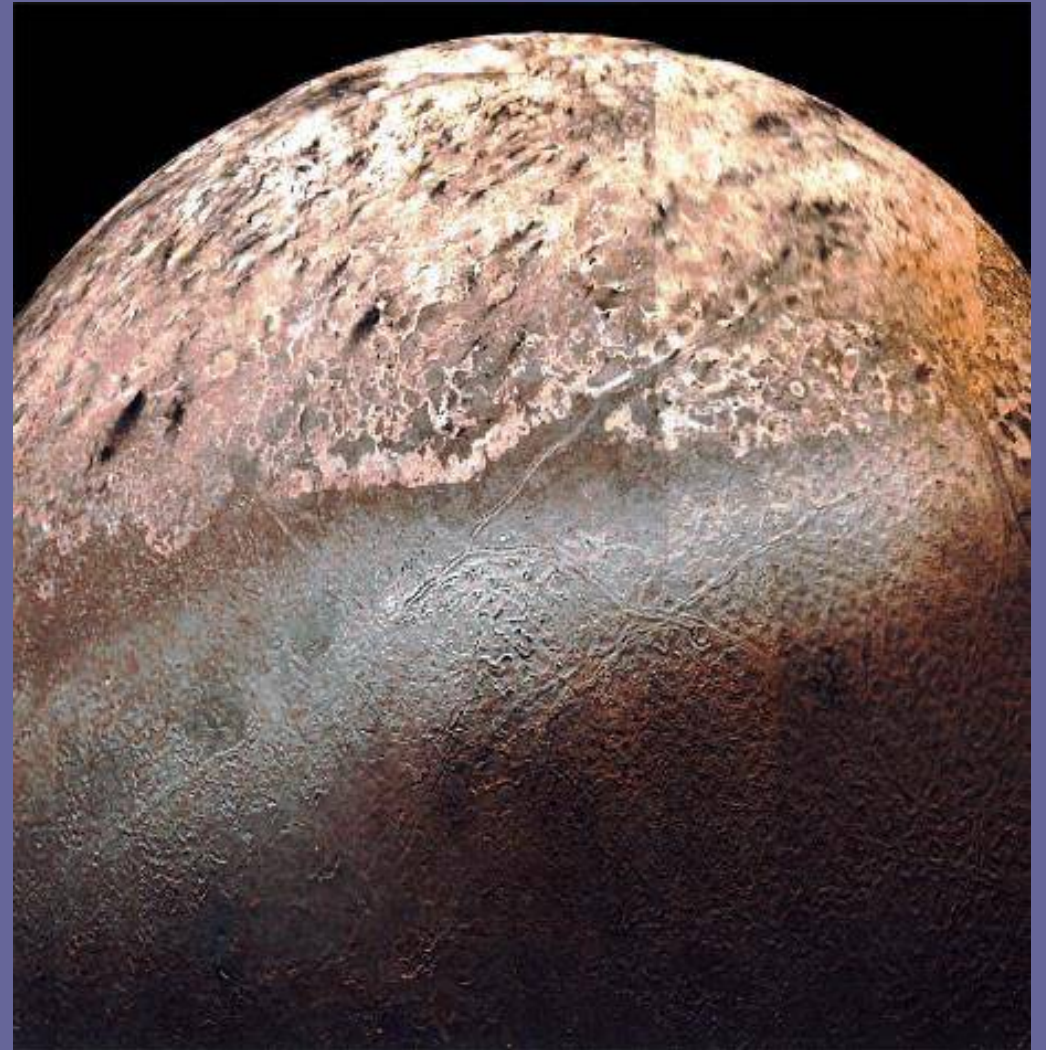
First Color Image

Huygens on Titan

There are also two planets that can only be seen through small telescopes, Uranus and Neptune. Both are similar in size, about 5 times larger than the Earth.



Neptune has one very large moon, Triton
which shows volcanic activity



The next easiest things to see are shooting stars, small objects from space burn up in the atmosphere due to friction with the air. Things the size of a frozen pea arrive every hour as in the left picture, while larger things, a few meters across, as on the right, every 100 years. On other bodies without an atmosphere they would hit and form craters.



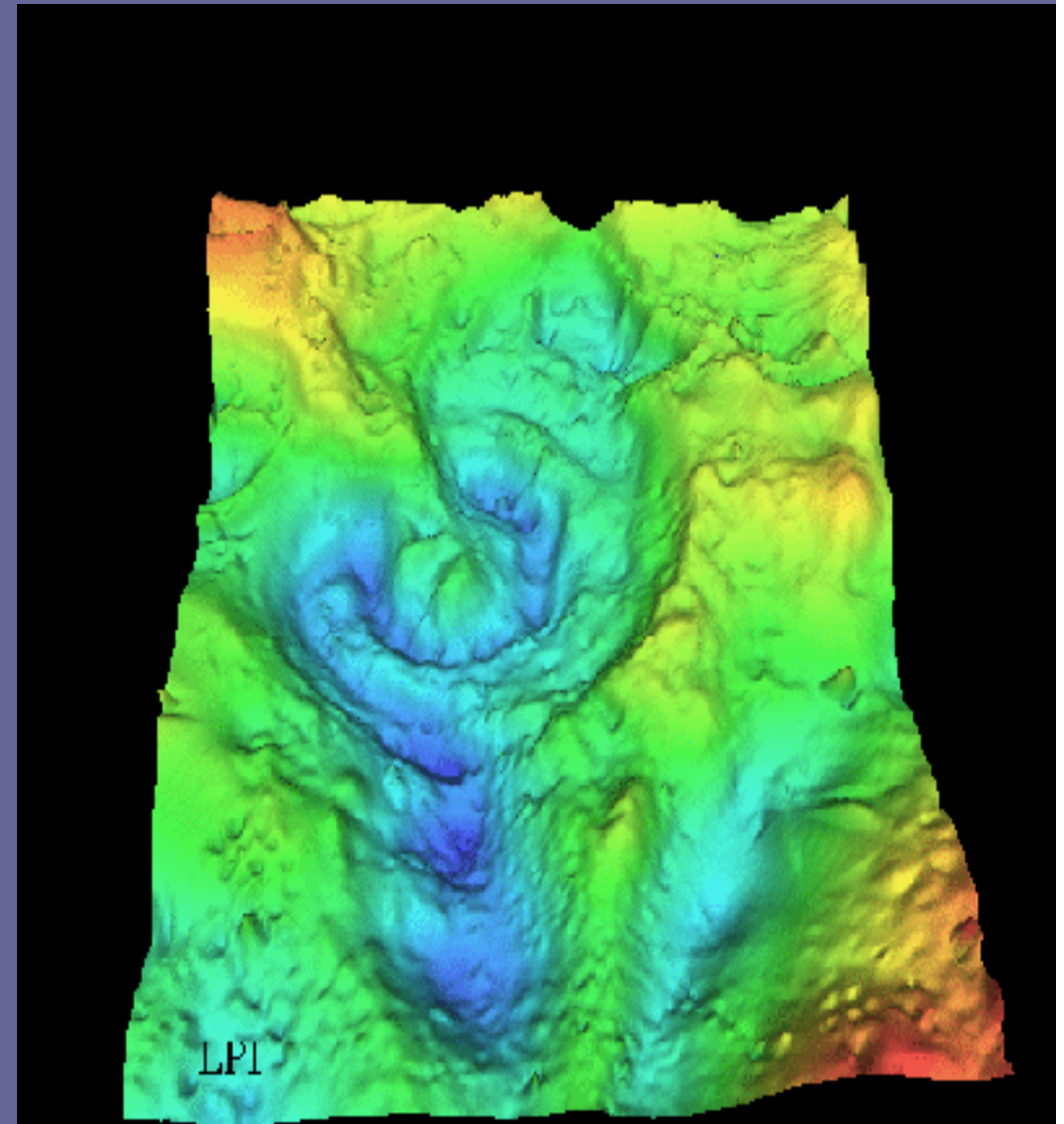
Fireballs are not as rare as people think. Here are some seen in the last few years.



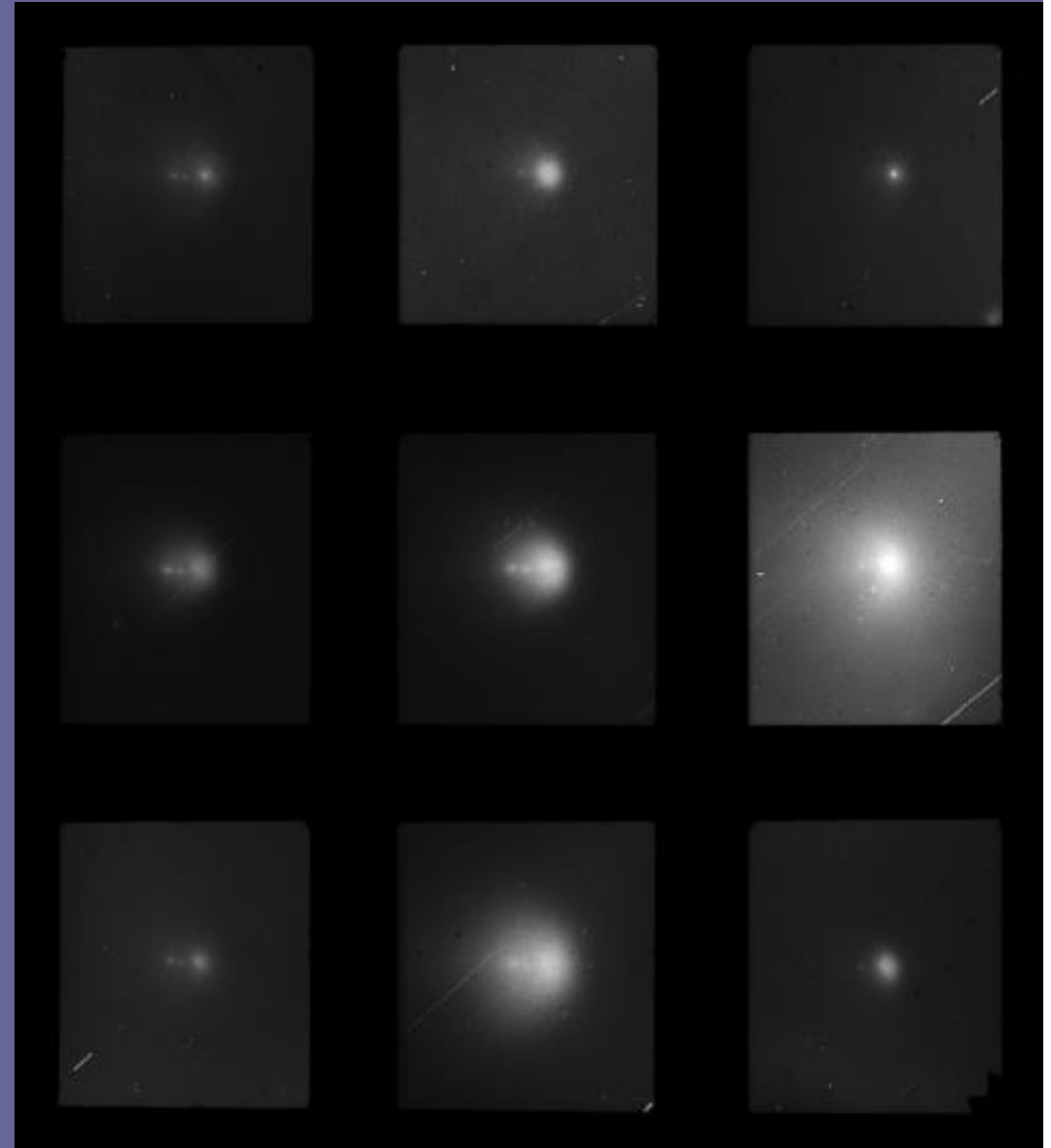
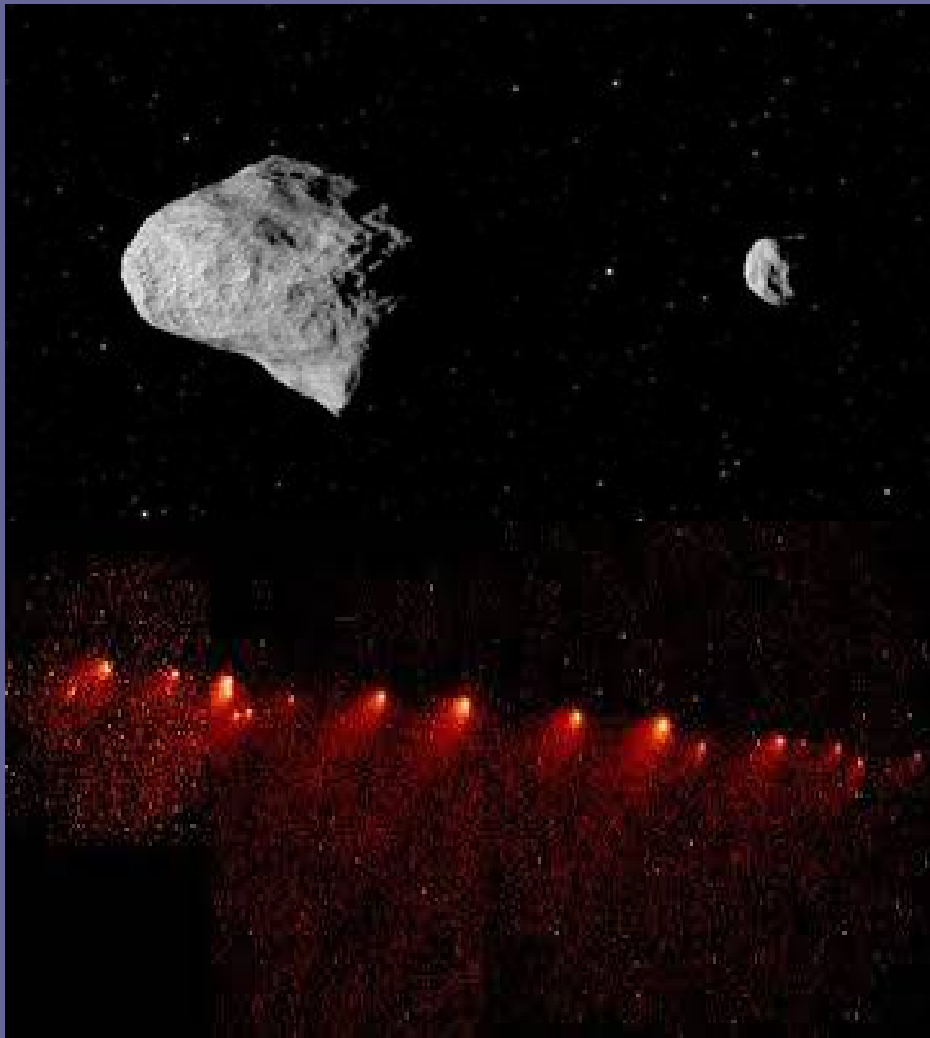
Larger bodies can survive and make craters on Earth.



One giant impact is generally accepted as being the cause of mass extinction.



These large bodies come from the break-up of asteroids and comets.



Comets can be seen with the naked eye if we are lucky. The last good one in the North was Hale-Bopp in 1995 while McNaught was spectacular in Australia in 2007.



I was involved in the ESA project Rosetta, a mission to land on comet 67P/Churyumov-Gerasimenko, launched in 2004.



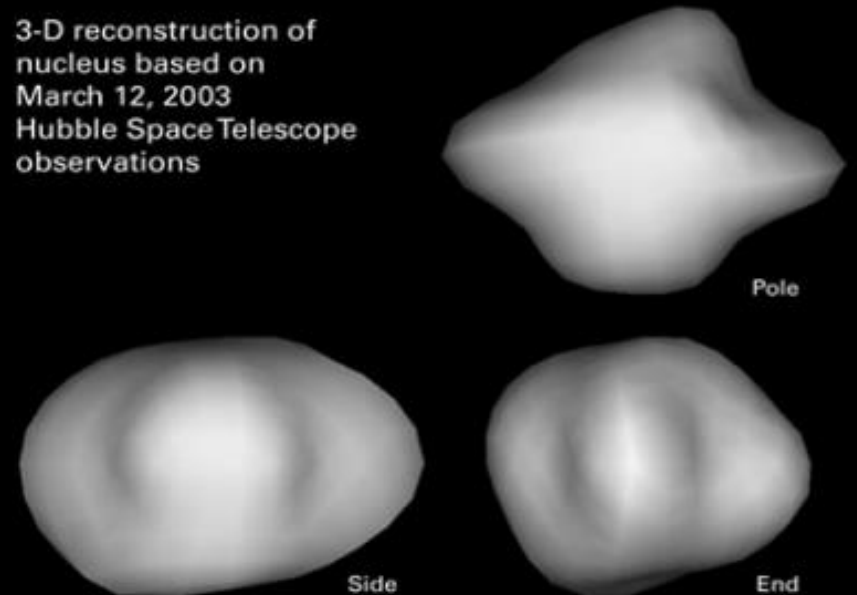
Comet 67P/Churyumov-Gerasimenko

- 67P roughly 5x3km.
Very little was known about 67P/ at that time..

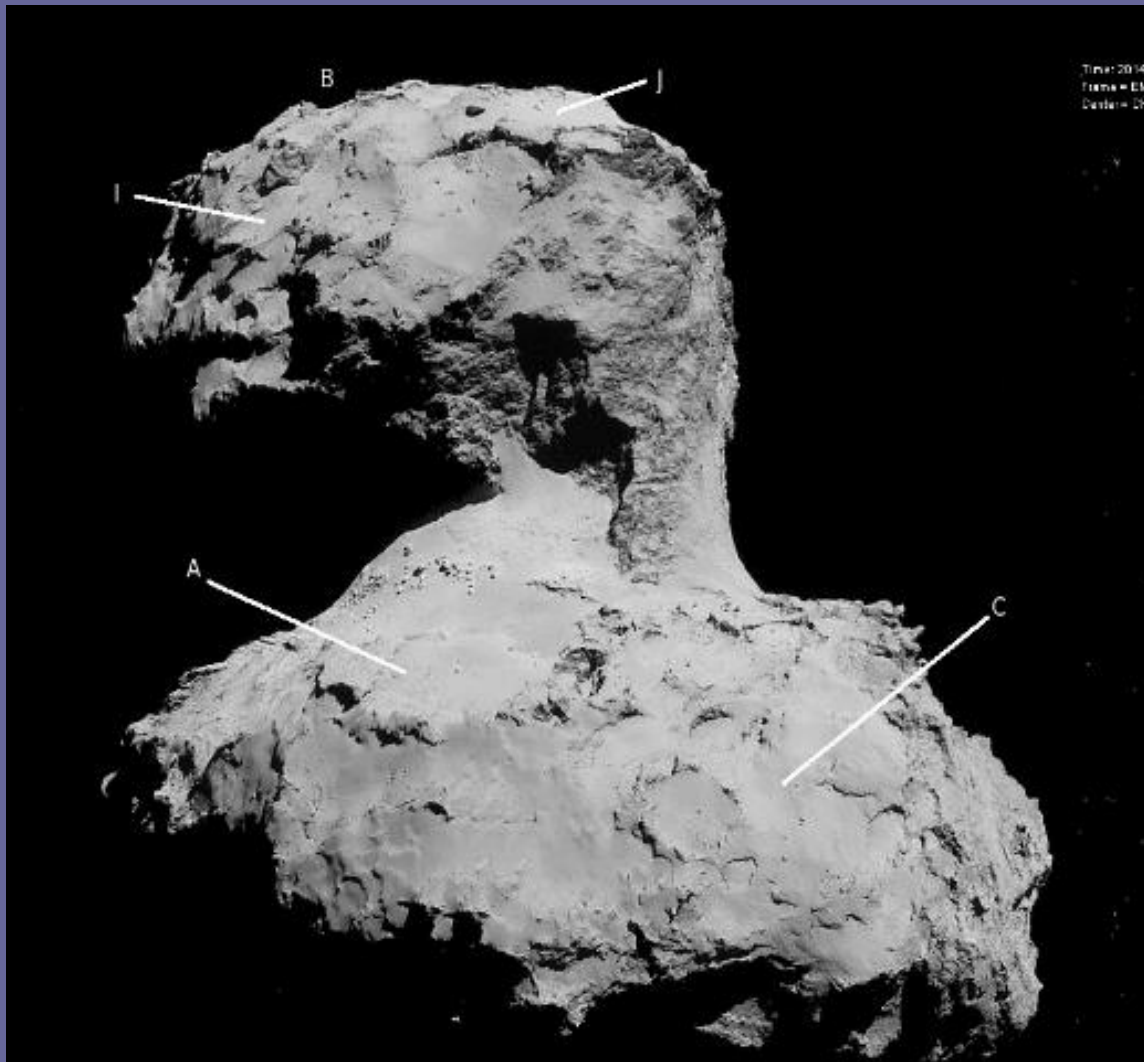


Comet 67P/Churyumov-Gerasimenko

3-D reconstruction of
nucleus based on
March 12, 2003
Hubble Space Telescope
observations



Selecting a landing site was problematic as the comet was much odder than expected.



Time: 2014-1
Frame: EMO
Date: 2010

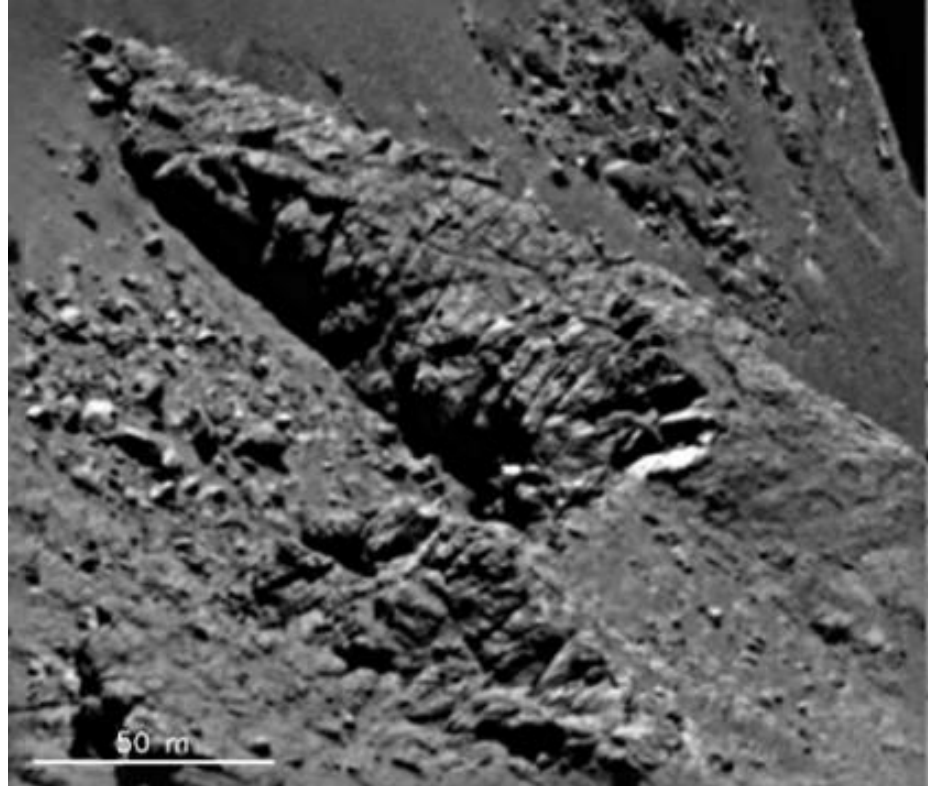
Comet 67P/Churyumov-Gerasimenko from Rosetta 31 August 2014
Credits: ESA/Rosetta/Navcam/Ken Kremer/Marco Di Lorenzo

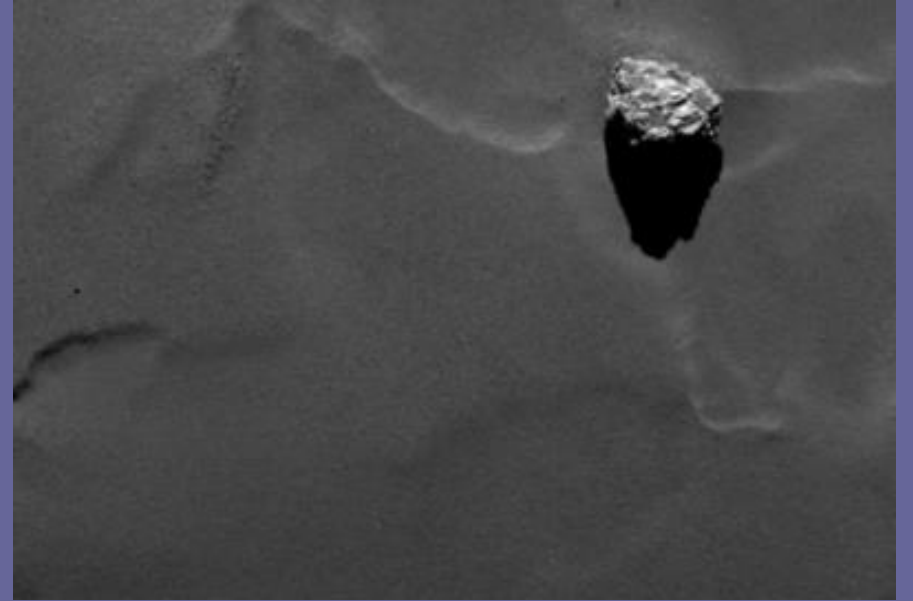
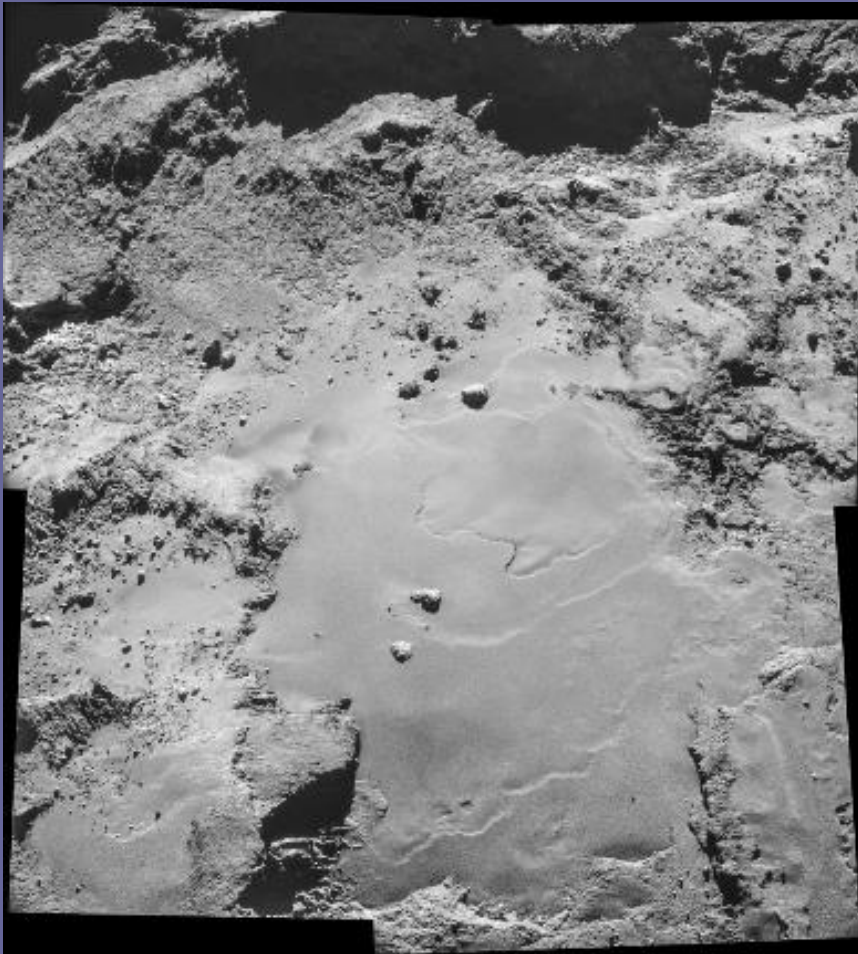


Comet 67P/Churyumov-Gerasimenko from Rosetta - 26 September 2014
Credits: ESA/Rosetta/Navcam/Marco Di Lorenzo/Ken Kremer

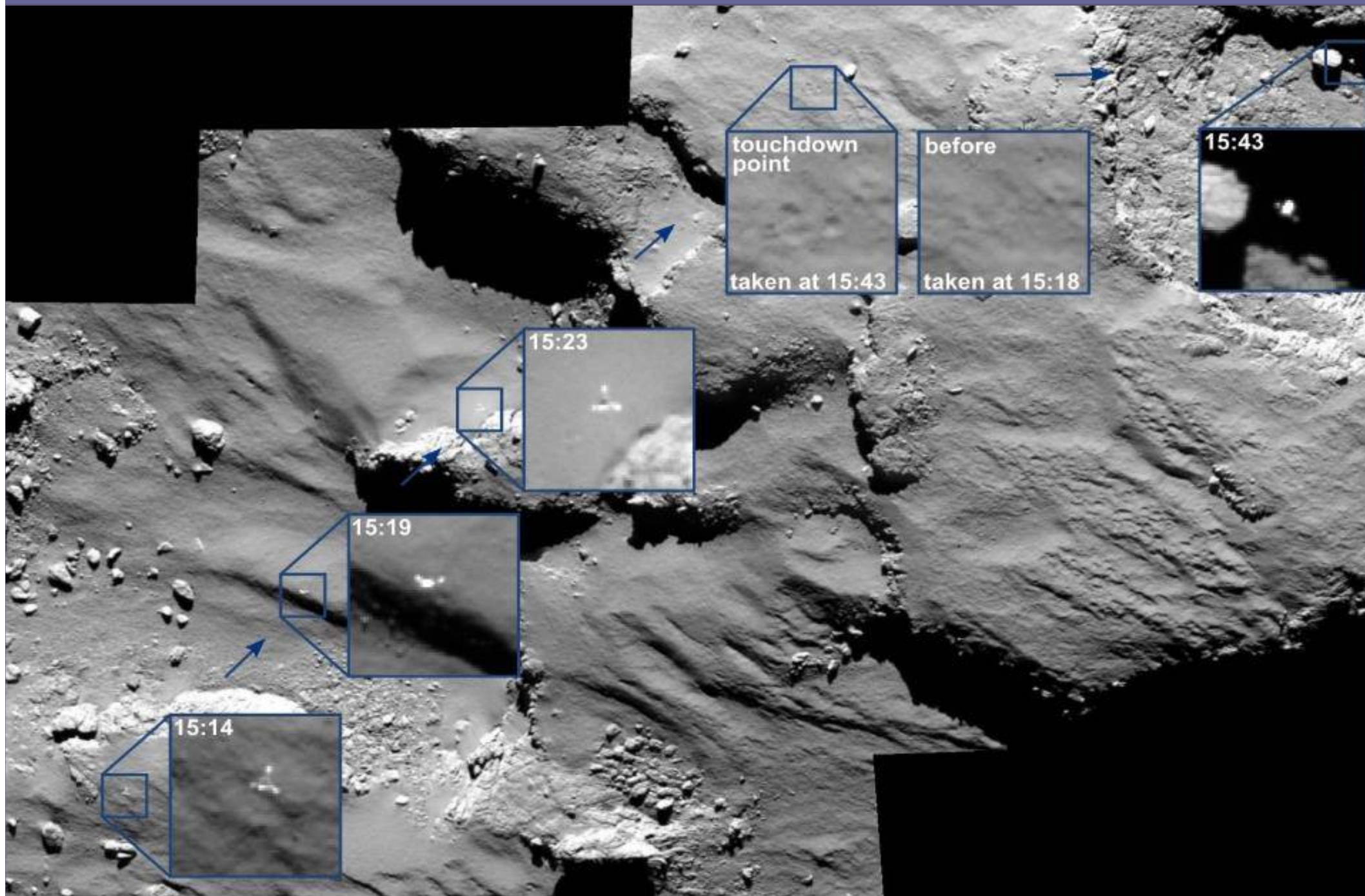
Philae separated from the Rosetta orbiter on 2014 November 12 at 07h30 UTC. Some nice images were obtained both by Philae and Rosetta, while close to the comet.



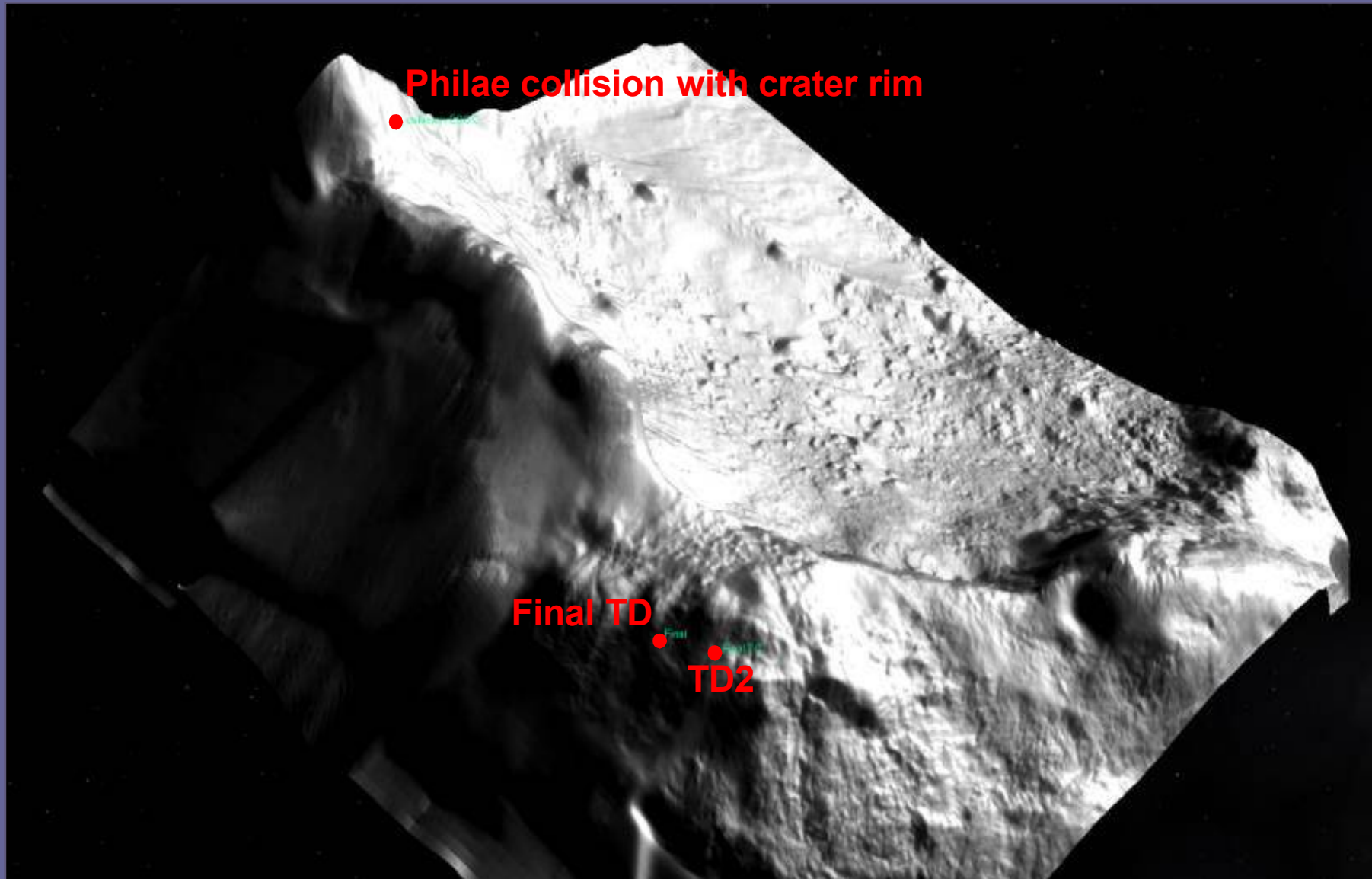




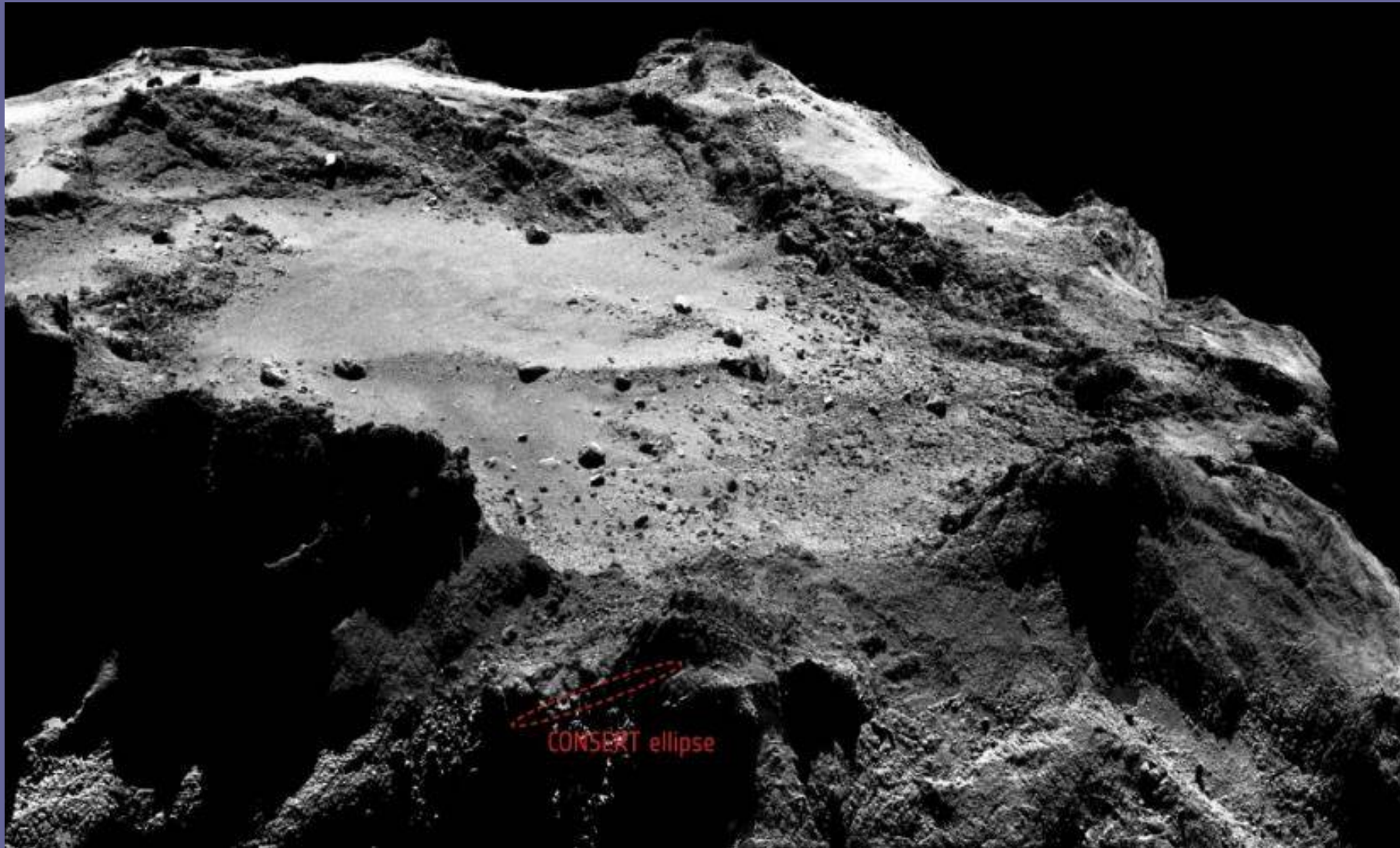
Philae touchdown scenario.



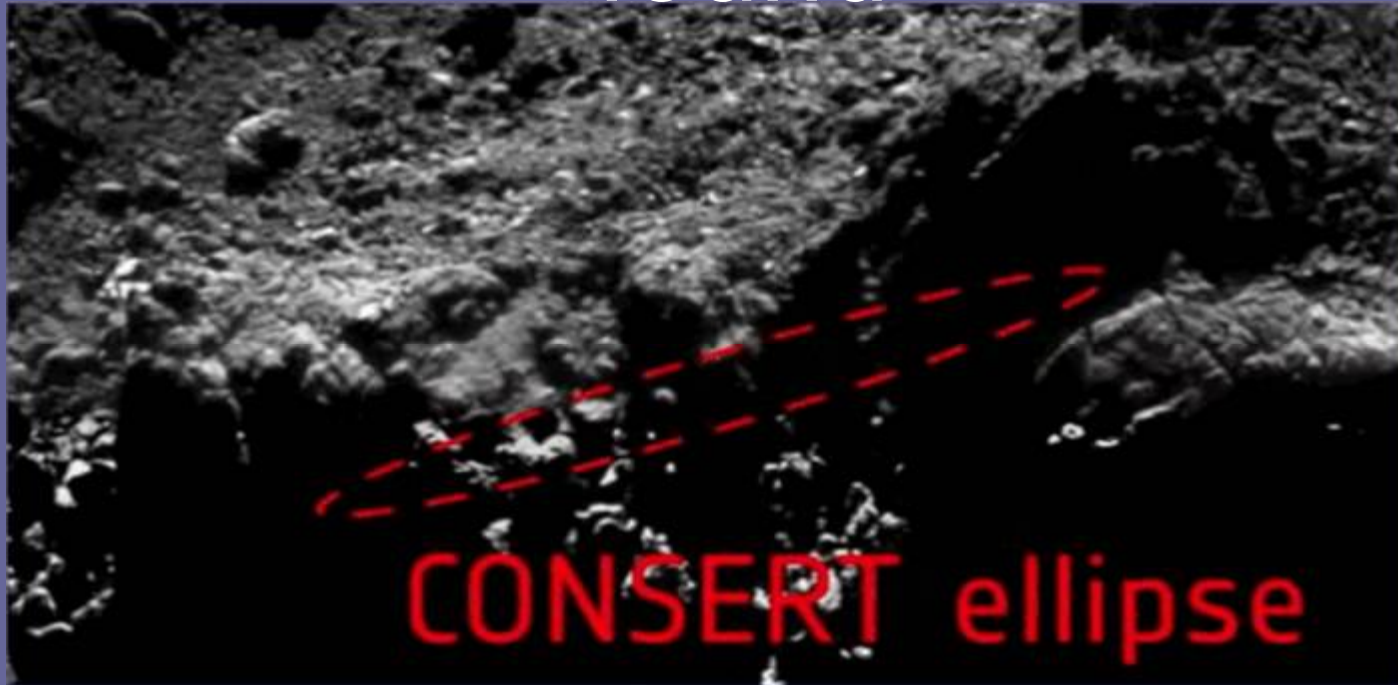
- Unfortunately, Philae bounced twice before finally coming to rest at 17h31, about 1km from the intended site.

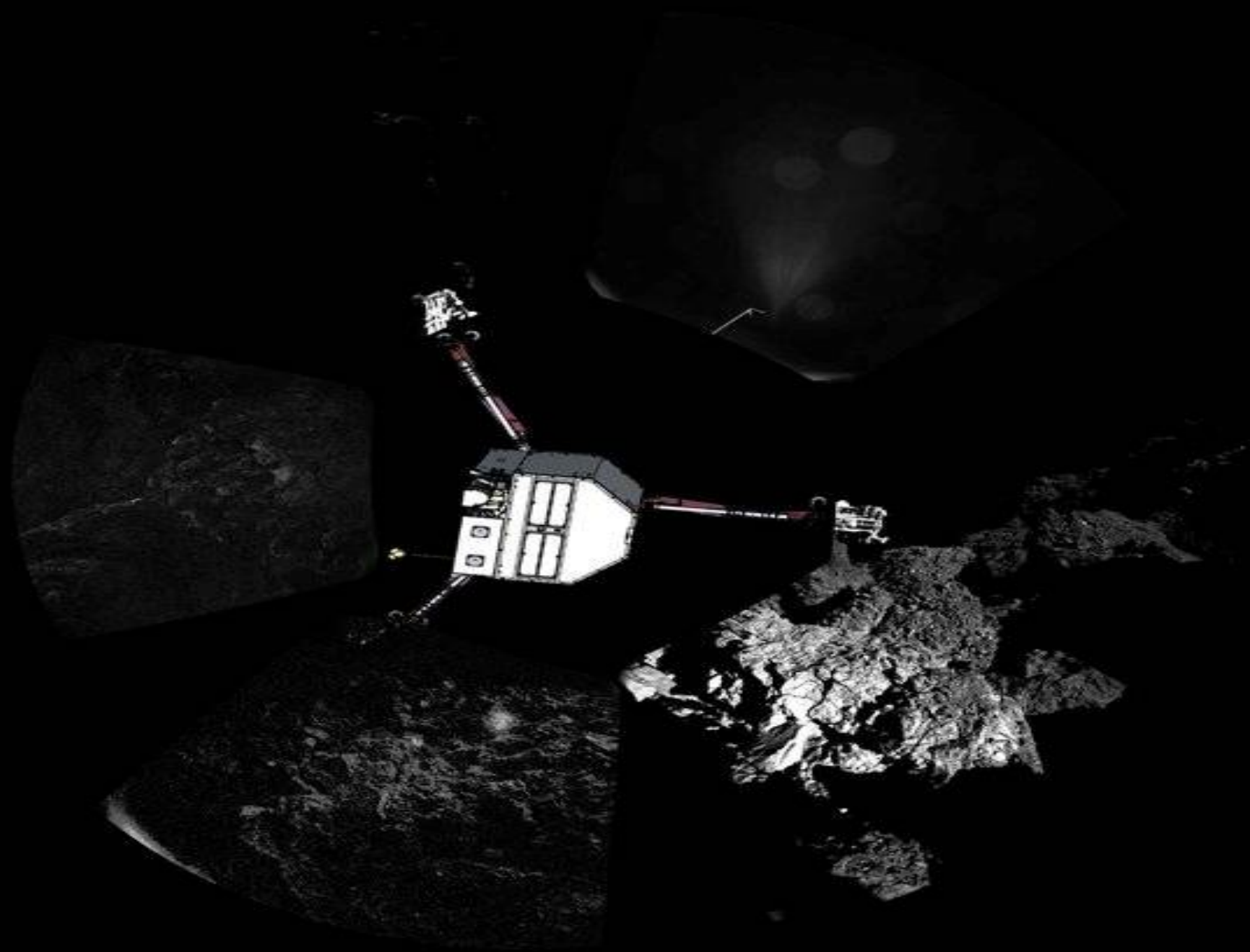


The improved landing position superimposed on an OSIRIS image

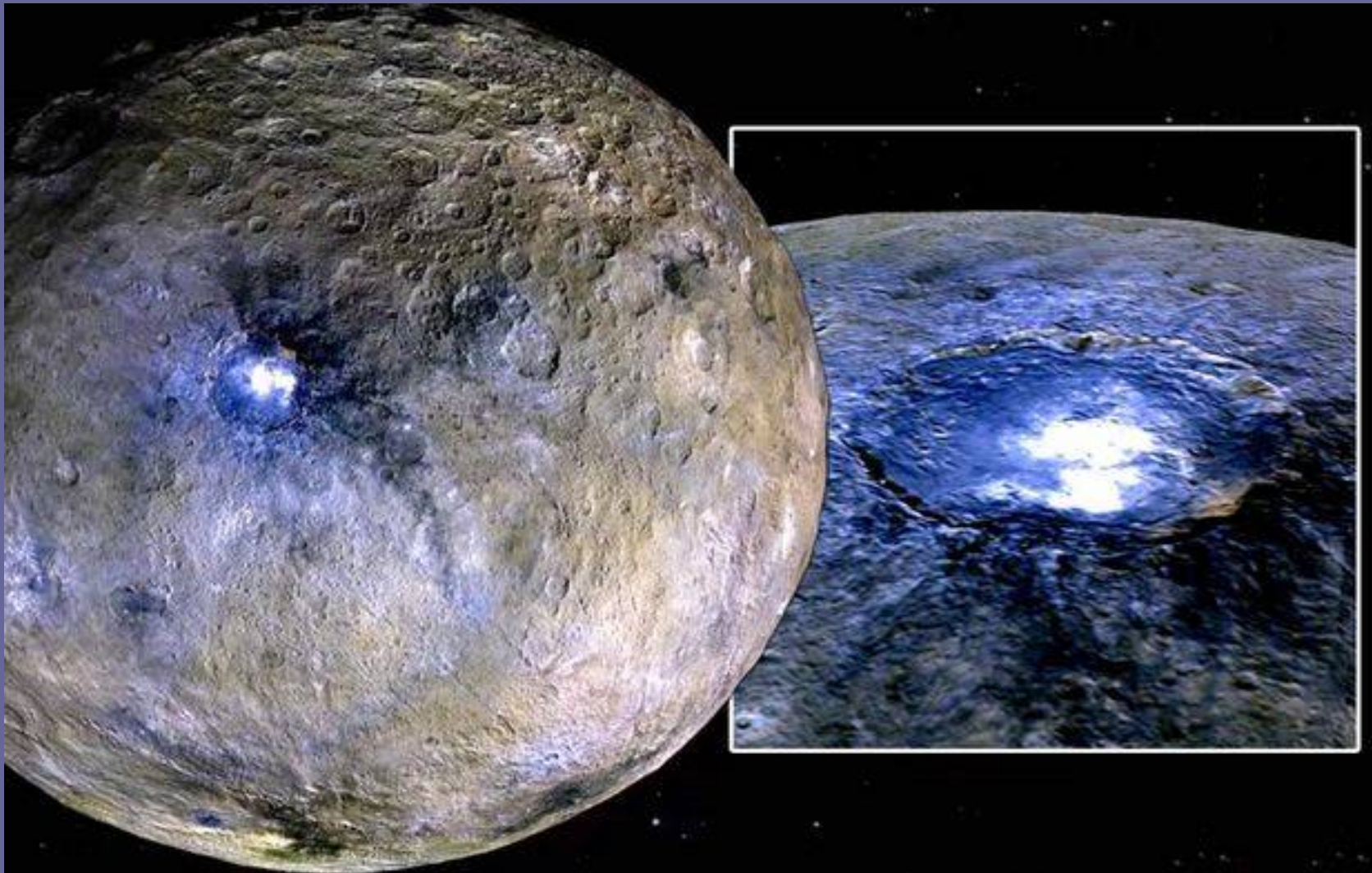


On November 5, 2016, Philae was found

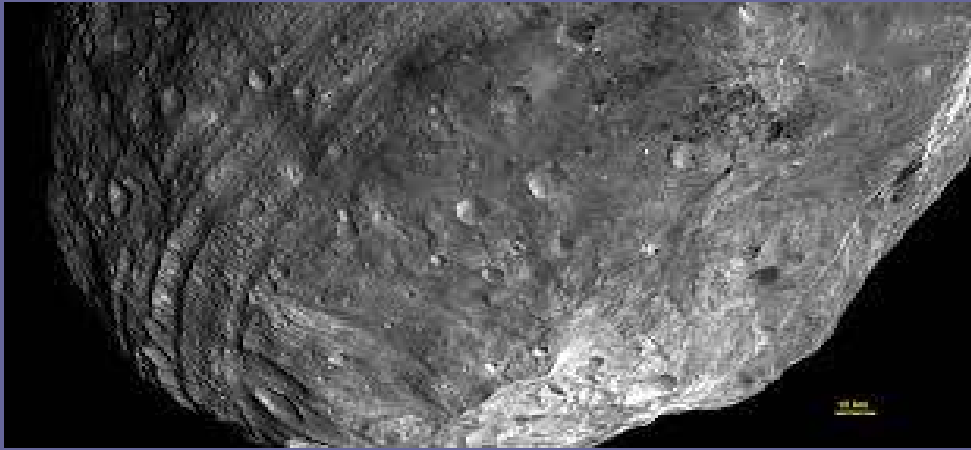




Between Mars and Jupiter there is a family of smaller bodies, called Asteroids. They can be seen with small telescopes, the largest is Ceres about 600miles across.



Other interesting ones are Vesta,
Psyche and Ikotawa.



THE END

