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Recent Discovery Of 8000 Near-Earth Objects, and Rocket Fuel Mass

It's not about you, she scolded
me. "It's about getting the
kids interested in science."

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Idaho National Laboratory of United States Dept. of Energy
West Wind Elementary School -- Science Fair
Lancaster, California
20 January 2012

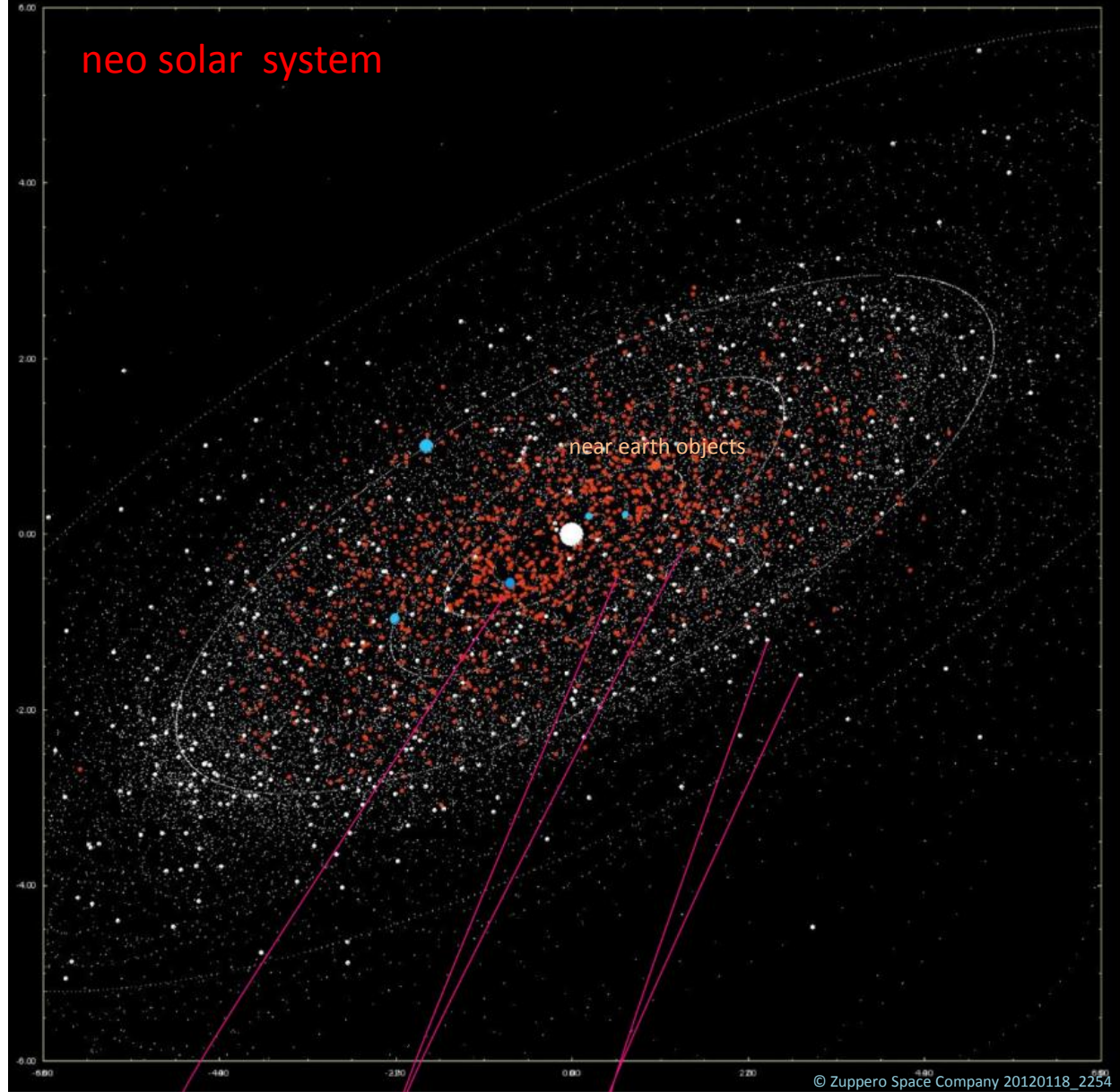
We wanted to leave Earth, and become a space faring Life Form. NASA showed us we could go to the moon repeatedly.

But there was no rocket fuel in space, so we were stuck here.

And then, astronomers discovered we were immersed in a swarm of space rocks. NASA warned us they might be dangerous and crash into Earth. They wanted to know how to move them out of a collision course.

At the Department of Energy, we found how to move them, but there was no rocket fuel in space.

We were out of luck.



you are here near earth objects comets

I'm going to tell you :

- recent discovery
 - massive swarm
 - nearly invisible
 - near Earth objects,
 - a good percent : hydrated
- rocket fuel mass
water is everywhere.**

It is like finding massive oil, easy to get out of the ground, just about the time when they were inventing engines.

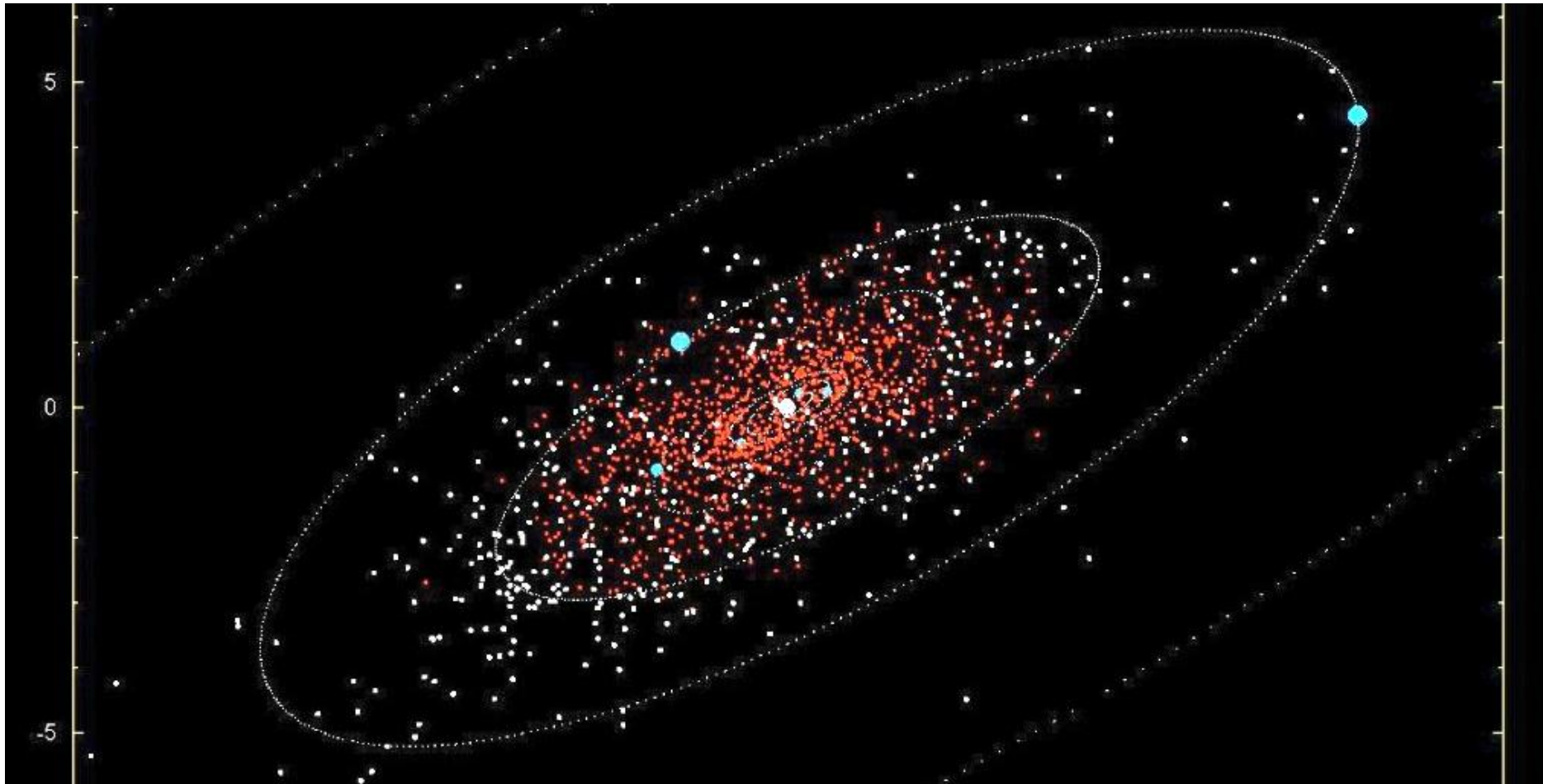
Only, this is rocket fuel mass.

Some of it is easier to get to than landing on and getting back off the moon.

You live in the middle of a swarm of tiny worlds, just above your sky.

If you had eyeballs like an owl, each eyeball three feet across, and if you could see infrared, like a rattlesnake, only way better, you could see what the near earth object astronomers see.

This is a CAT scan of the new solar system, one with swarms of near earth objects



This is a CAT scan of the solar system as of 12 April 2011. It was tuned to include dark periodic comets of the Jupiter family, and the recently discovered *swarm* of "**near earth objects.**" Of the more than 8000 known, only about 1200 of them are shown here. The 1200 had to be bigger than 1/2 kilometer in size, big enough to be global disaster affecting food supply immediately if colliding with Earth.

Sun in the middle, the bright star. Count the dotted orbit rings.

Mercury, Venus, Earth, Mars, Ceres,

and **Jupiter**, big blue star,

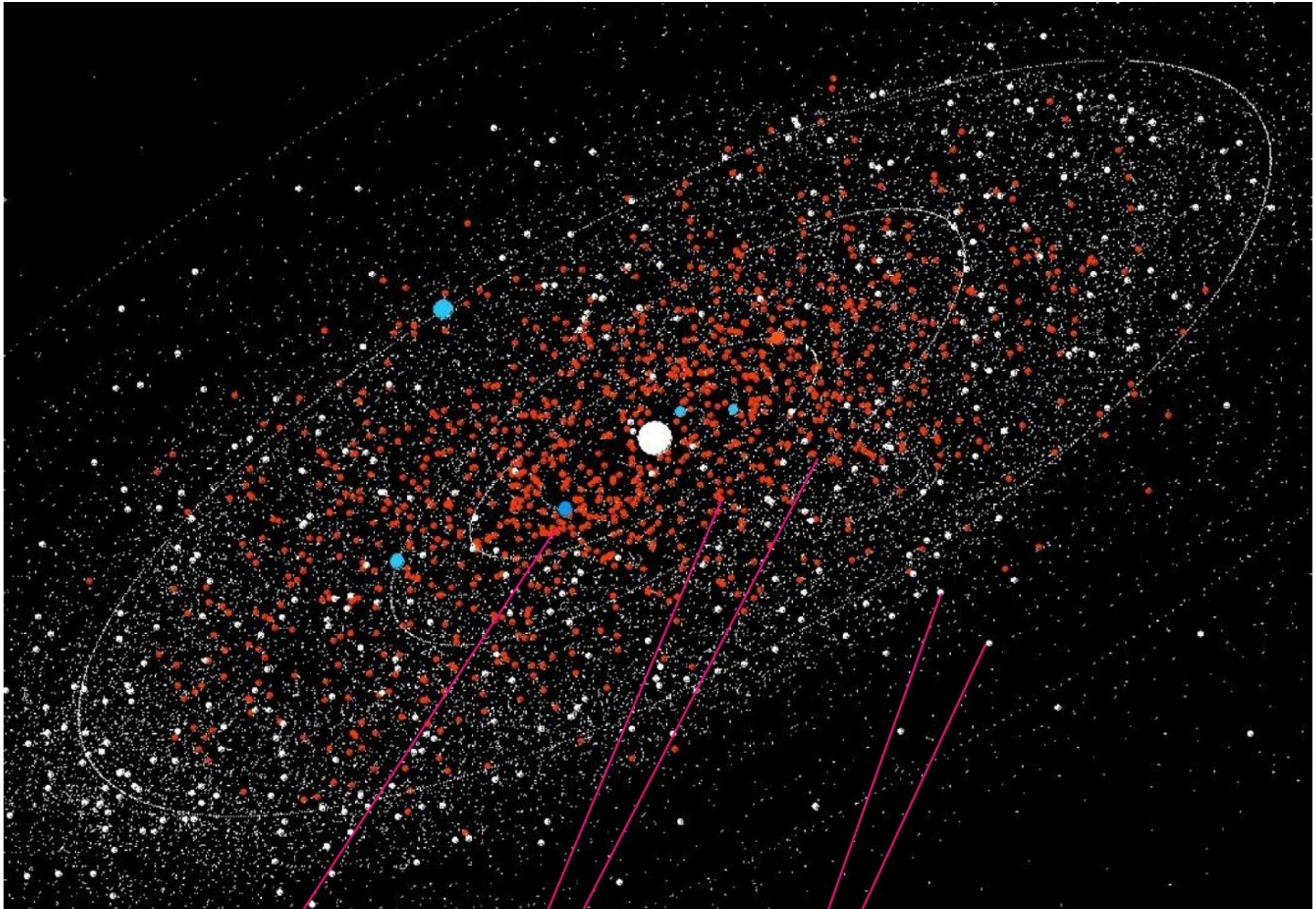
upper right, **Saturn**, big blue star.

white stars and dust **Jupiter family comets**

orange-red stars **NEOs** brightness size greater than 1/2 km

We knew about the dark comets, the tiny white stars. They were farther out, most of the time.

We did not know of the orange red stars until digital camera's were attached to computer pointed telescopes, all over the world.



Sun in the middle, the bright star. Count the dotted orbit rings.
Mercury, Venus, Earth, Mars, Ceres,
and **Jupiter**, big blue star, and
white stars and dust **Jupiter family comets and their orbit dust**

red orange objects: Some tens of percent are expected to have water in some form. Heating friable regolith to self cleaning oven temperatures releases water. Water is everywhere.

Digitally Algorithmic Hyper spectral Image
Zuppero Space Company

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This is one of the first Nuclear Rocket Engines. It used hydrogen as its rocket fuel mass.

The nuclear reactor provided the rocket fuel energy.

Could we use the water in a nuclear rocket?



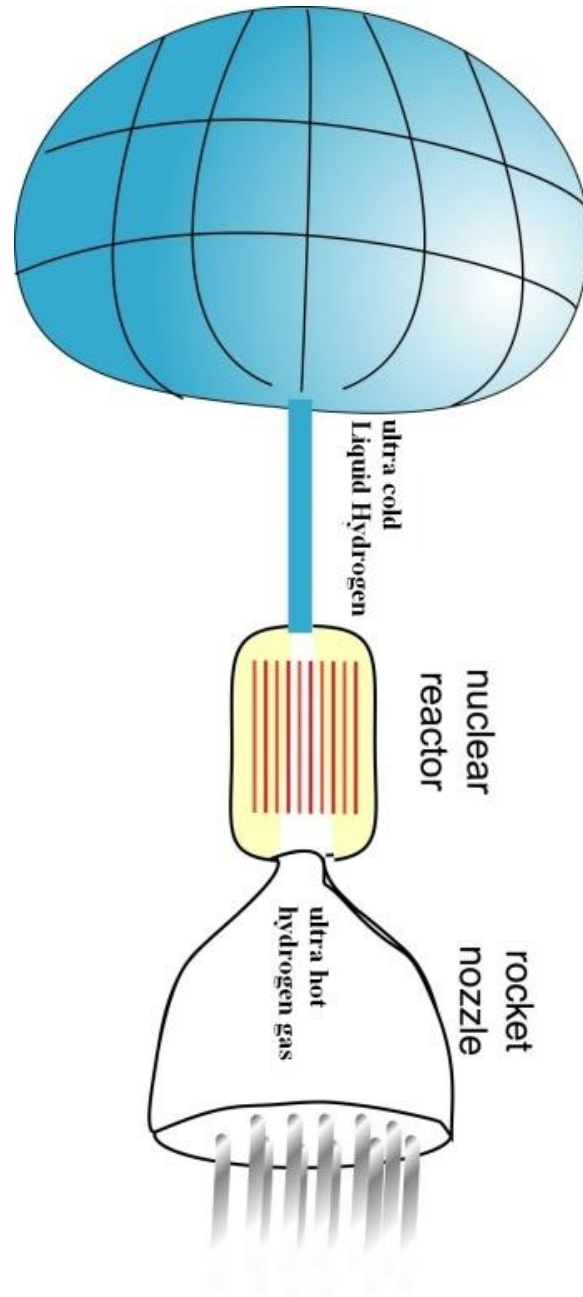
Someone joked , "This is the Russian version."

It was a joke because many of their designs looked like ours.

What would the Chinese version look like?

There are only so many ways to make something that will work..

They look alike.



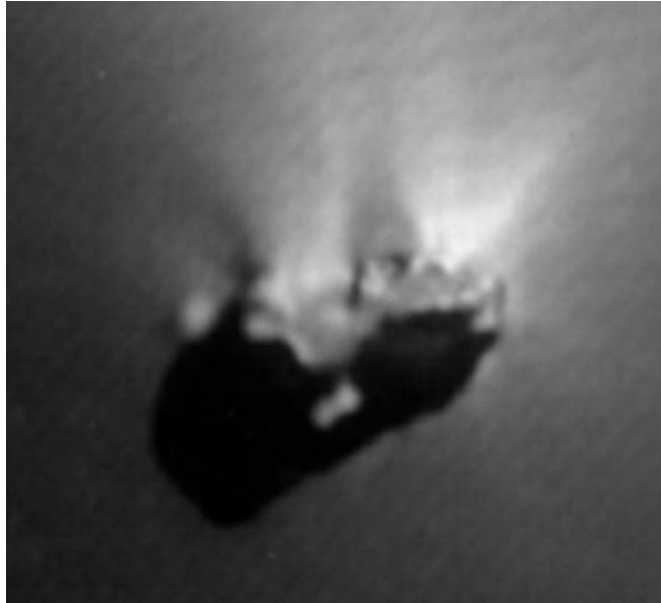
NERVA used liquid hydrogen for its rocket fuel mass.

How much liquid hydrogen (LH2) is there in a glass of water?

How much hydrogen gas is there?

Water is hydrogen ore.

You need to do expensive work to get the hydrogen and oxygen out of the water.



Dr Marsha Neugebauer, JPL, Cal Tech

"Here is your water"

she told me, as she pulled one of the first ever images of a comet out of her briefcase, after her talk on plasma something or other.

Most thought the comet would be the closest water to in space, until we get out as far as Jupiter.

TABLE II
Abundance of Probable Parent Molecules in the Coma of Comet Halley*

Molecule	Relative Abundance	Comments
Comet P/Halley		
H ₂ O	100	Remote and <i>in-situ</i> detections ¹
CO	~ 7	Direct (native) source ²
	~ 8	Distributed source ²
H ₂ CO	0-5	Variable ³
CO ₂	3	Infrared (Vega 1 IKS)
CH ₄	<0.2-1.2	Groundbased infrared ⁴
	0-2	Giotto IMS ⁵
NH ₃	0.1-0.3	Variable. ⁶ Based on NH ₂
	1-2	Giotto NMS ⁷
HCN	0.1	Variable. Groundbased radio
	< 0.02	Giotto IMS
N ₂	~ 0.02	Groundbased N ₂ ⁺ emission
SO ₂	< 0.002	Ultraviolet (IUE)
H ₂ S	—	Giotto IMS ⁸
CH ₃ OH	~ 1	Giotto NMS and IMS ⁹
Other Comets		
CO	20	West (1976 VI)
	2	Bradfield (1979 X)
	1-3	Austin (1990 V)
CH ₄	<0.2	Levy (1990 XX) ¹⁰
	1.5-4.5	Wilson (1987 VII) ¹¹
CH ₃ OH	1-5	Variable ¹²
H ₂ CO	0.1-0.04	If a parent species ¹³
HCN	0.03-0.2	Several comets ¹⁴
H ₂ S	0.2	Austin (1990 V); Levy (1990XX) ¹⁵
S ₂	0.025	IRAS-Araki-Alcock (1983 VII) ¹⁶

* Table adapted from Mumma et al. (1993).

¹ Water was detected directly by infrared spectroscopy (Mumma et al. 1986; Combes et al. 1986) and by mass spectroscopy (cf. Krankowsky et al. 1986).

² CO was detected directly at ultraviolet wavelengths (Feldman et al. 1987; Woods et al. 1994, 1997) and in neutral mass spectra (Eberhardt et al. 1997).

Weissman and Campins asked
¿What molecules would be
the source of the visible,
tail of a comet ?

Answer: mostly water molecules.
And some poison: carbon monoxide

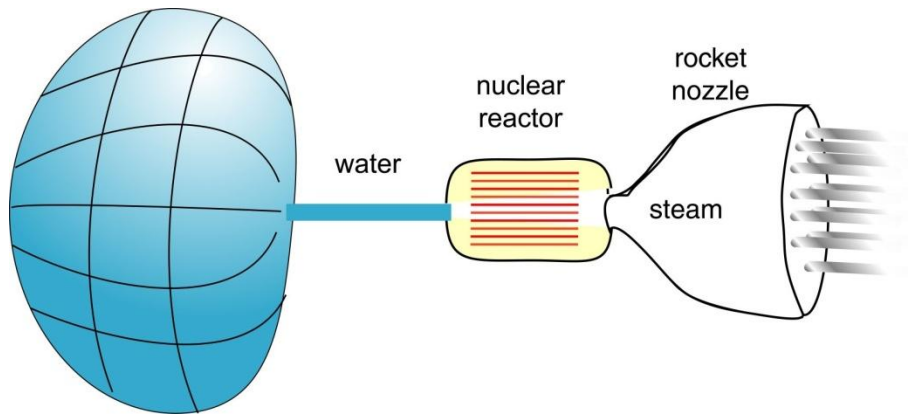
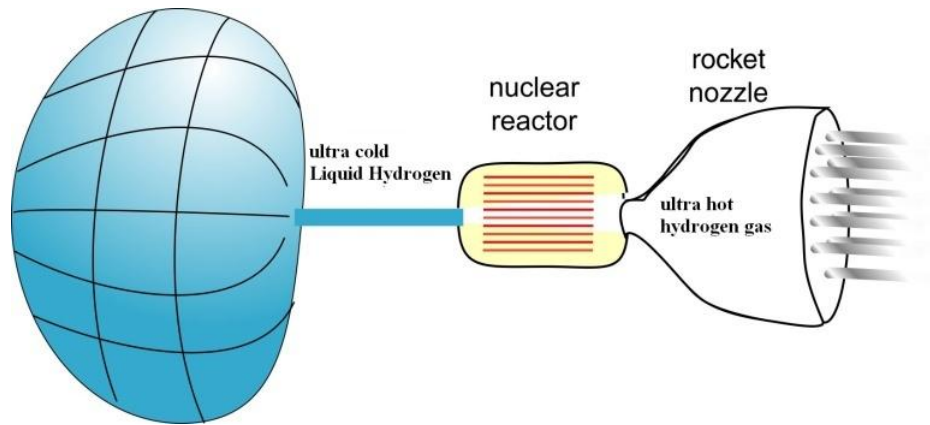
Notice the NH₃, ammonia.
Amines are really good for growing things.
They also stink.

A piece of comet ought to
look like dirty oil shale powder
mixed like permafrost dirt mud,
frozen to dry ice temperatures,
soaked in some poison gas,
and stink like many-cat pee .



European Space Agency
was the first to image a comet
and to sample its fog directly.

comet Halley jpeg.jpg



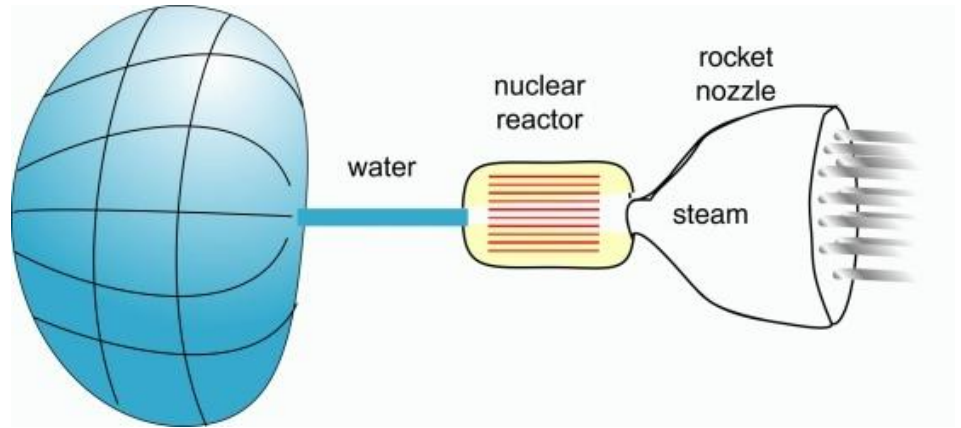
Water is an awful rocket fuel mass.

Liquid Hydrogen is far superior.
NASA wants LH2 NTR because it can go fastest.

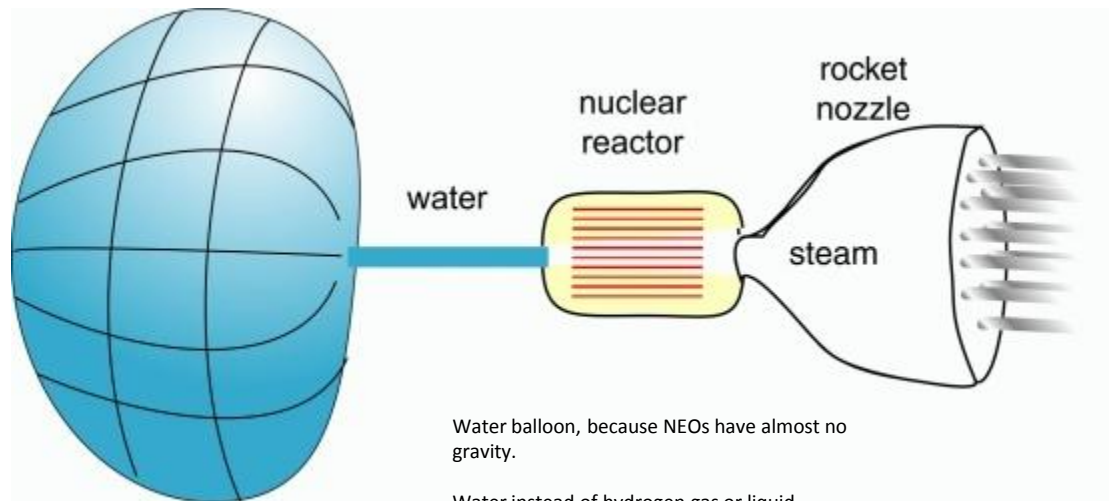
Water only really works when
the objects are easier to get to than
landing on and getting off the moon.

Otherwise,
water is an awful rocket fuel mass.

**AND, water space tankers can haul
about 100 to 1000 times bigger payloads
than any other way we know of.**



**"thermal rocket
with water for rocket fuel mass
and nuclear for rocket fuel energy"**



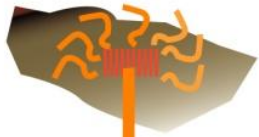
Water balloon, because NEOs have almost no gravity.

Water instead of hydrogen gas or liquid, because water is the only thing out there that will work now.

Nuclear, because it is the only energy source that **barely** works in space. The energies are way too big.

"Works" means haul tanker-sized payloads repeatedly, not basketball satellites.

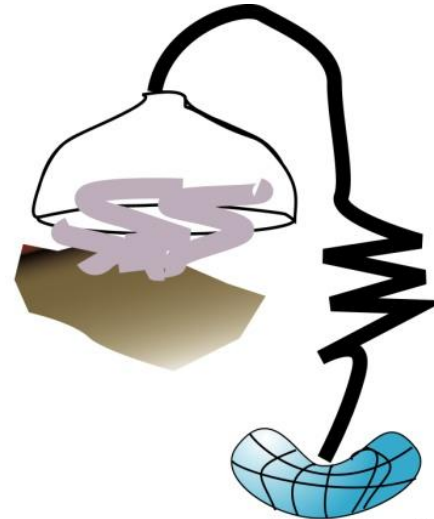
NEO fry



heater

(nuclear reactor)

steam



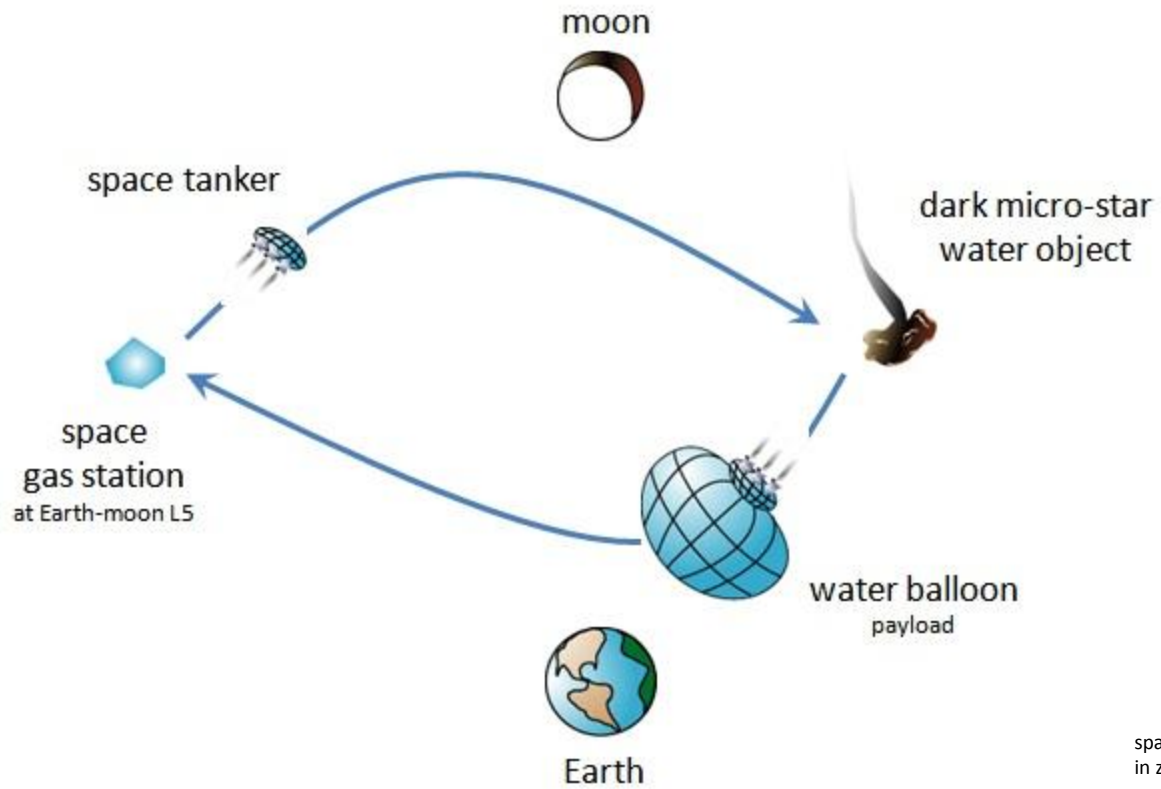
**condense into
bladder tank**



**space tanker
hauls off**

NEOs have almost no gravity,
1000 times less than moon, typically.
This means we can launch
1000 times bigger payloads
off a NEO than off the moon.

Water balloon, instead of a tank.
Huge, 50-100 yards across (100 meters)
Starts out deflated, like any balloon
Pointed down, because it is already up there, in space,
coming back down

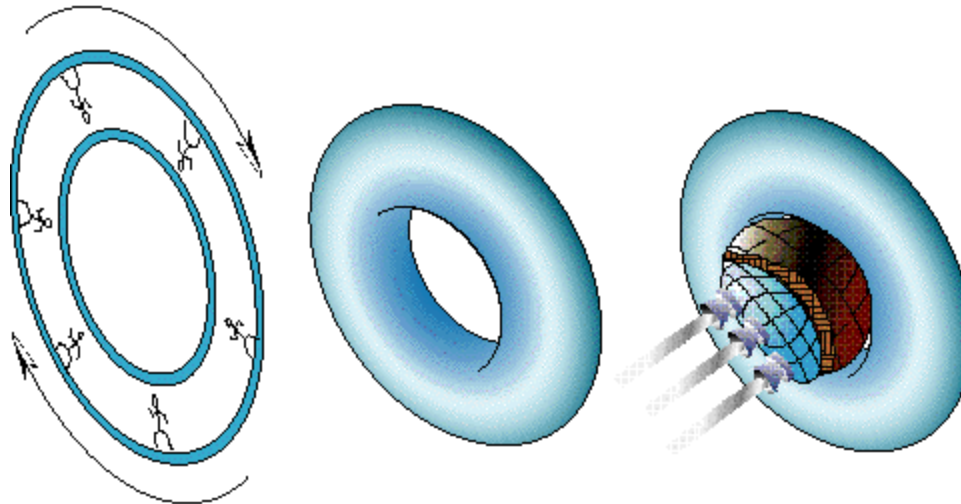


space tanker
in zero gravity of space.

go to NEO
come back with water or ice

repeat until extremely rich

"Ice Tire" Torus Space Ship



slowly spins
to give "gravity"



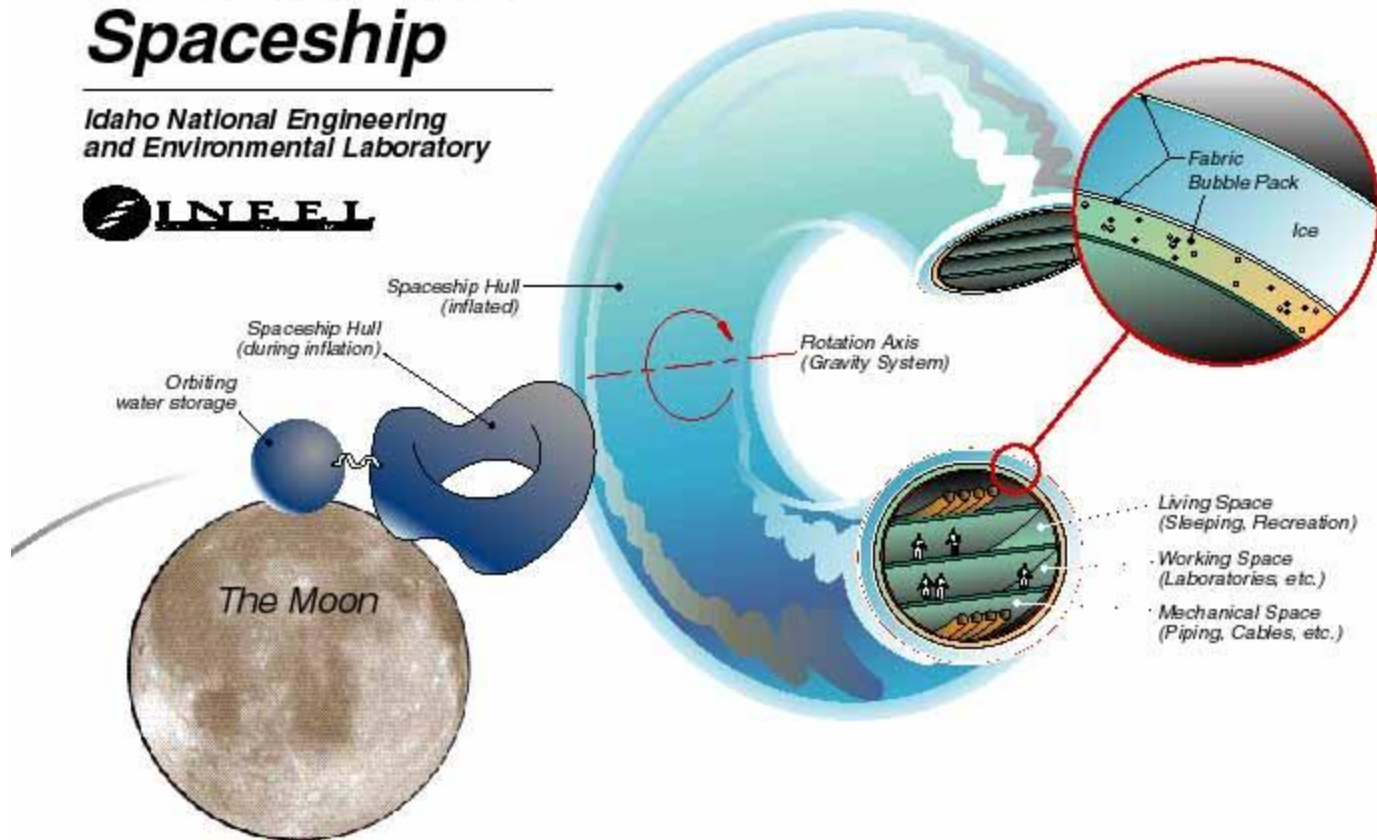
Ice2_VG.ai
zuppero line1 980422p1027

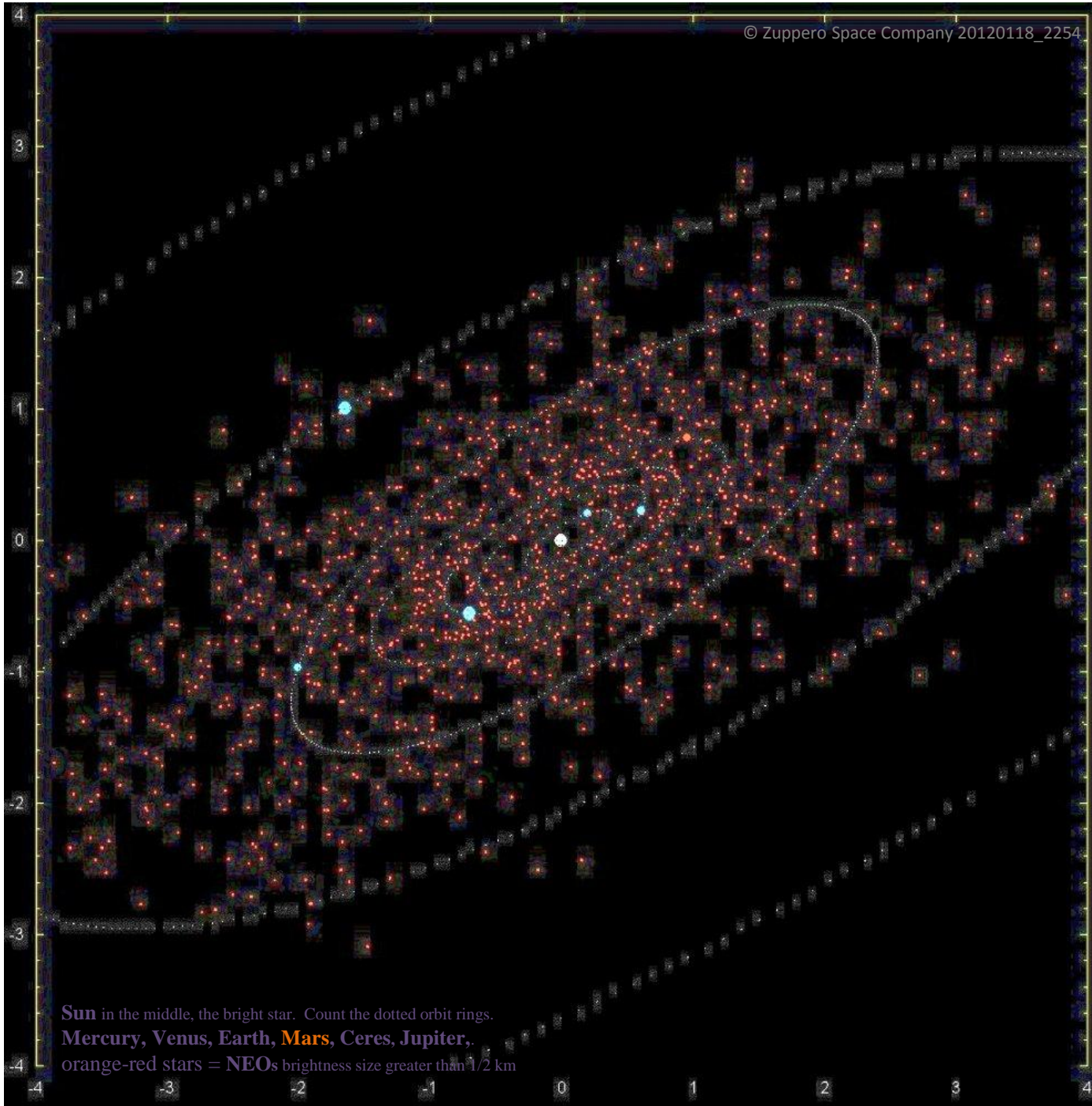
If you have Ice,
make an Ice Ship.

Make an Ice Igloo
Space Tanker,
Space Ship,
and be an
Icetronaut

Ice Structure Spaceship

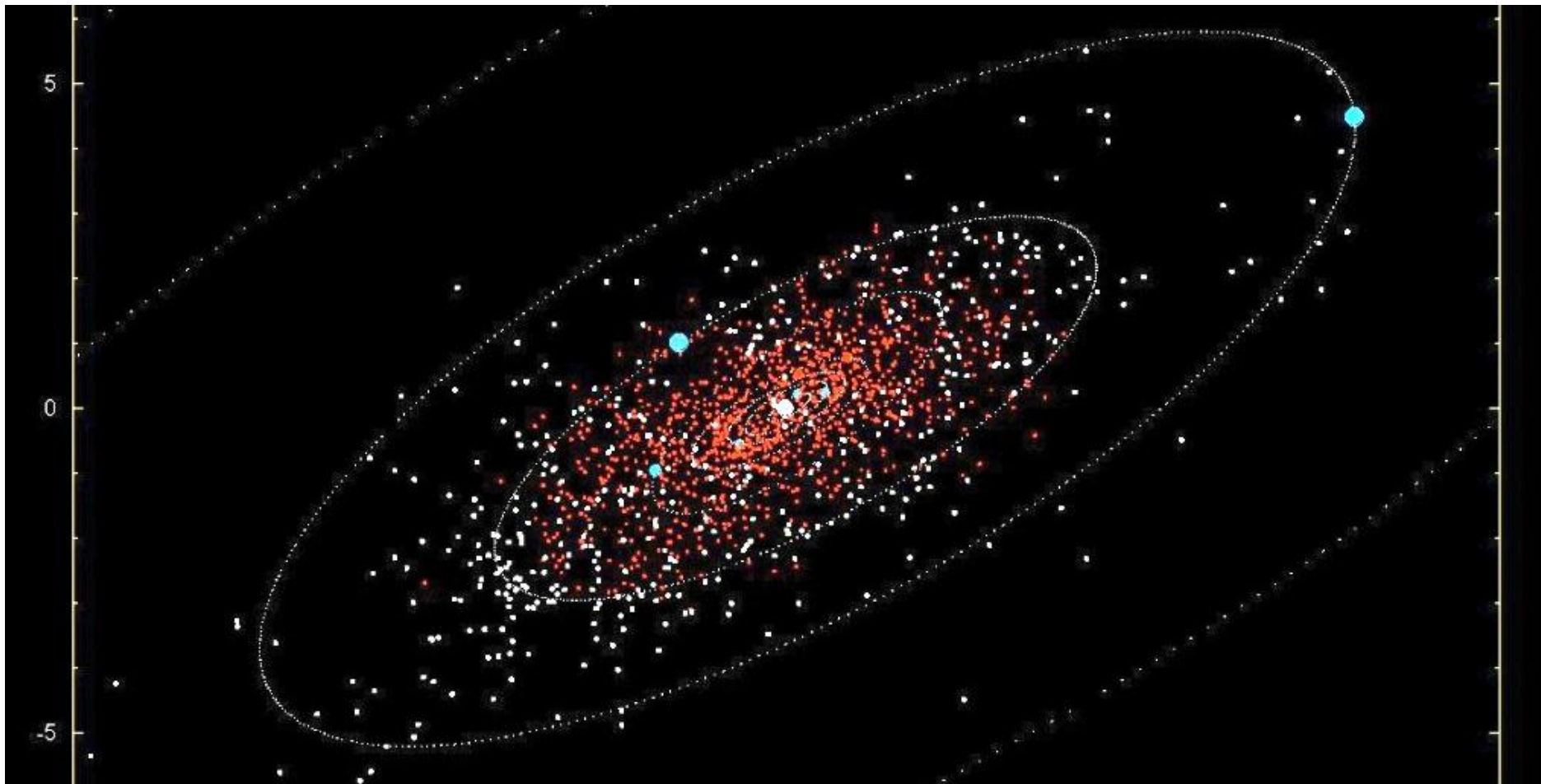
Idaho National Engineering
and Environmental Laboratory





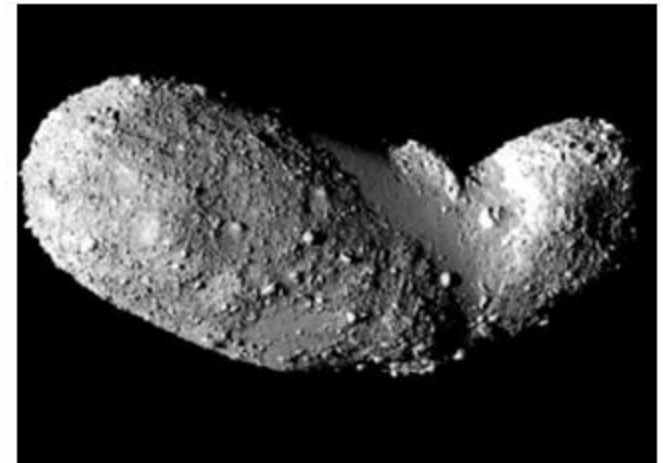
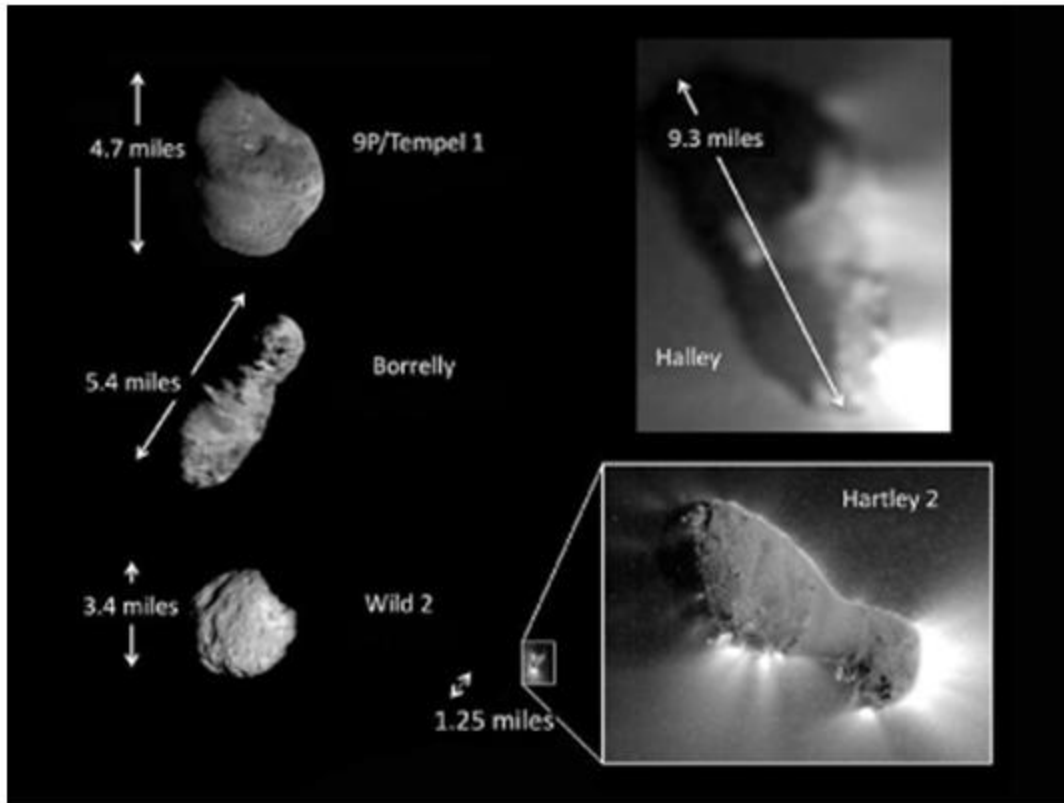
Sun in the middle, the bright star. Count the dotted orbit rings.
Mercury, Venus, Earth, Mars, Ceres, Jupiter,
orange-red stars = NEOs brightness size greater than 1/2 km

end of the story
about the discovery of a
neo Solar System
full of water-bearing
near Earth Objects,
and a swarm of rocket
fuel mass objects.



This is what you get:

- **rocks in space**
- **dirty coal dust stinking permafrost**
- **ammonia rocks,**
- **platinum-nickel steel things**
- **water rocks**
- **permafrost hydrocarbon dirt stones**
- **strange things, many**

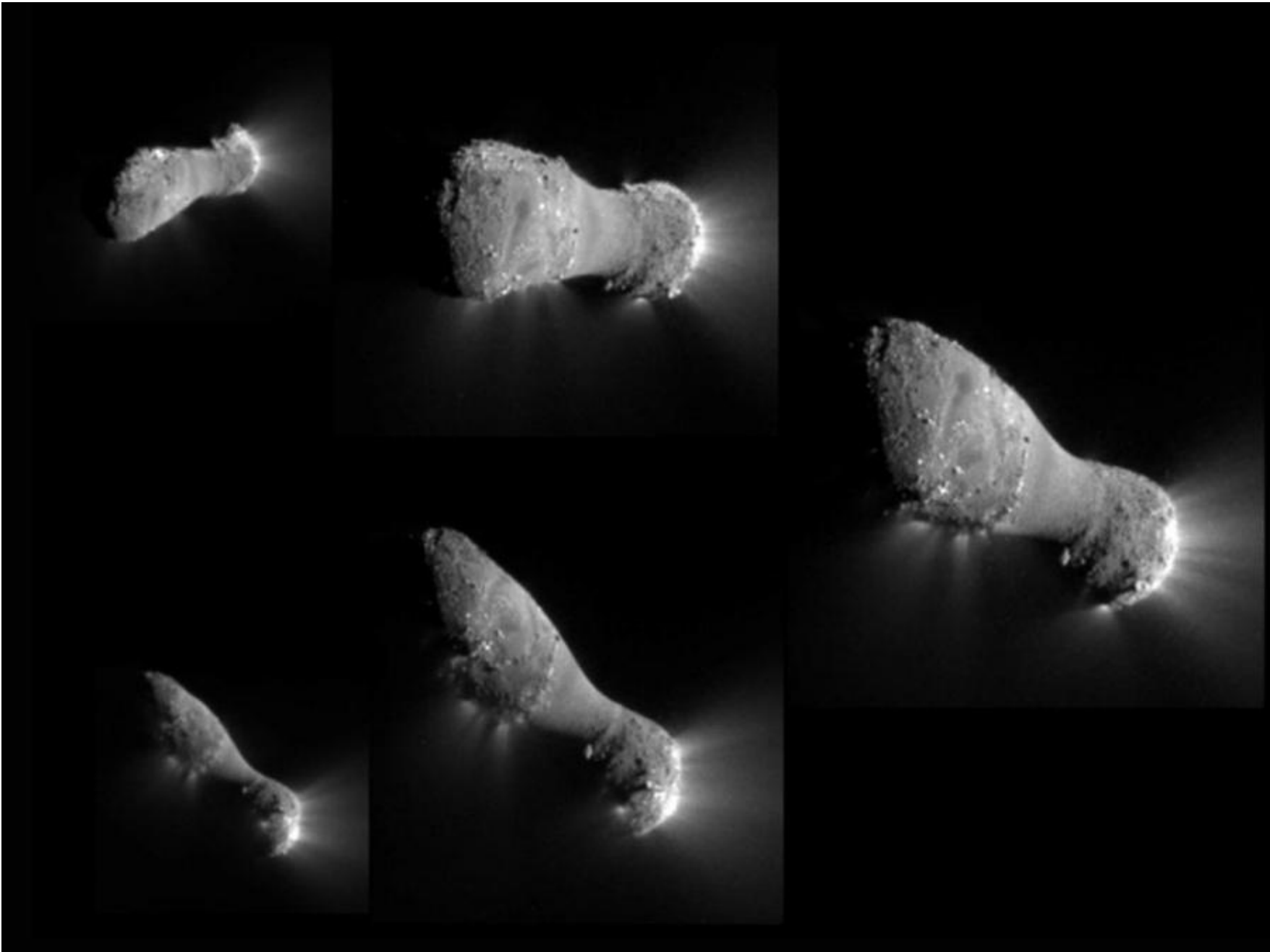


asteroid Itokawa

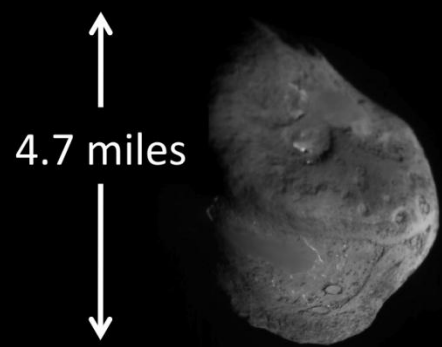


Deimos, outer moon of Mars

They look uninteresting if I sympathize with a NASA Astronaut.

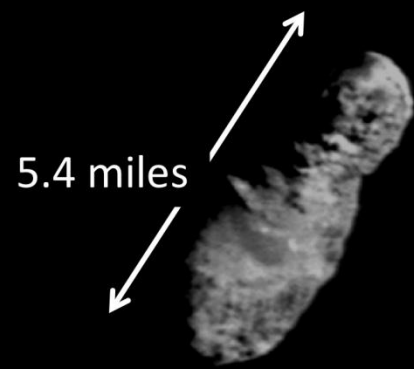


comet_hartleymontage1x5_epoxi900



4.7 miles

9P/Tempel 1
(*Deep Impact*)



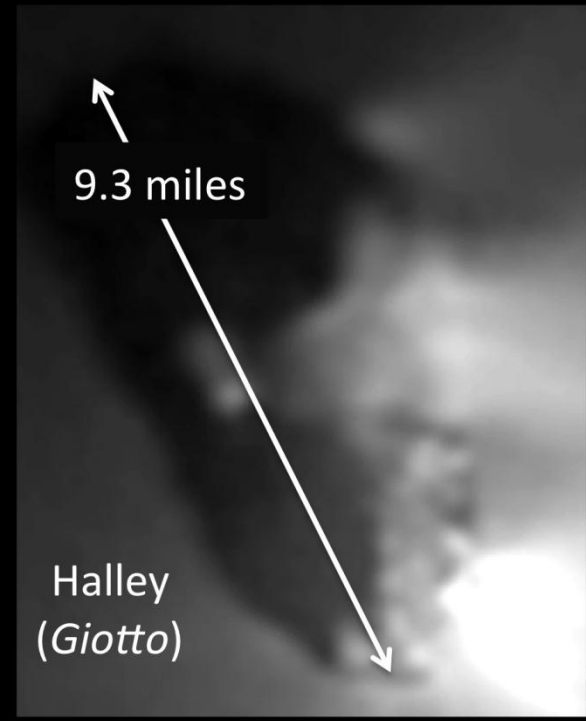
5.4 miles

Borrelly
(*Deep Space 1*)



3.4 miles

Wild 2
(*Stardust*)

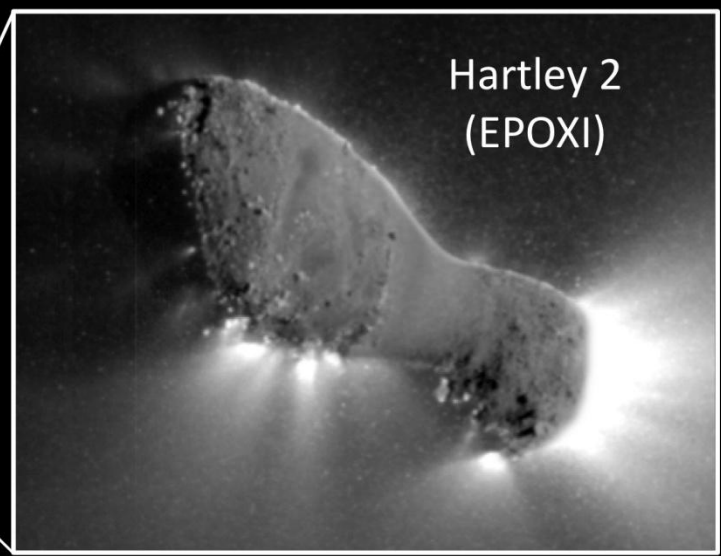


9.3 miles

Halley
(*Giotto*)

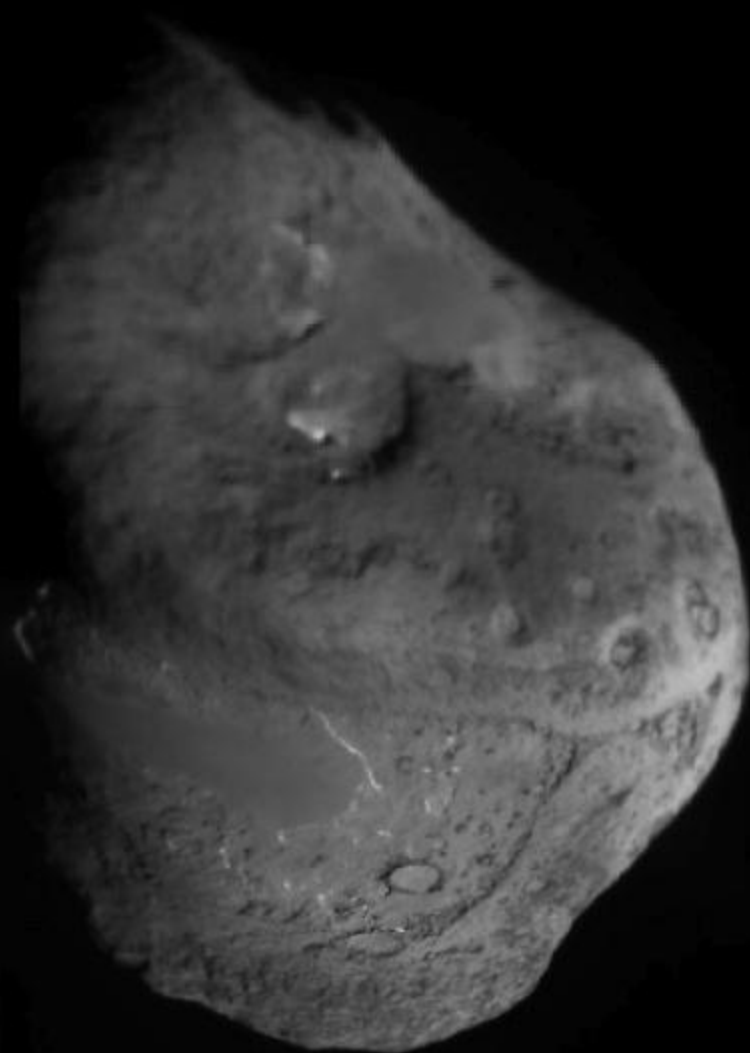


1.25 miles



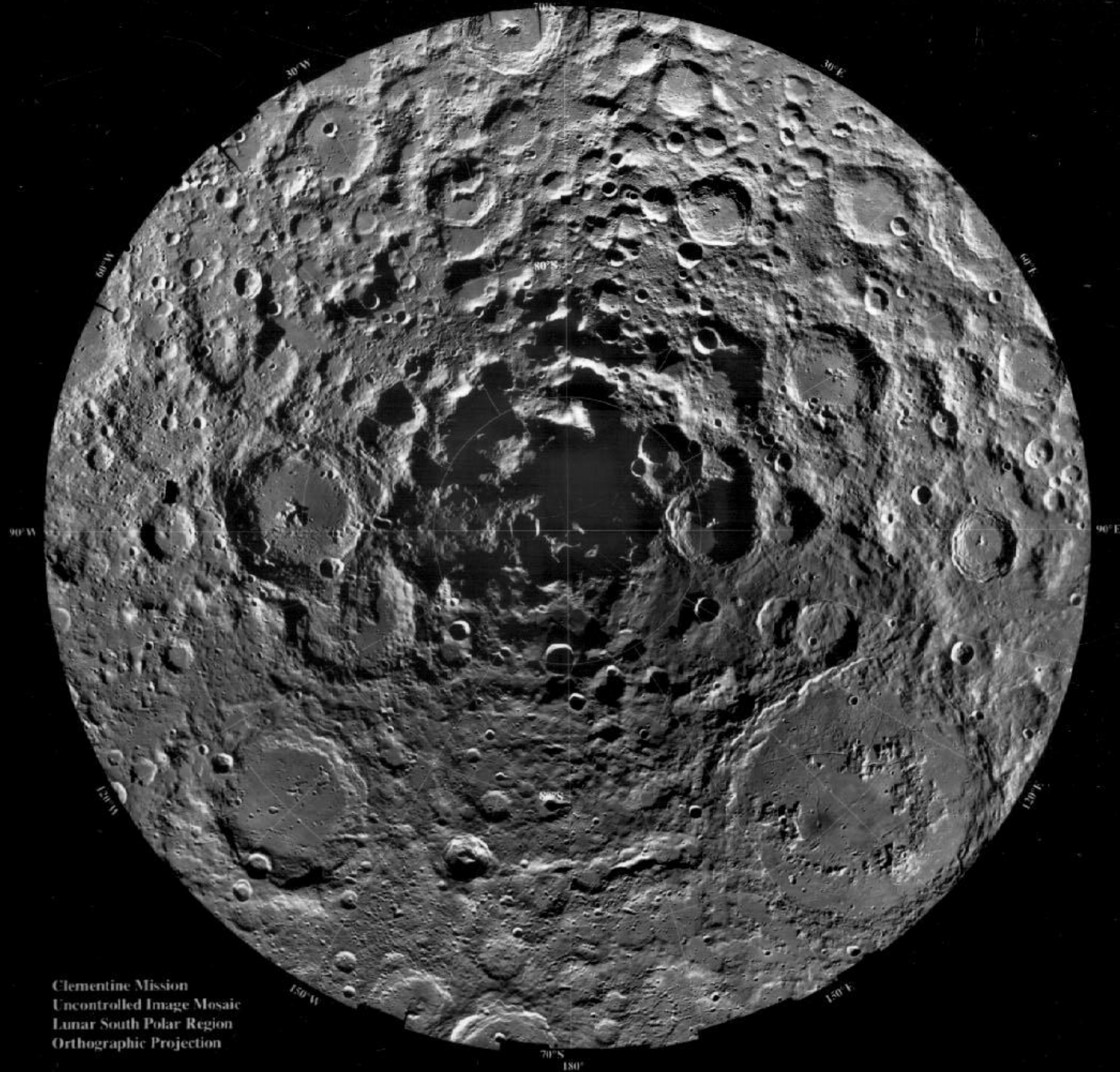
Hartley 2
(*EPOXI*)

↑
4.7 miles
↓



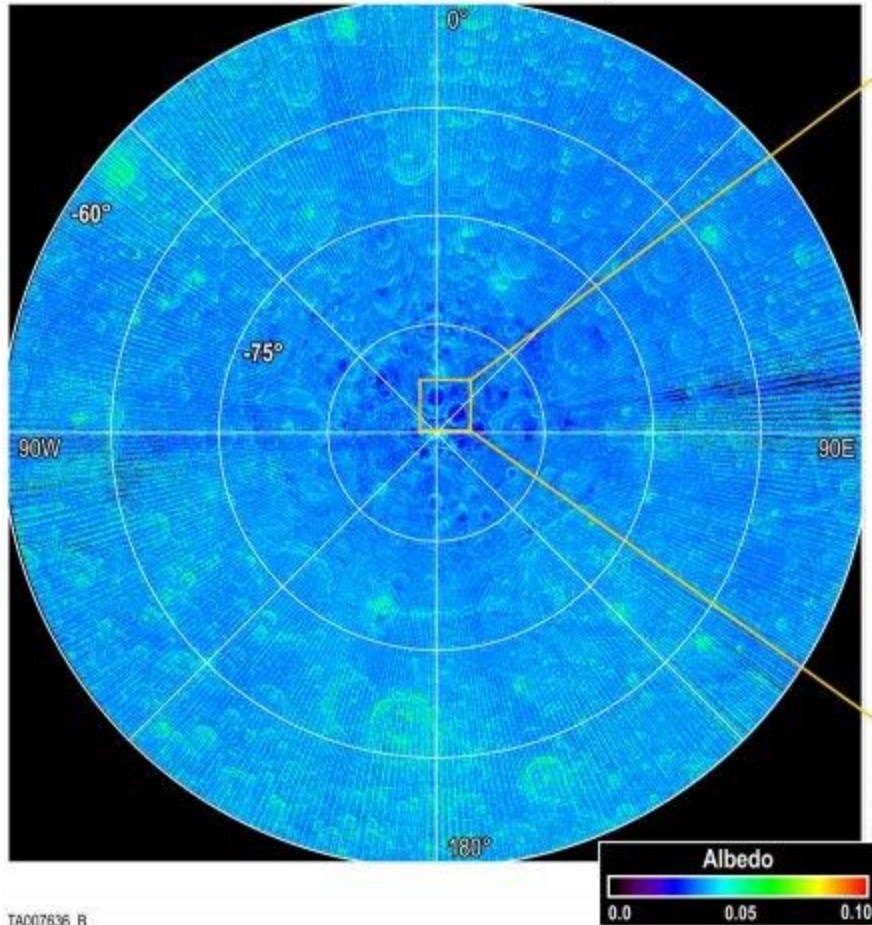
...not very exciting,
if you have to go there
and live in a porta-potty
for 6 years.

comet_images_all_5_Sunshine2__**temple-1**_CR.jpg



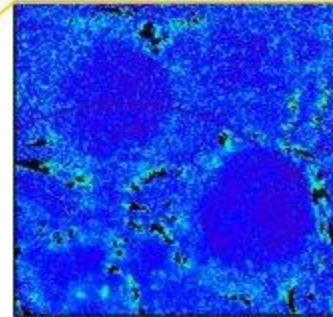
Clementine Mission
Uncontrolled Image Mosaic
Lunar South Polar Region
Orthographic Projection

South Pole Lyman- α Map

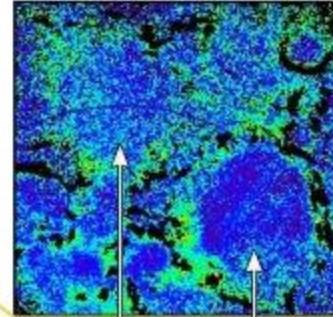


TA007636_B

Surface Water Frost Shorter FUV (Frost Absorbs)



Longer FUV (Frost Reflects)



Haworth Crater:
Brighter Longer FUV =>
~1% Water Abundance

Shoemaker Crater:
No Water Frost

south pole of moon, 2011, NASA

Frost on the surface of a forever-dark moon crater is a puzzle.

It is too hot for water frost to live 2 Billion years in the crater. It vaporizes, according to all the early calculations.

But we still see the frost.

Frost is there.

Something is making the frost come out of the moon dirt.

I conclude and conjecture:
"There must be lots of water deeper inside the moon."



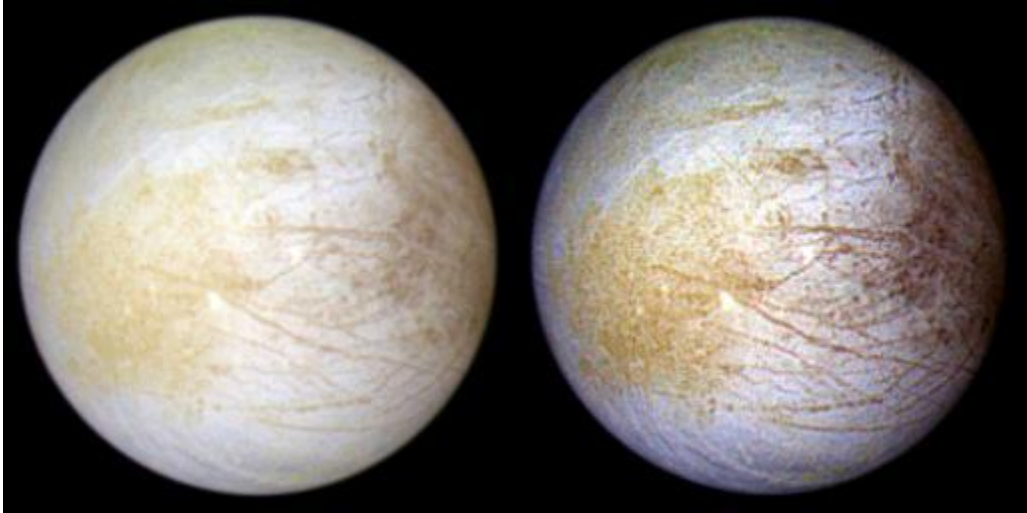
ganymede-000126galileo_04.jpg

NASA

Water moons of Jupiter.

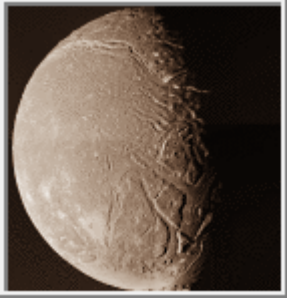


callisto-blackice1.2in.jpg



double-europa-PIA01295-lrgr.jpg

Water moons of the gas giants planets



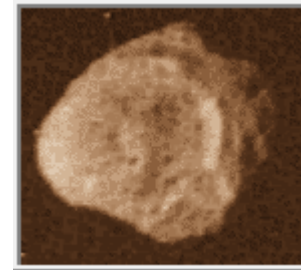
ariel-uranus.gif



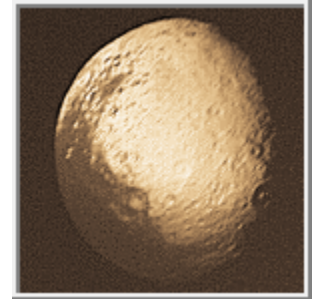
dione3.gif



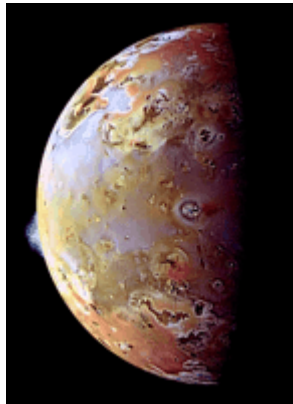
enceladx.gif



hyperio1.gif



iapetus2.gif



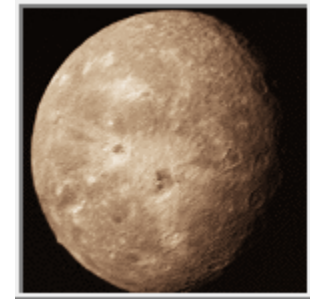
io-se3997874005ss.gif



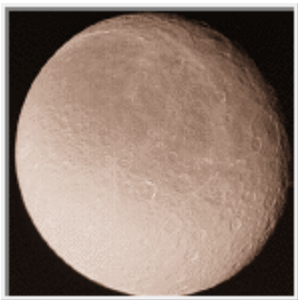
janus-saturn.gif



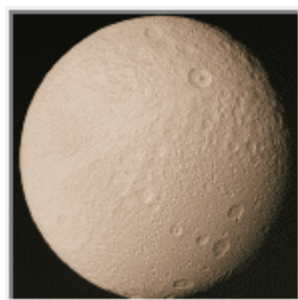
miranda4.jpg



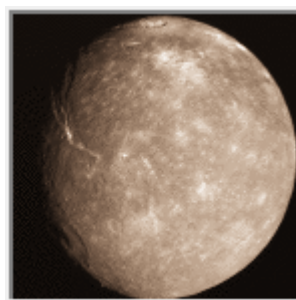
oberon-uranus.gif



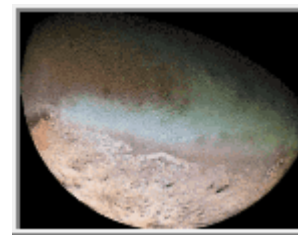
rhea1.gif



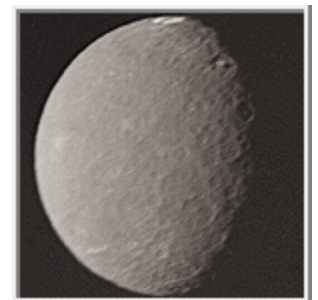
tethys.gif



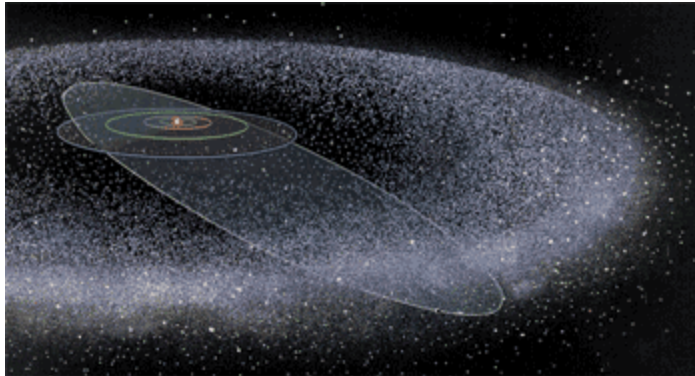
titania.gif



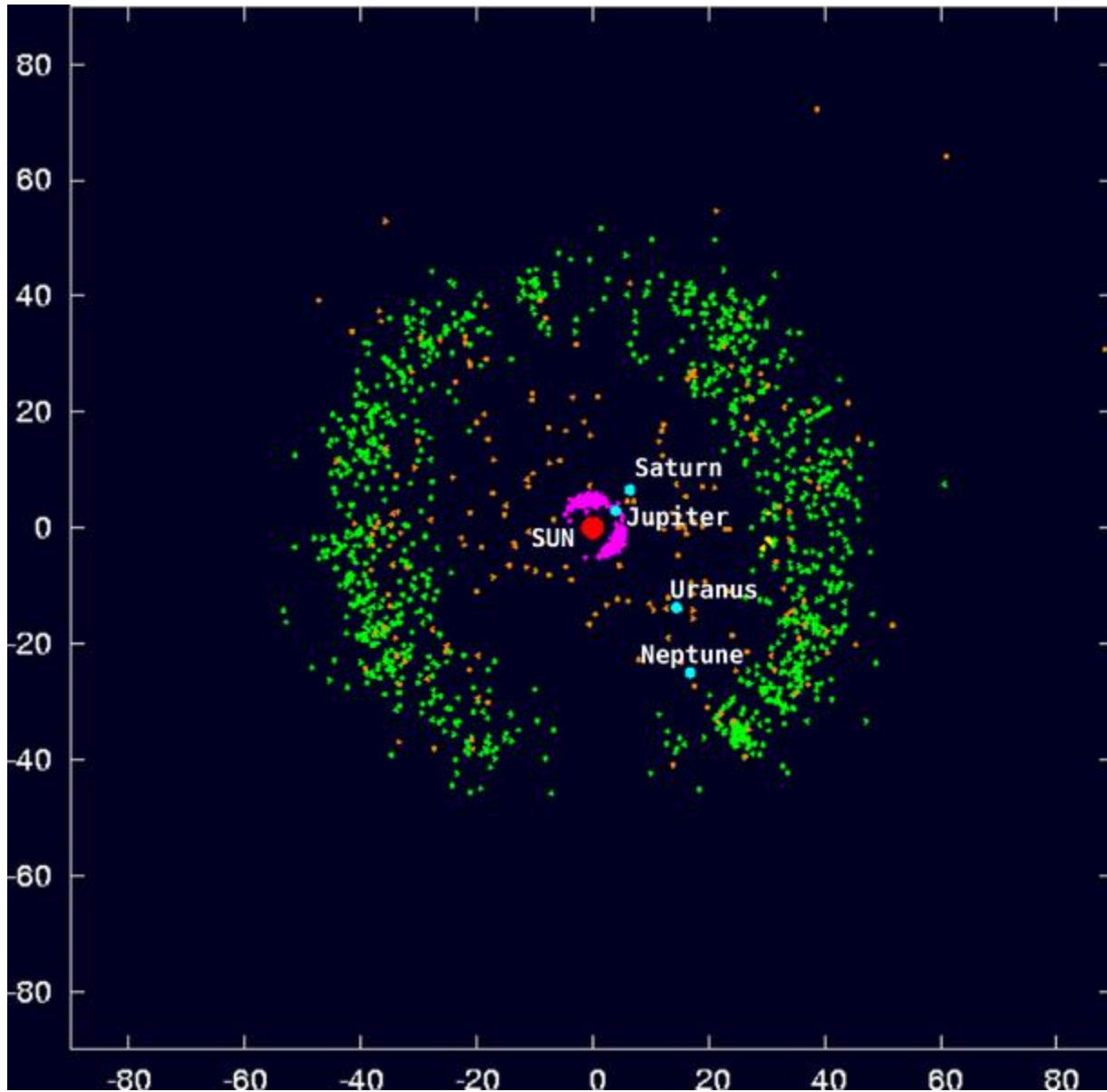
triton-neptune.gif



umbriel-uranus.gif



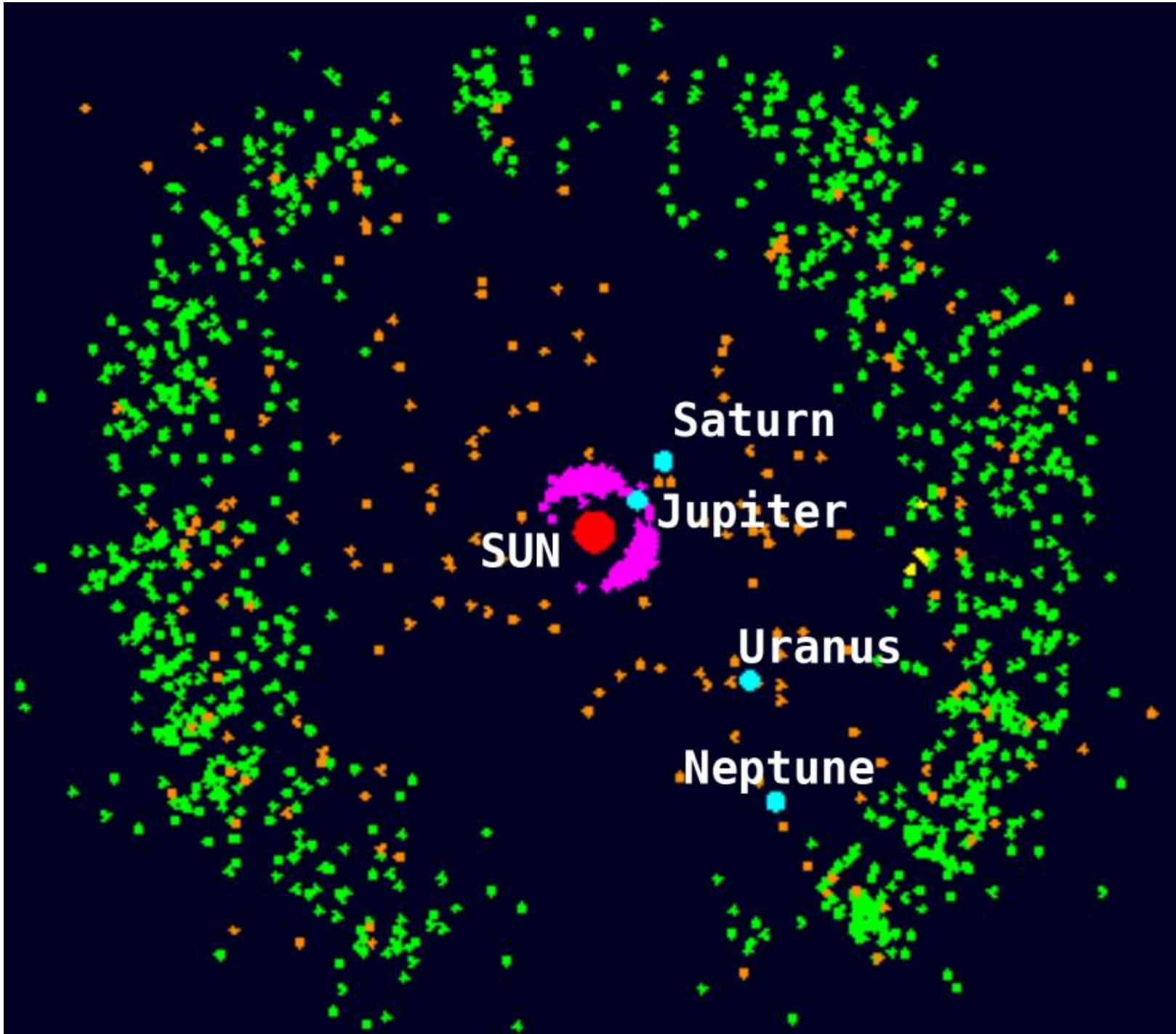
**Probable distribution of Trans Neptunian Objects
of the Solar System**



CAT Scan of Kuiper Belt, a.k.a. T.N.O's, **Trans Neptunian Objects**

Trans Neptunian Objects,
TNO's.

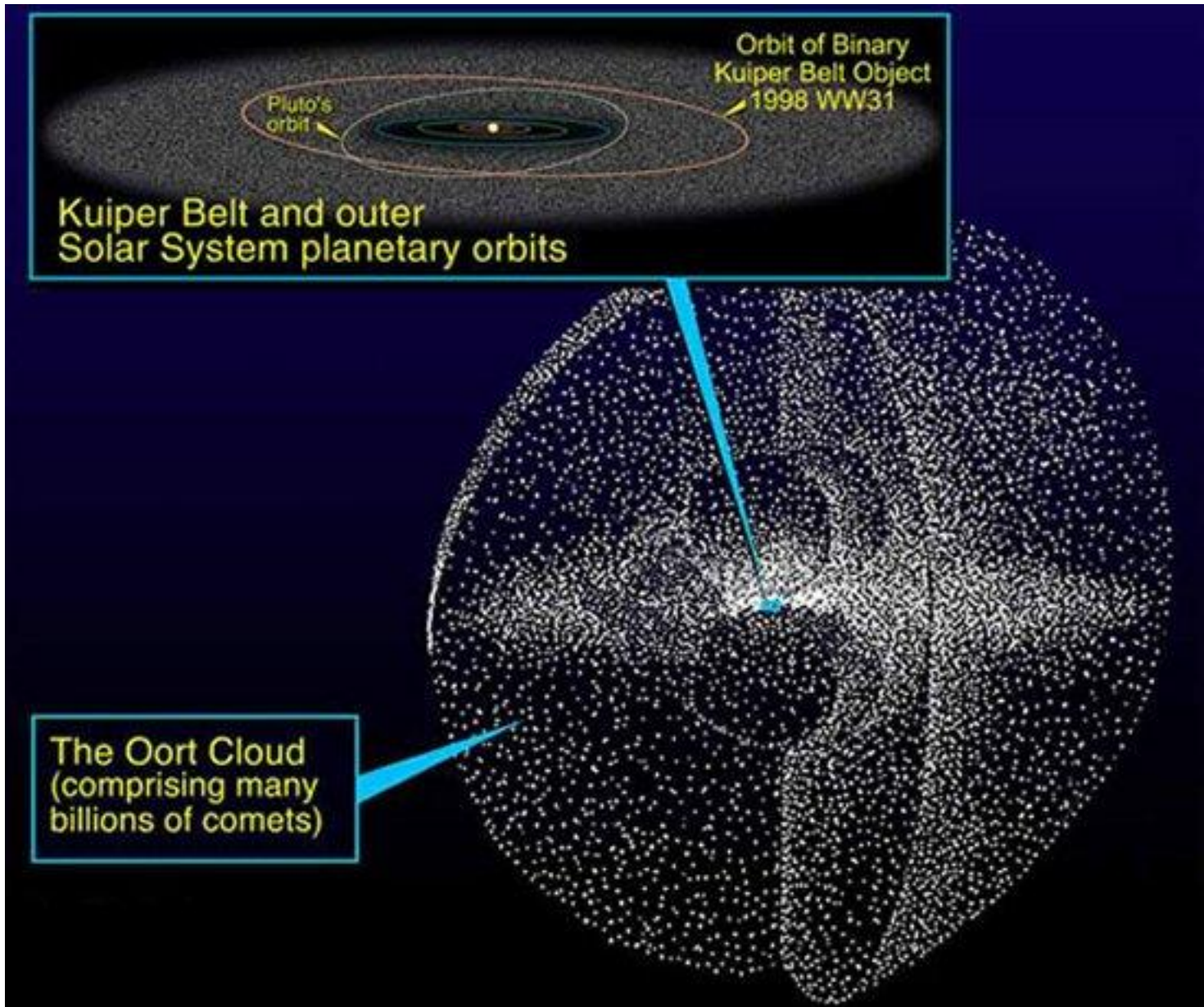
An entire micro-galaxy of
places with water and
hydrocarbons,
accessible to a space tanker.



Each of the green dots is another water object, and large enough to sustain outposts.

Can get there in 30 years using a nuclear heated steam rocket, after a powered fly-by of Jupiter.

However, I don't know how to stop there -- yet.

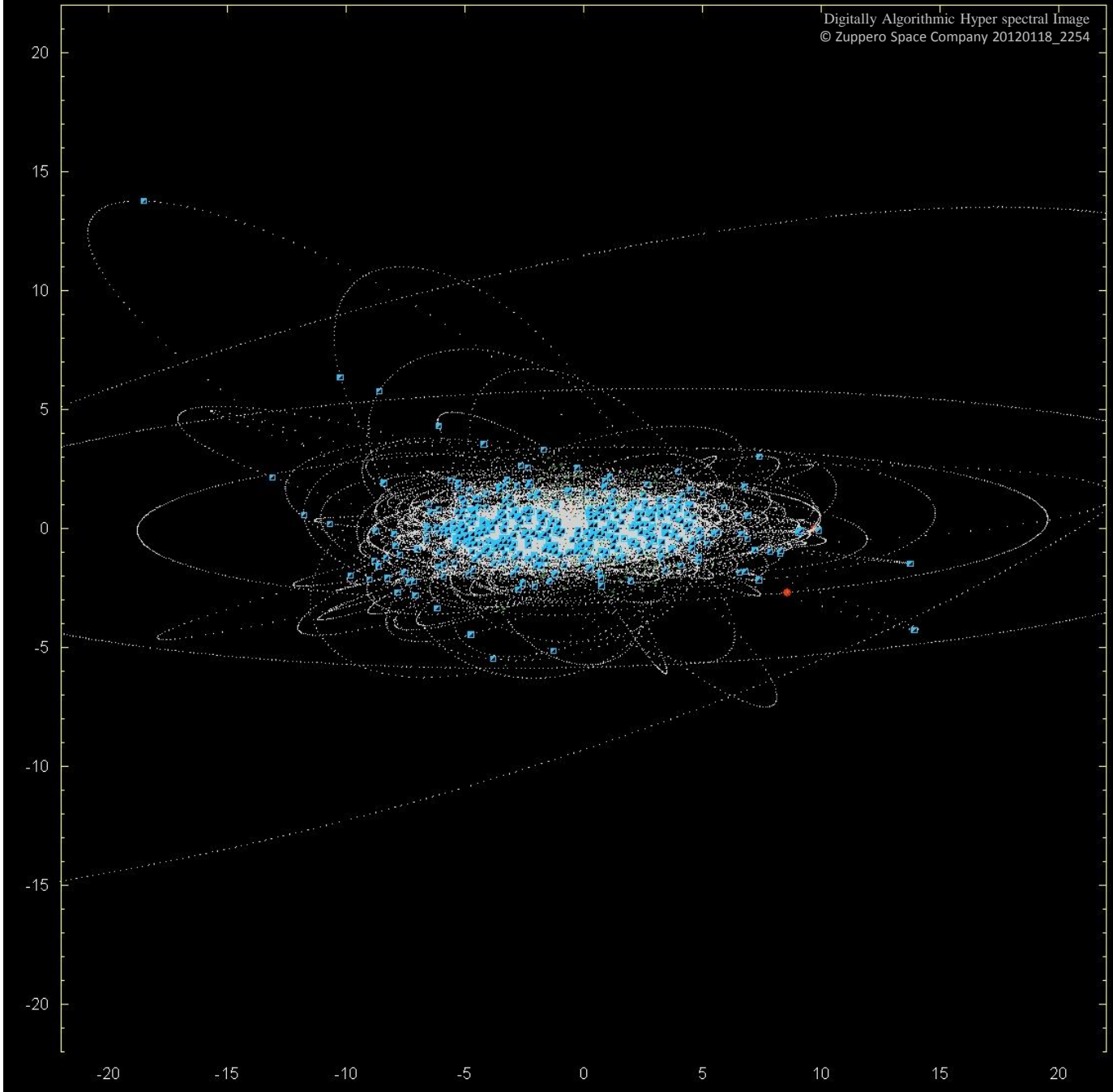


costin_kuiper-oort.jpg

The Oort Cloud around the Solar System, probability picture.

There are billions of places to go, if you have a nuclear propulsion system.

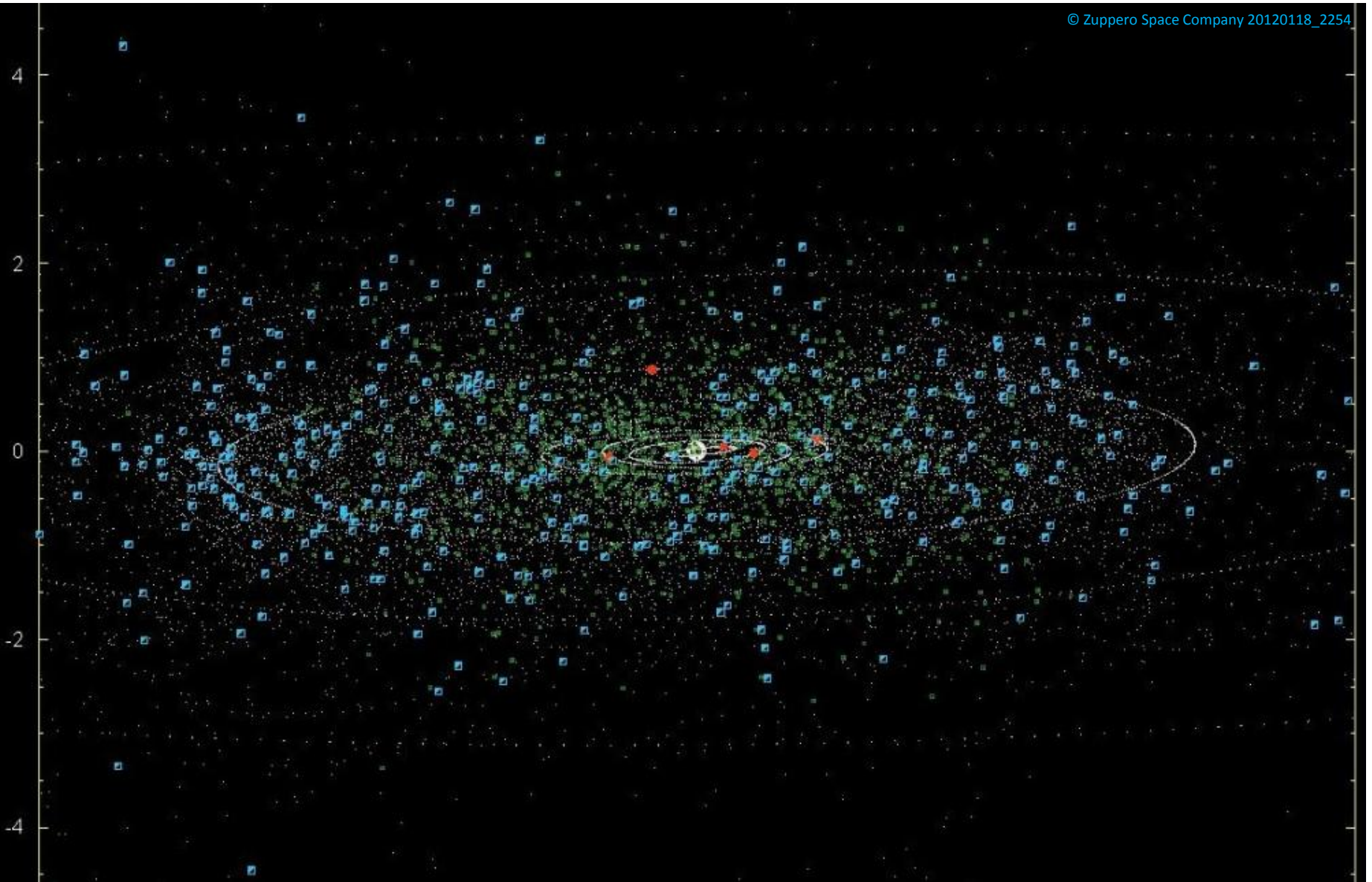
We live in a micro-galaxy of dark micro stars.



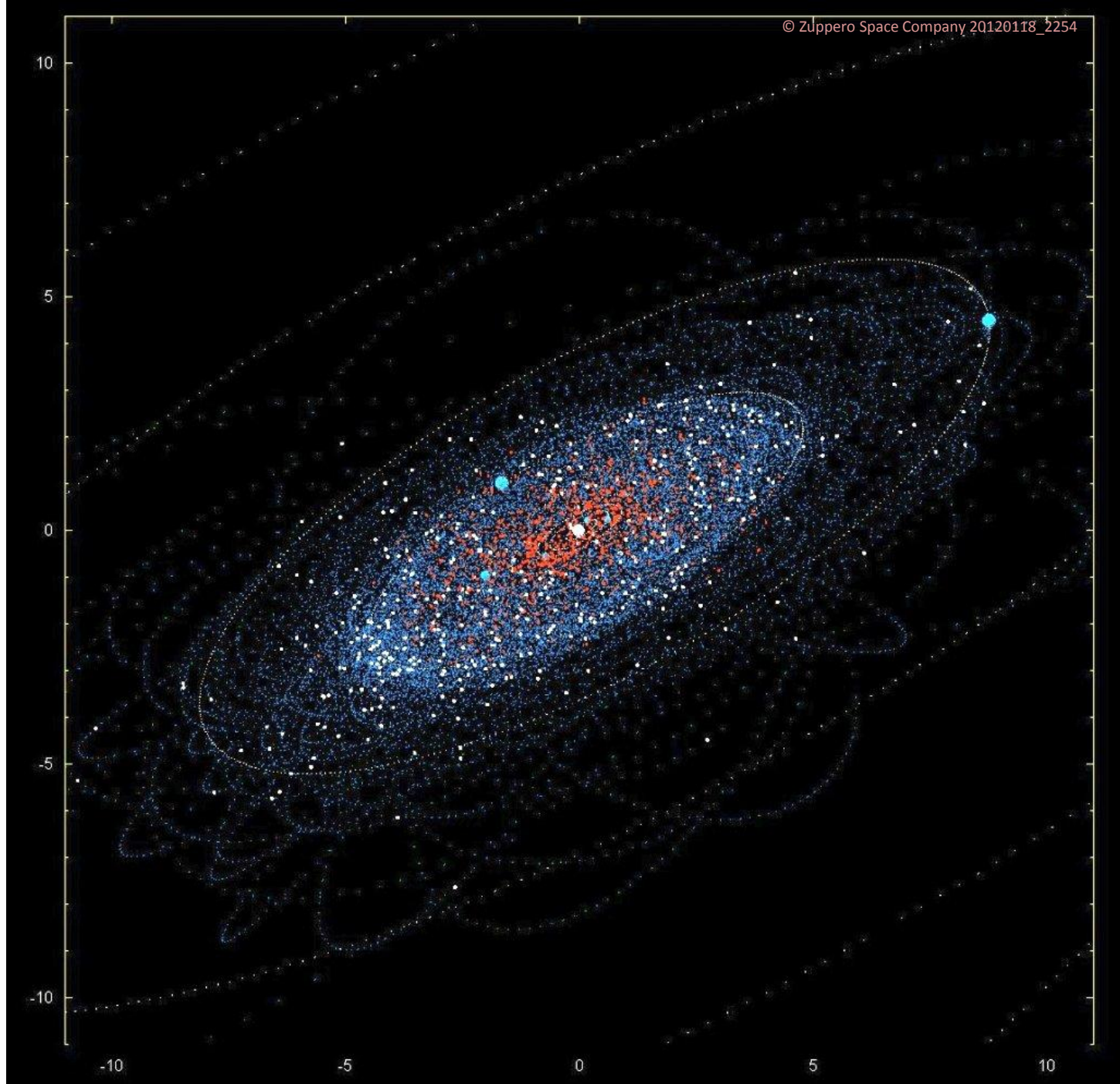
The periodic comets as seen from past Pluto, almost on edge.

Hyper spectral image chosen to make ice blue and dust white.

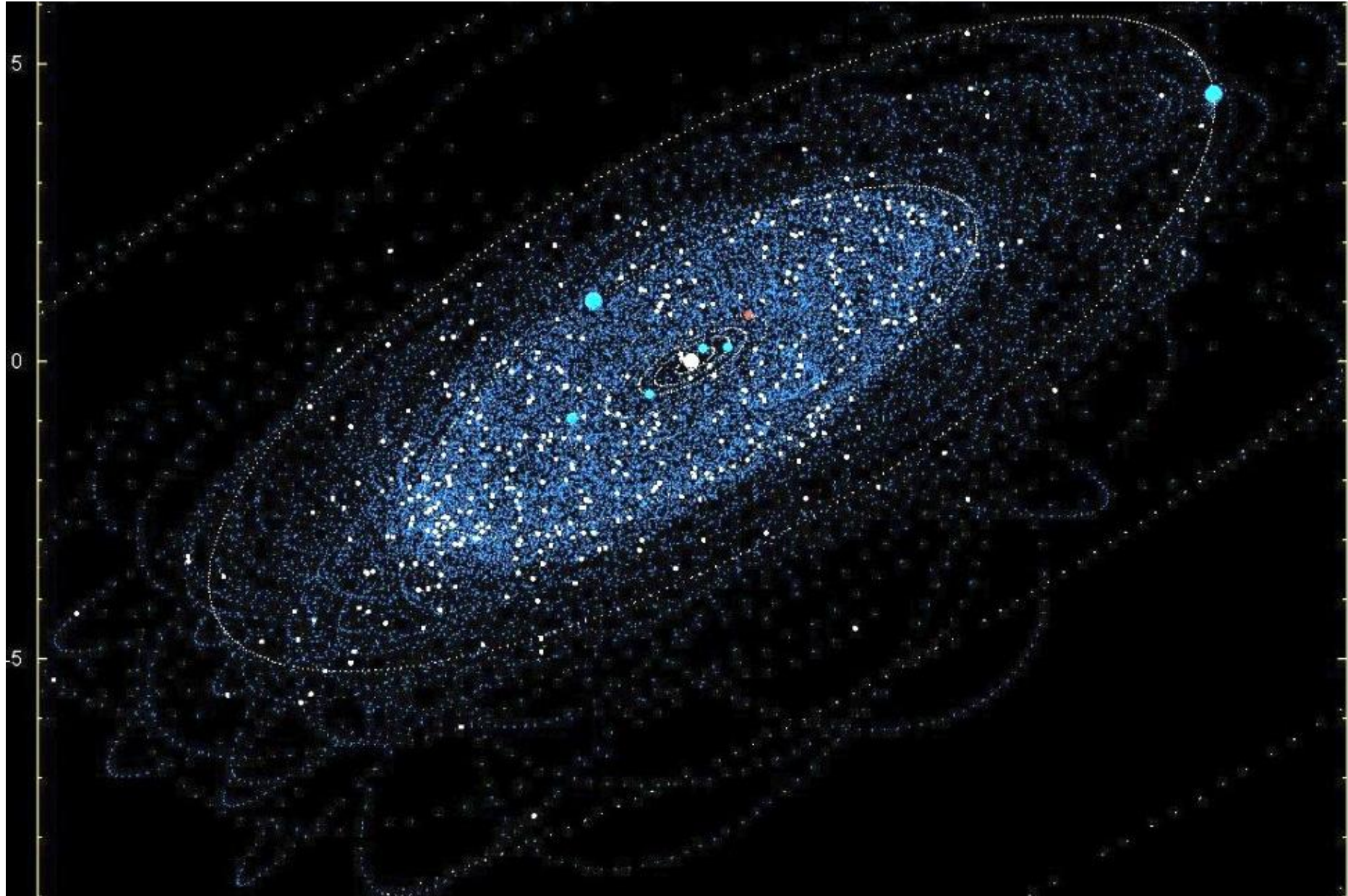
CAT scan of periodic comets and their orbit density. ,



The periodic comets and the big NEOS, Seen from past Pluto,
Colors were chosen to be instructive and pretty, but colors failed and it was only interesting.



I don't know how to display it so that it looks pretty.

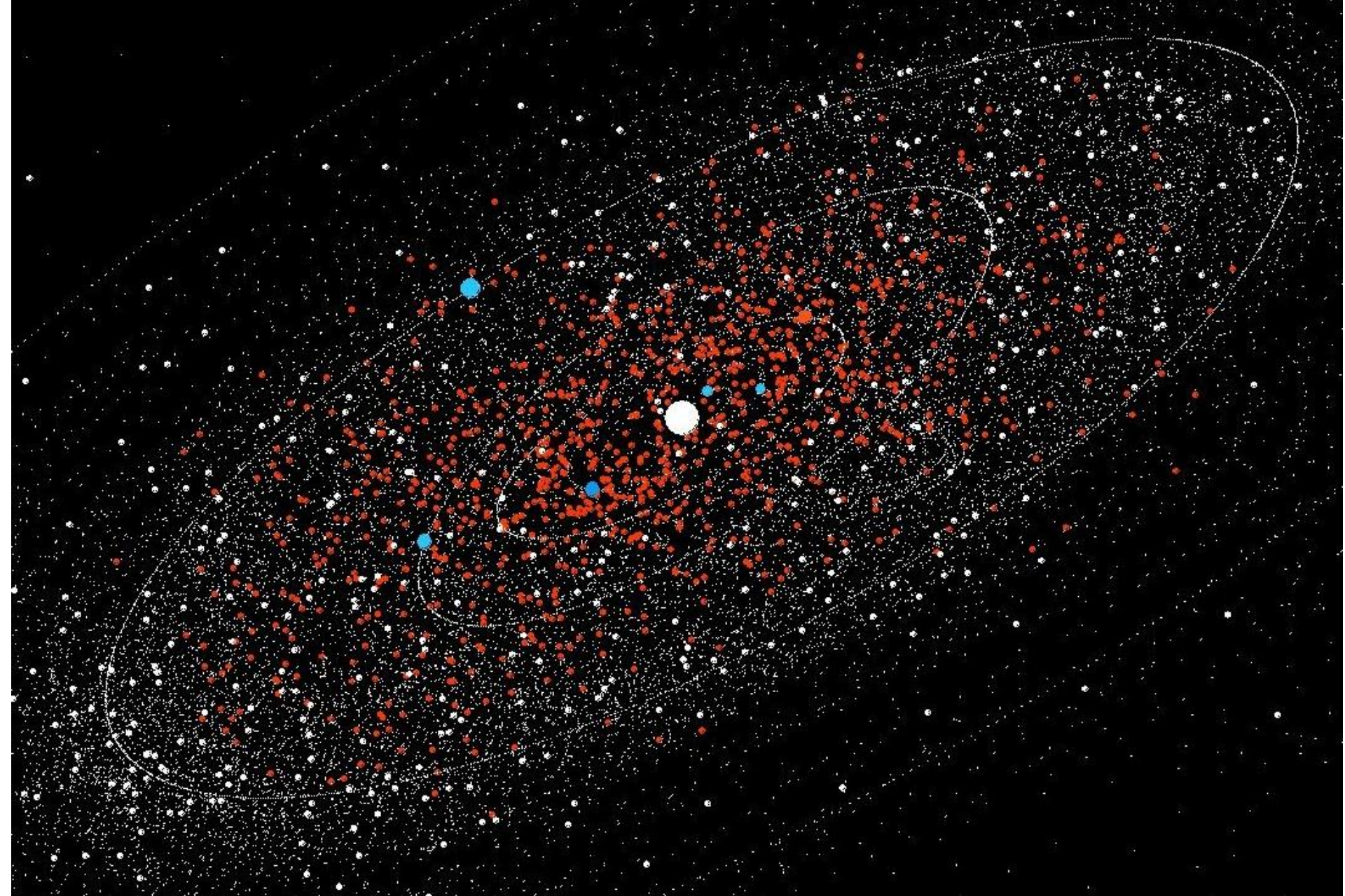


Sun in the middle, the bright star. Count the dotted orbit rings.
Mercury, Venus, Earth, Mars, Ceres,
Jupiter, big blue star, and
Jupiter family comets and their orbit dust white stars and dust

"Water donut micro galaxy of the Solar System"
 white and blue dust objects: The neo micro-galaxy of dark comets, invisible in the
 night sky, like dark micro-stars Water is everywhere on objects with almost no
 gravity.

Digitally Algorithmic Hyper spectral Image

© Zuppero Space Company 20120118_2254



Sun in the middle, the bright star. Count the dotted orbit rings.
Mercury, Venus, Earth, Mars, Ceres,
Jupiter, big blue star, and
Jupiter family comets and their orbit dust white stars and dust

neo micro-galaxy of dark micro-stars .
red orange objects: Water is everywhere on objects with almost no gravity.

Digitally Algorithmic Hyper spectral Image

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end

Meteor Exploded with Atomic Bomb Force



Tunguska, Siberia, after multi-megaton bomb-equivalent explosion in the air

Why were they looking at this?
NASA discovered that these
NEOs could hit us!
!! They already did !!!
!!! The sky is falling !!!

Send NASA and DOE and DOD
MORE MONEY !!

It was a good thing, because
everyone knows that we would
discover how to use the objects
and make great movies with
Bruce Willis saving the world.

Killing a Saber Toothed Tiger
is really dangerous,
and we did it anyway because we
ate them.

Comets and near Earth objects
are probably just as dangerous,
and tasty-useful for us to
Occupy The Solar System.

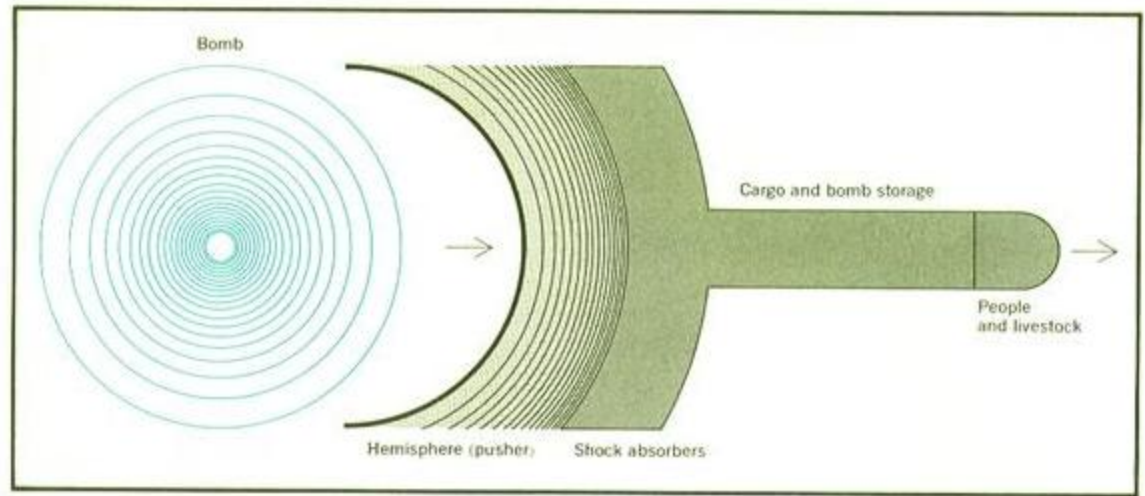




atomic_bomb_Cromeo3.jpg

Atomic Bomb Propulsion

During the 1960's, this is what we thought we would use to propel rockets, with a city as a payload, to the nearest star. This is what got me started.



BOMB-PROPELLED SPACE SHIP. Debris from the exploding bombs transfers momentum to the shock absorbers and hence to the payload section of the ship. Mission velocities for this primitive design would be 500–10 000 km/sec; the upper limit is similar to supernova-debris velocities.



**When we daydream, it helps us imagine what we want to do.
Then we discover, later, we can do anything we can clearly imagine.**