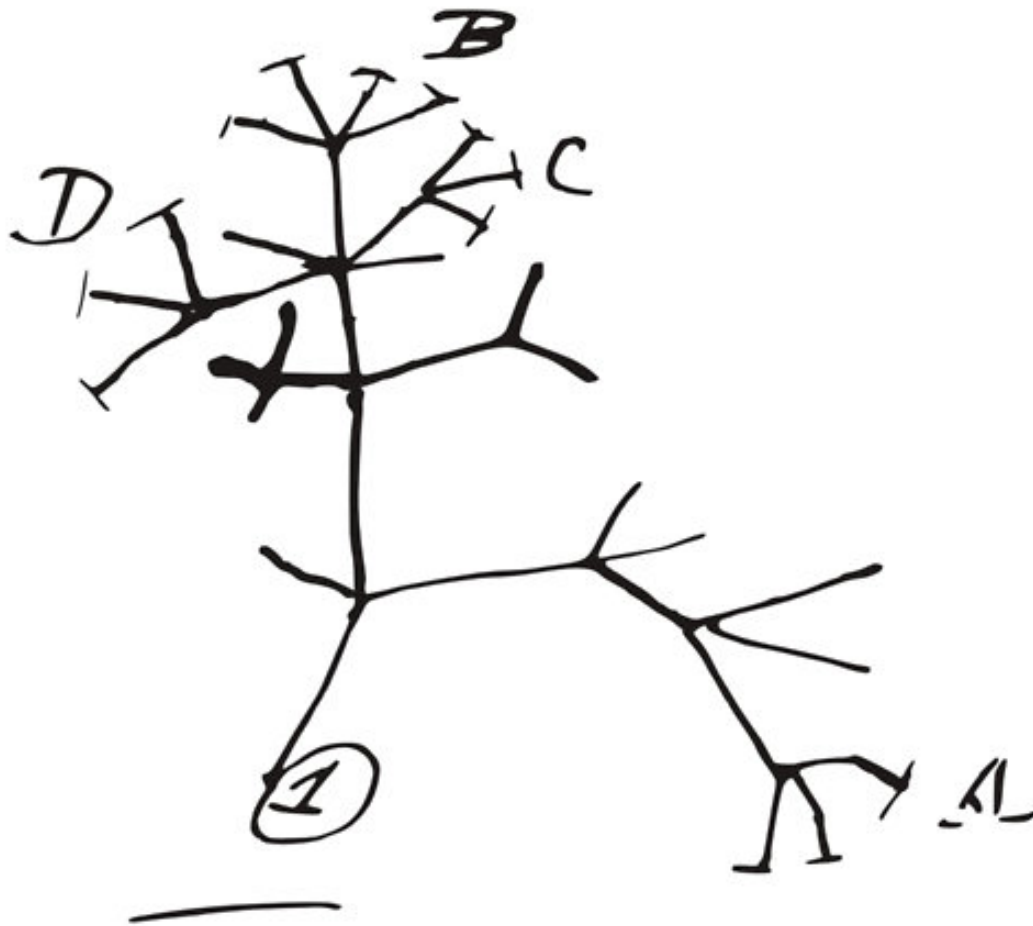


I think

# Relación entre los pequeños cuerpos del Sistema Solar

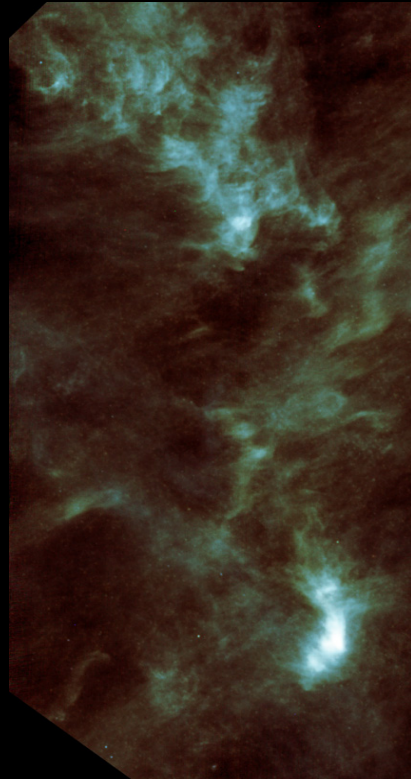


Pedro Gutiérrez (IAA-CSIC)

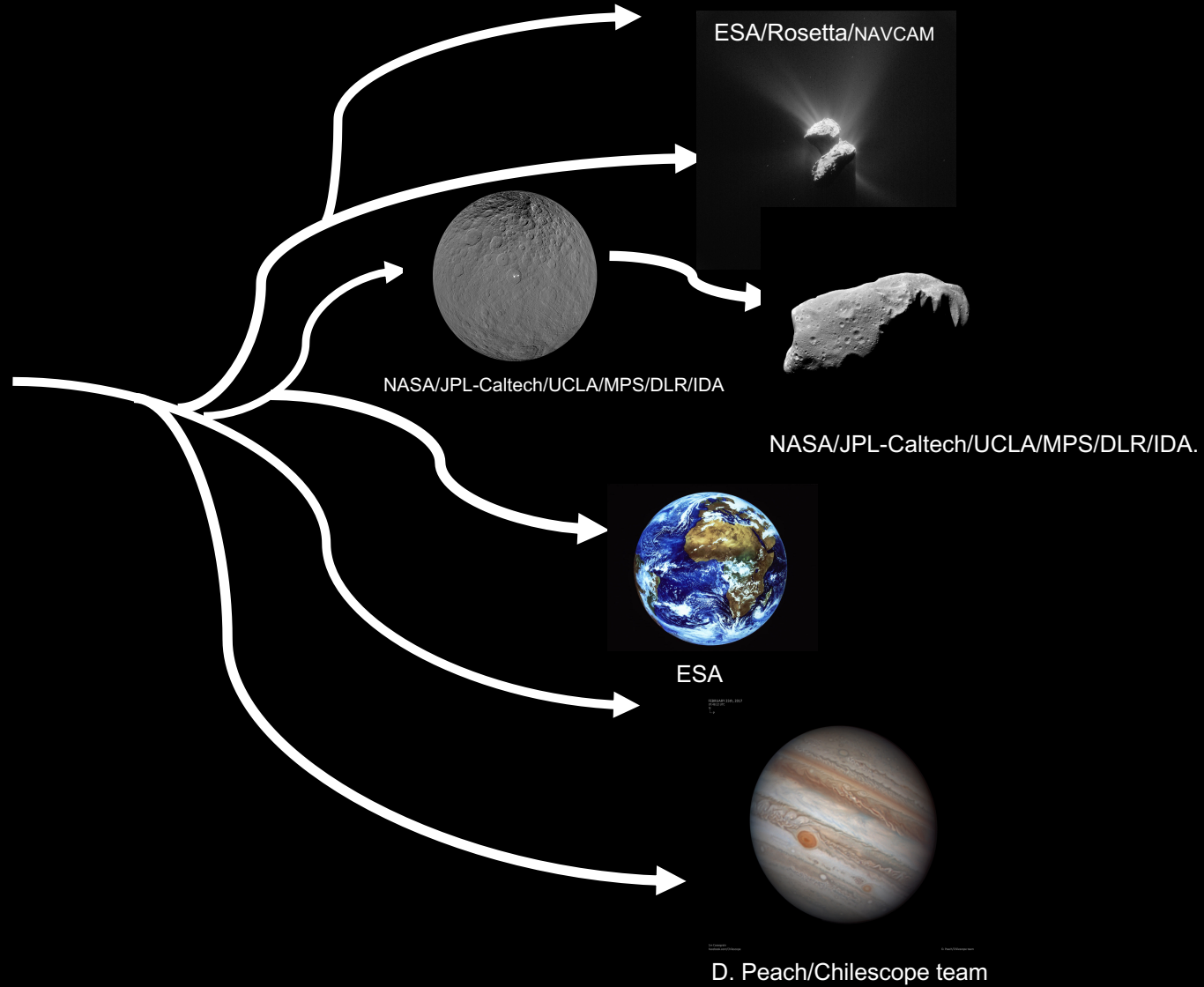
La Agencia Espacial Europea: pequeños cuerpos del Sistema Solar.

4-7 Abril 2022

“ANCESTROS” → EVOLUCIÓN → “ESPECIES” ACTUALES



ESA/Herschel/SPIRE



INTERNATIONAL ASTRONOMICAL UNION  
UNION ASTRONOMIQUE INTERNATIONALE



\*\*\*\*\* IAU0603: FOR IMMEDIATE RELEASE \*\*\*\*\*  
<http://www.iau2006.org/mirror/www.iau.org/iau0603/index.html>

**IAU 2006 General Assembly: Result of the IAU Resolution votes**

24-August-2006, Prague: The first half of the Closing Ceremony of the 2006 International Astronomical Union (IAU) General Assembly has just concluded. The results of the Resolution votes are outlined here.



The International Astronomical Union/Lars Holm Nielsen

**(3) All other objects, except satellites, orbiting the Sun shall be referred to collectively as “Small Solar-System Bodies”.**

**These currently include most of the Solar System asteroids, most Trans-Neptunian Objects (TNOs), comets, and other small bodies.**

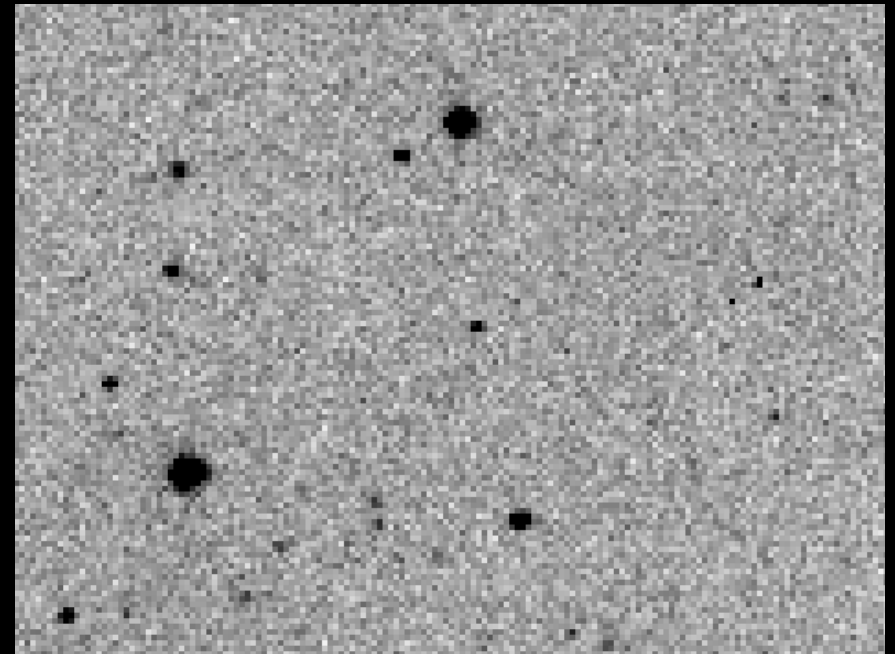
## "TAXONOMÍA NUMÉRICA". DIFERENCIAS OBSERVACIONALES

*Clasificación en atención a características en común, dando el mismo peso a todas las características posibles.*

### COMETAS



### ASTEROIDES



ESA

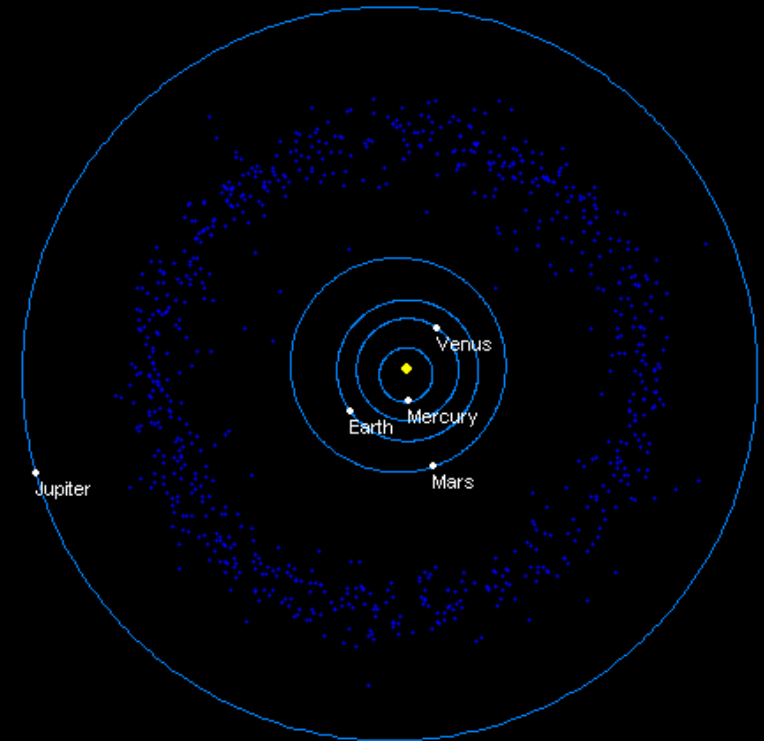
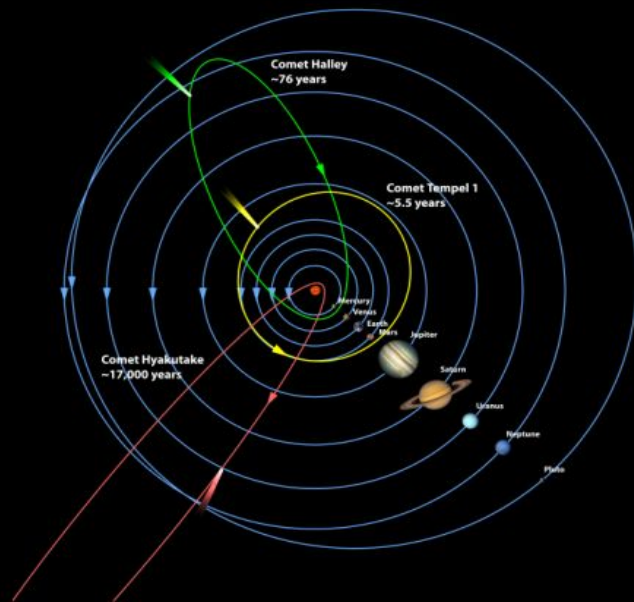
# DIFERENCIAS DINÁMICAS

## COMETAS

## ASTEROIDES

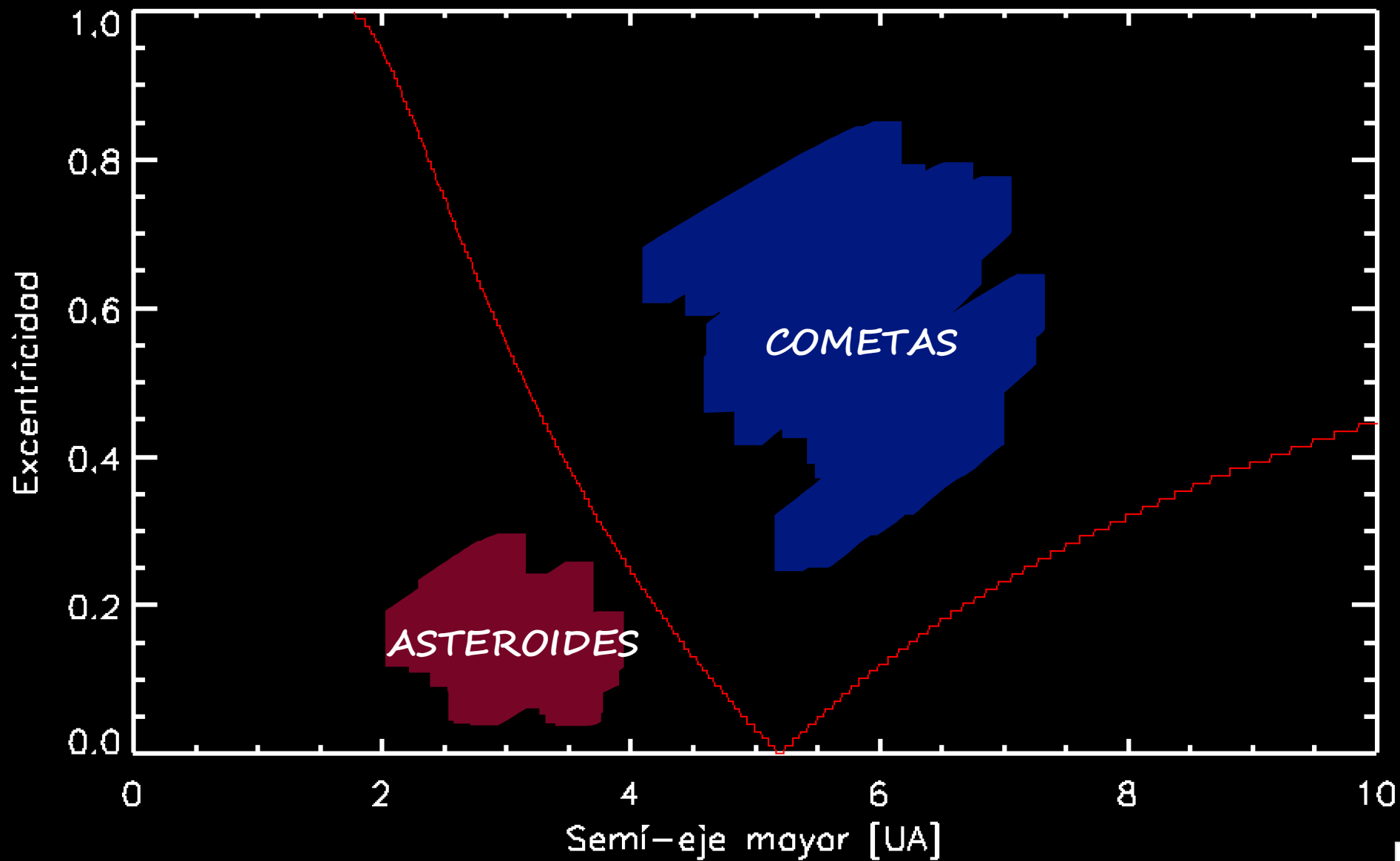
Date: 2005/04/27

Comets Follow Different Orbits

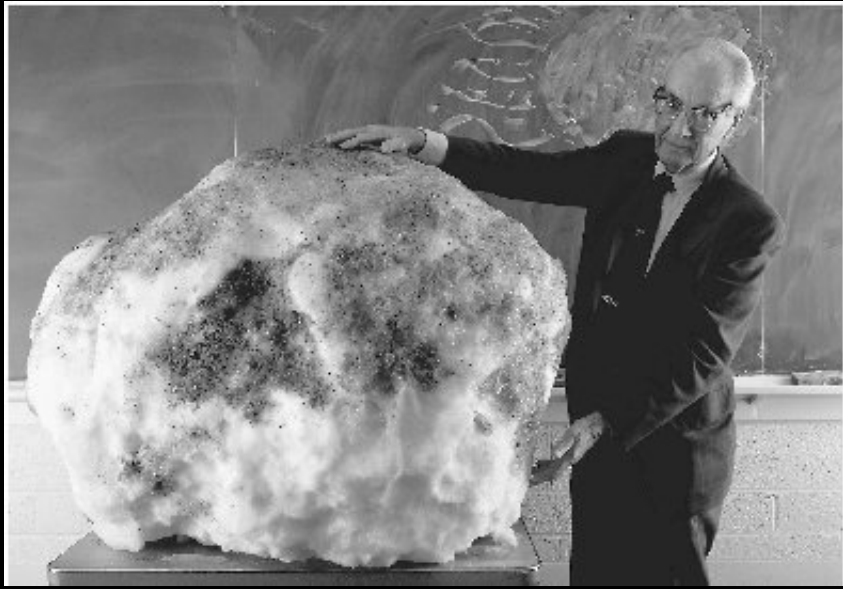


Kay Gibson, Ball Aerospace & Technologies Corp.

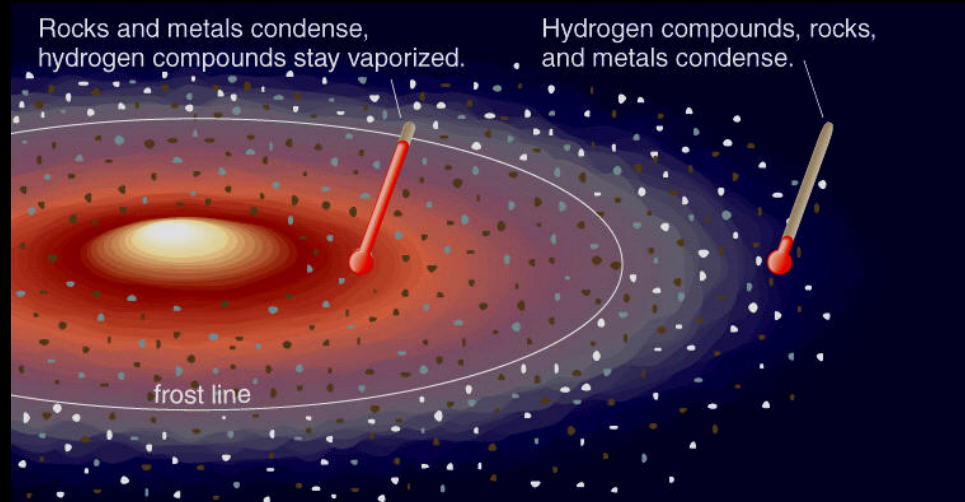
Petr Scheirich, 2005



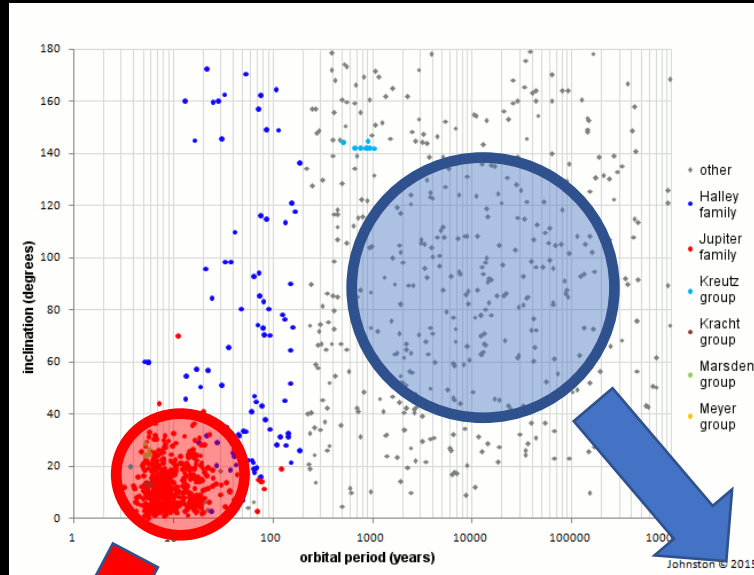
# DIFERENCIAS COMPOSICIONALES



NASA

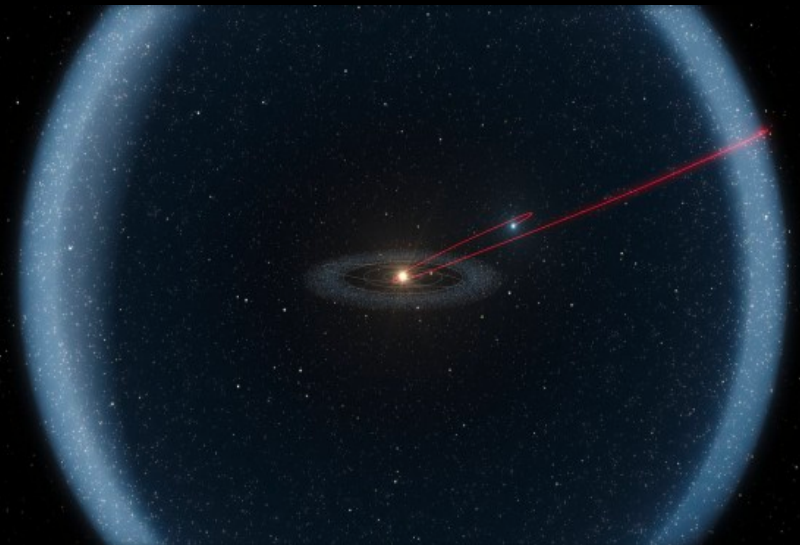
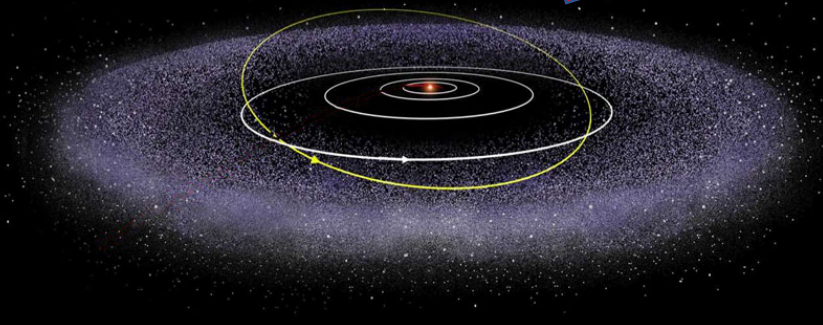


# DESAGREGACIÓN: COMETAS



ISOTRÓPICOS  
(OORT)

ECLIPTICOS  
(TRANSNEPTUNIANOS)





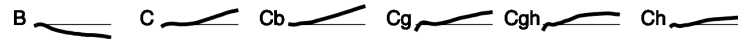
# DESAGREGACIÓN: ASTEROIDES

## Bus-DeMeo Taxonomy Key

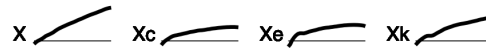
### S-complex



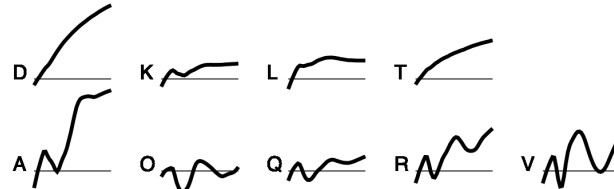
### C-complex



### X-complex



### End Members



<http://smass.mit.edu/busdemeoclass.html>

Condrita carbonácea

Silicatos, carbono, m. orgánico  
Material primitivo.



Condrita ordinaria

Olivino, piroxeno, metales  
Cierta grado de alteración



Acondrita.

Material basáltico  
Alto procesado térmico



Rocoso-metálico

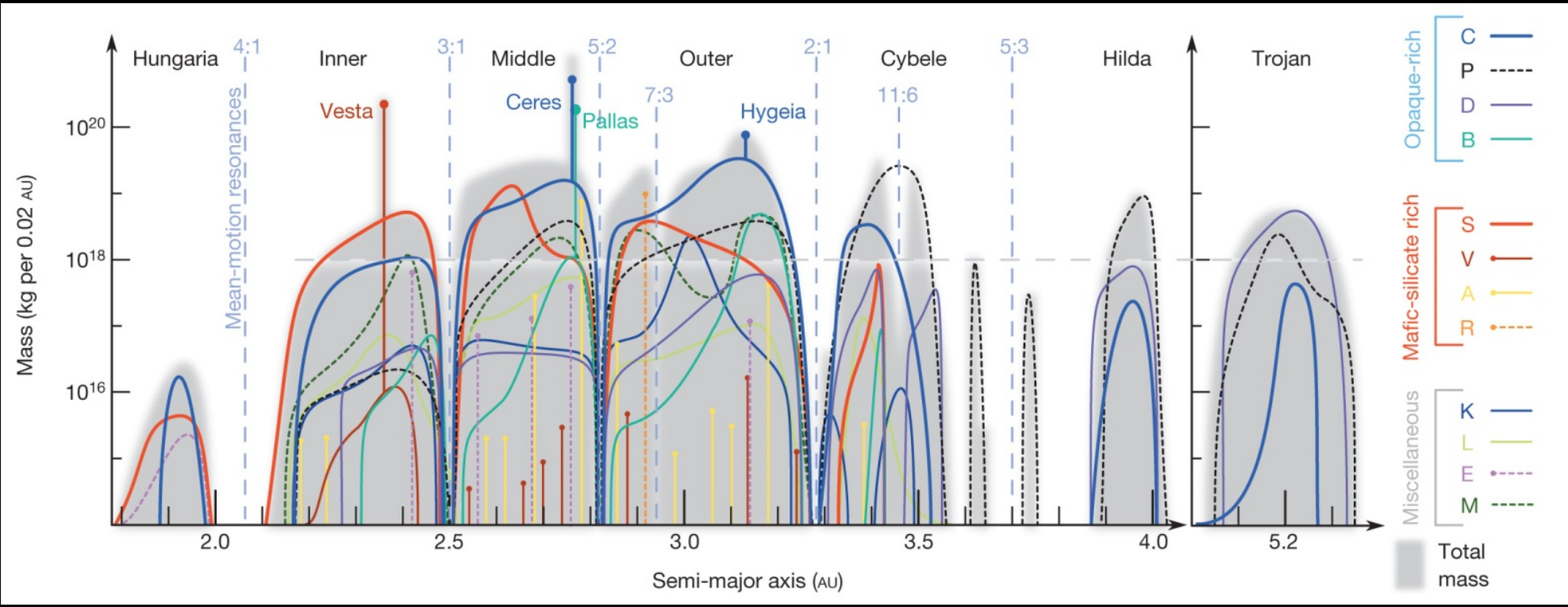
Palasita: Olivino/hierro  
Alto procesado térmico



Metálicos.

Alto procesado térmico

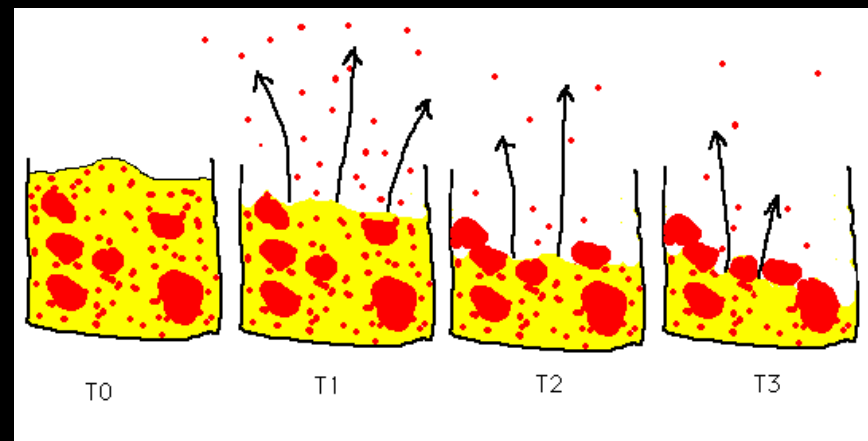




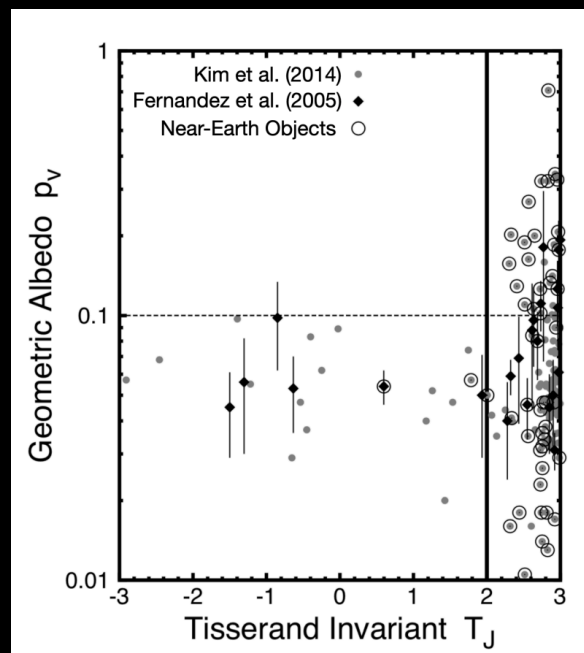
# CRISIS DE IDENTIDAD: ASTEROIDES EN ORBITA COMETARIA.

1920. 944 Hidalgo. Descubrimiento de un "asteroide" en órbita cometaria

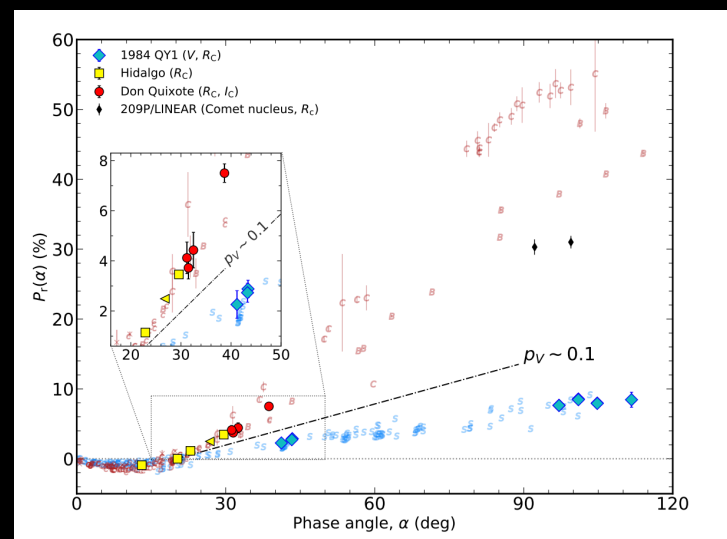
¿cometas extintos o durmientes?



<http://www2.ess.ucla.edu/~jewitt/rubble.html>

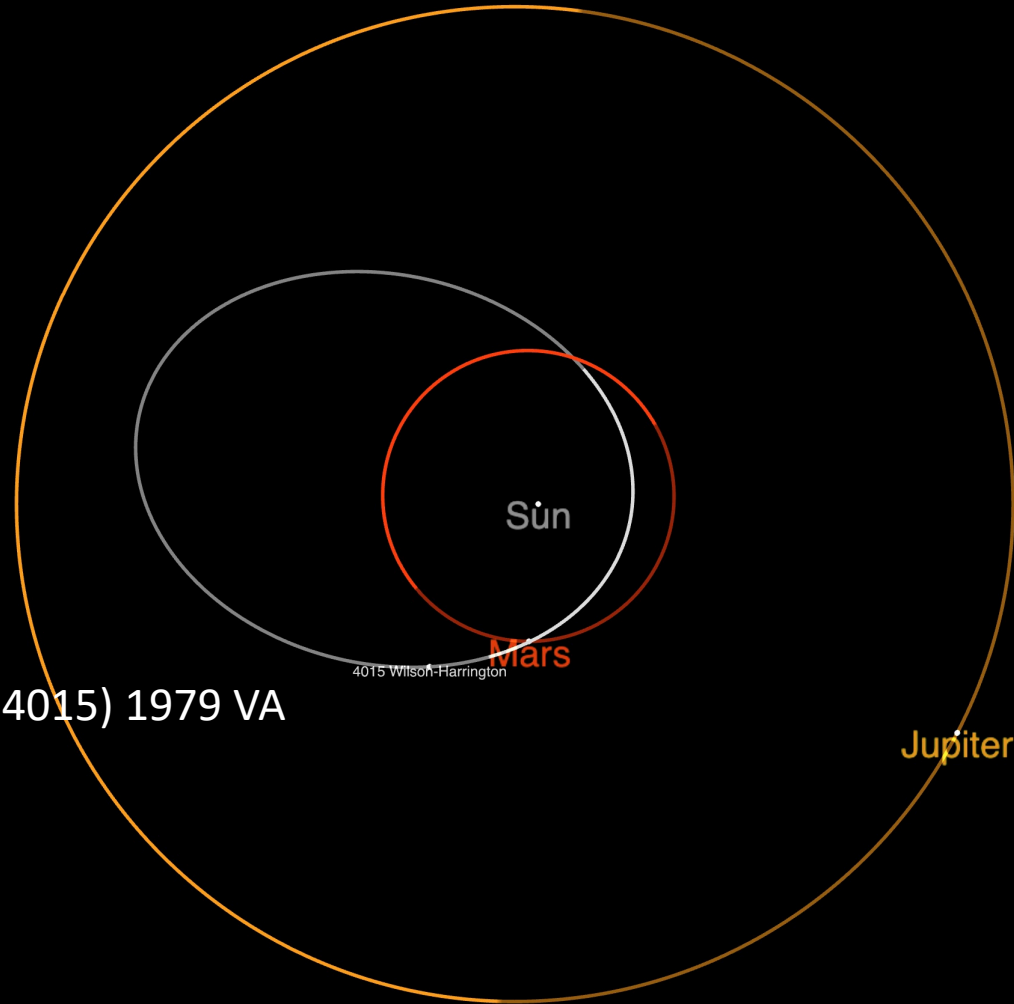


Kim et al., ApJ, 789, 2014



Geem et al., A&A, 658, 2022

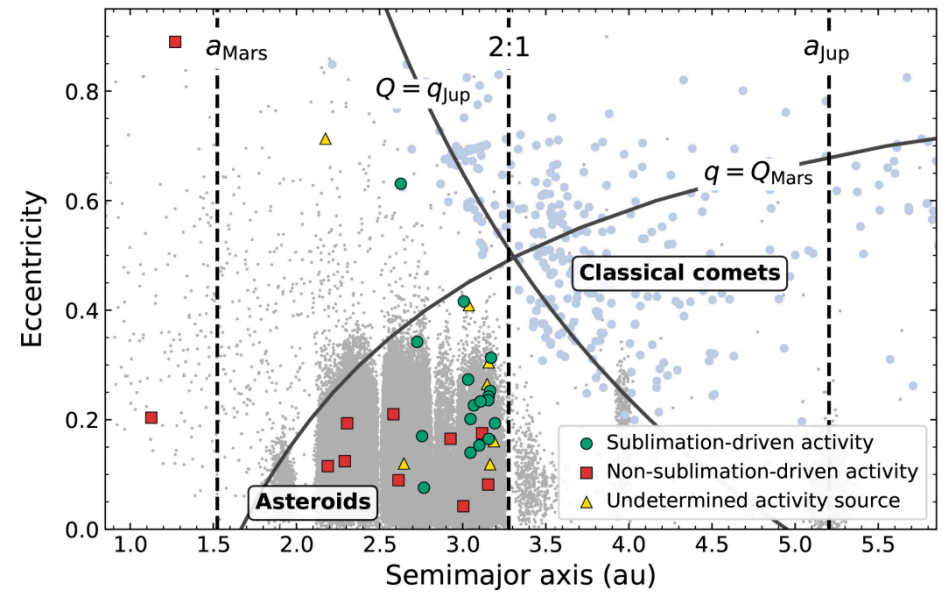
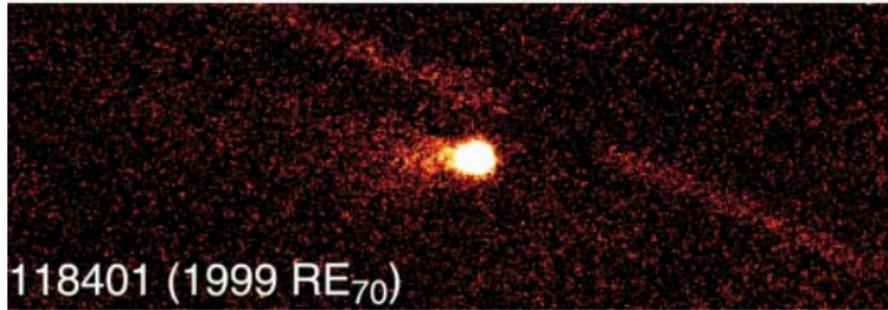
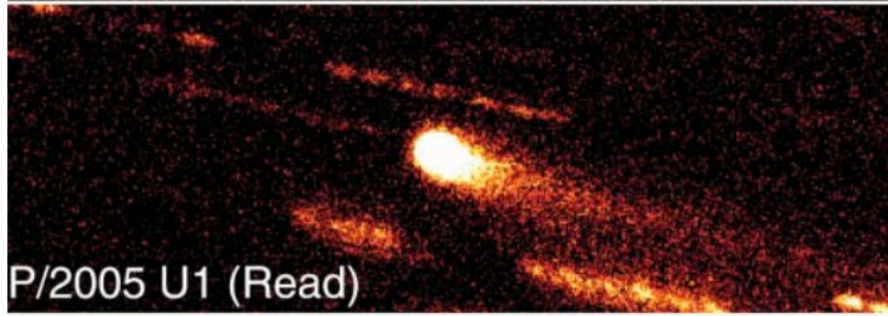
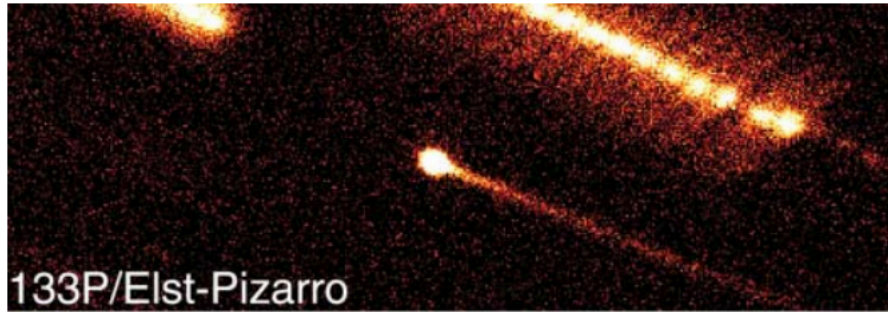
# CRISIS DE IDENTIDAD: COMETAS EN EL CINTURÓN DE ASTEROIDES



1949, 1979, 1992

107P/Wilson-Harrington- (4015) 1979 VA

# CRISIS DE IDENTIDAD: COMETAS EN EL CINTURÓN DE ASTEROIDES



Jewitt & Hsieh, 2022. <https://arxiv.org/pdf/2203.01397.pdf>

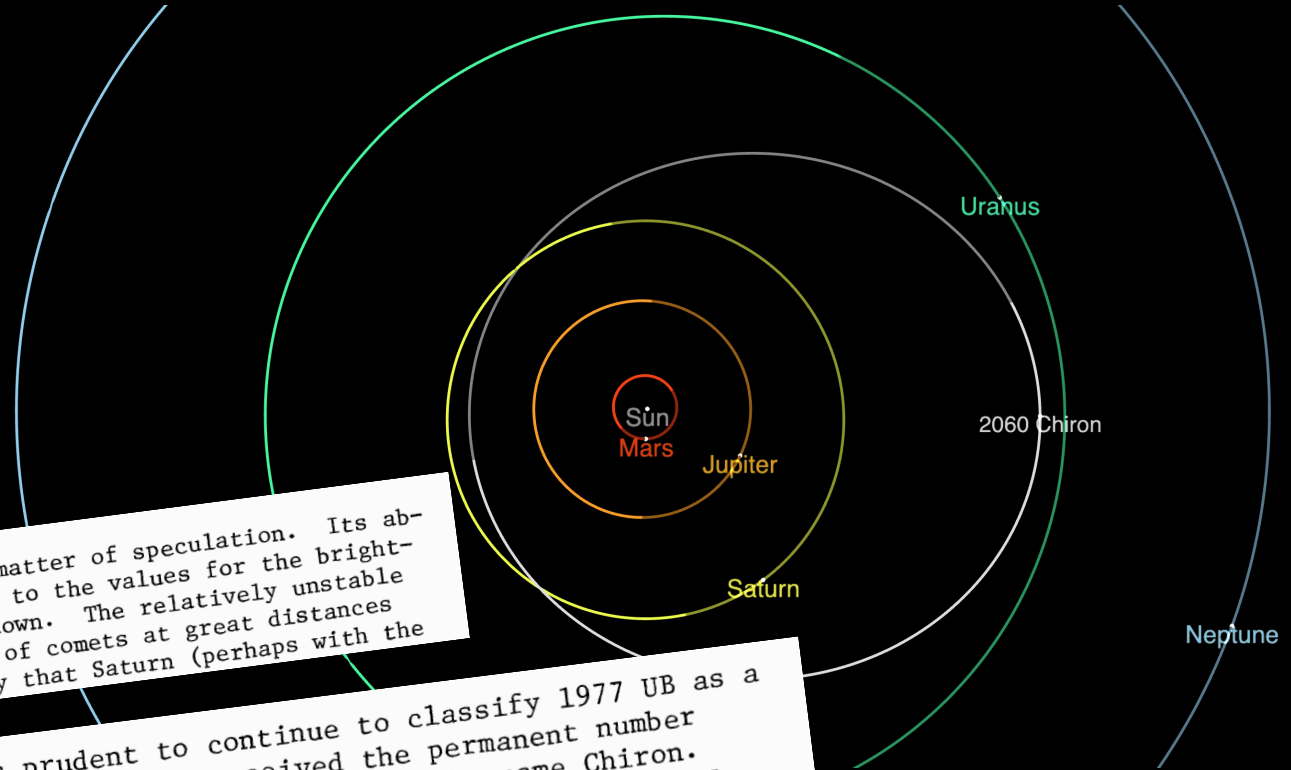
# NUEVAS FAMILIAS

1977 QUIRÓN -> CENTAUROS Objetos con perihelio o semieje-mayor entre Júpiter y Neptuno.  
1988 Actividad

Kowal et al., 1979

The nature of 1977 UB can be only a matter of speculation. Its absolute magnitude of about 6 is comparable to the values for the brightest minor planets, but its albedo is unknown. The relatively unstable nature of its orbit, the known existence of comets at great distances from the sun and the distinct possibility that Saturn (perhaps with the

On the whole, it seems prudent to continue to classify 1977 UB as a minor planet, and it has very recently received the permanent number (2060). The discoverer intends to give this object the name Chiron. Chiron was one of the centaurs, and it is suggested that the names of other centaurs be reserved for other objects of this same type that may be discovered in the future.



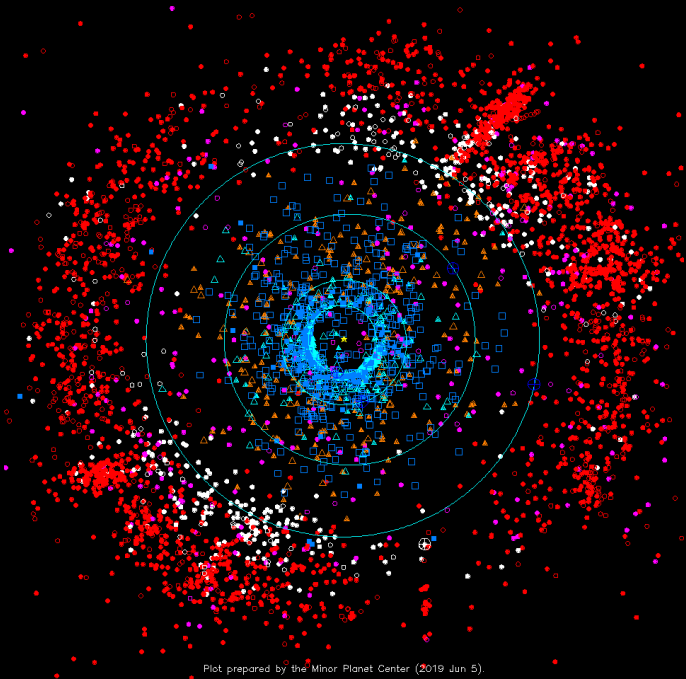
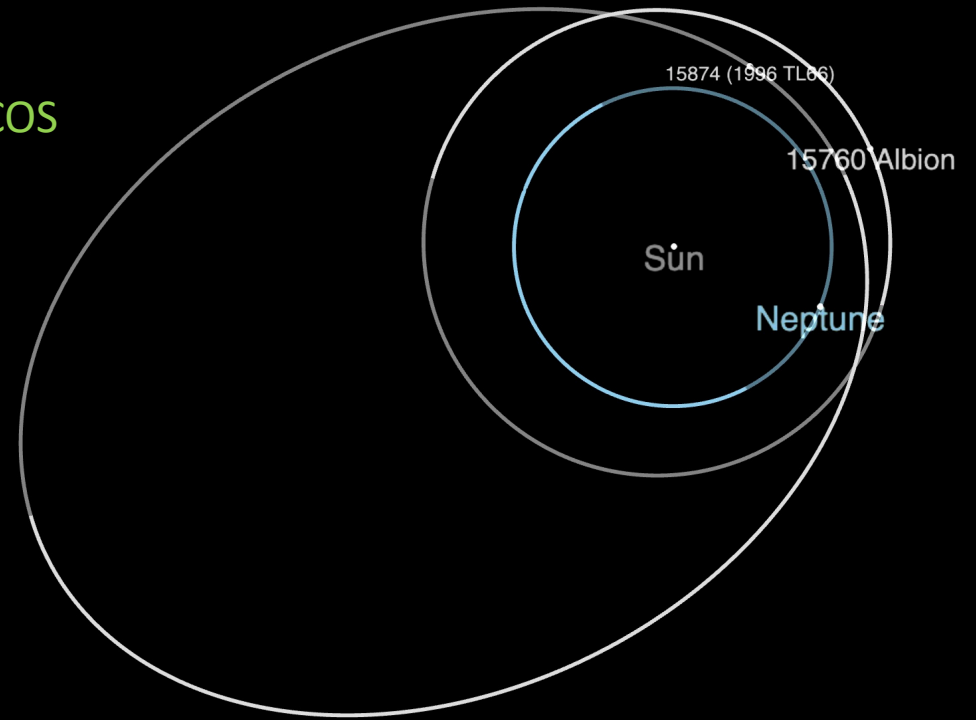
# NUEVAS FAMILIAS

1930 DESCUBRIMIENTO DE PLUTÓN

1992 PRIMER OBJETO TRANSNEPTUNIANO-> CLASICOS  
(ADEMÁS DE PLUTÓN)

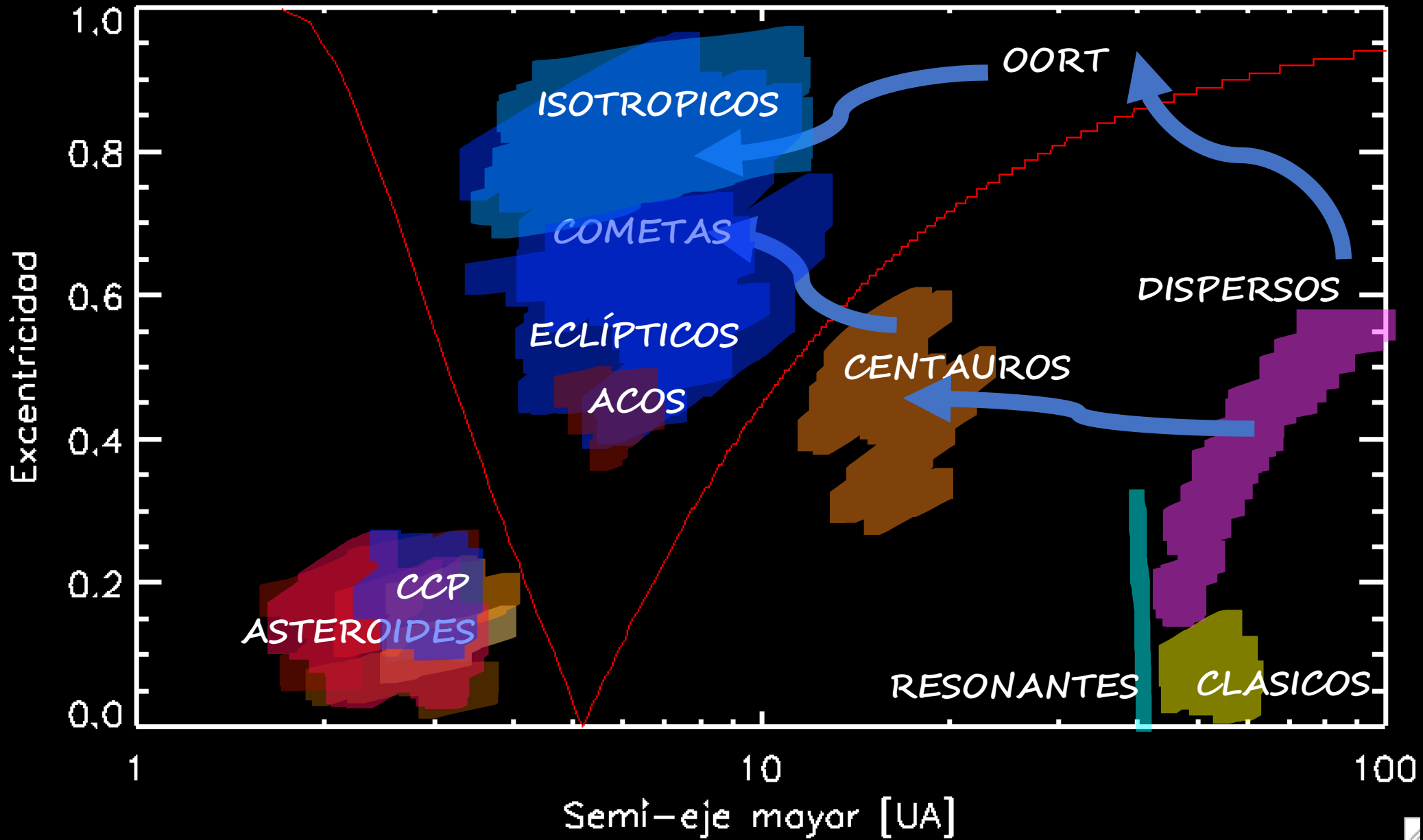
1993 ACOMPAÑANTES DE PLUTÓN-> RESONANTES

1997 OBJETOS EXCÉNTRICOS -> DISCO DISPERSO



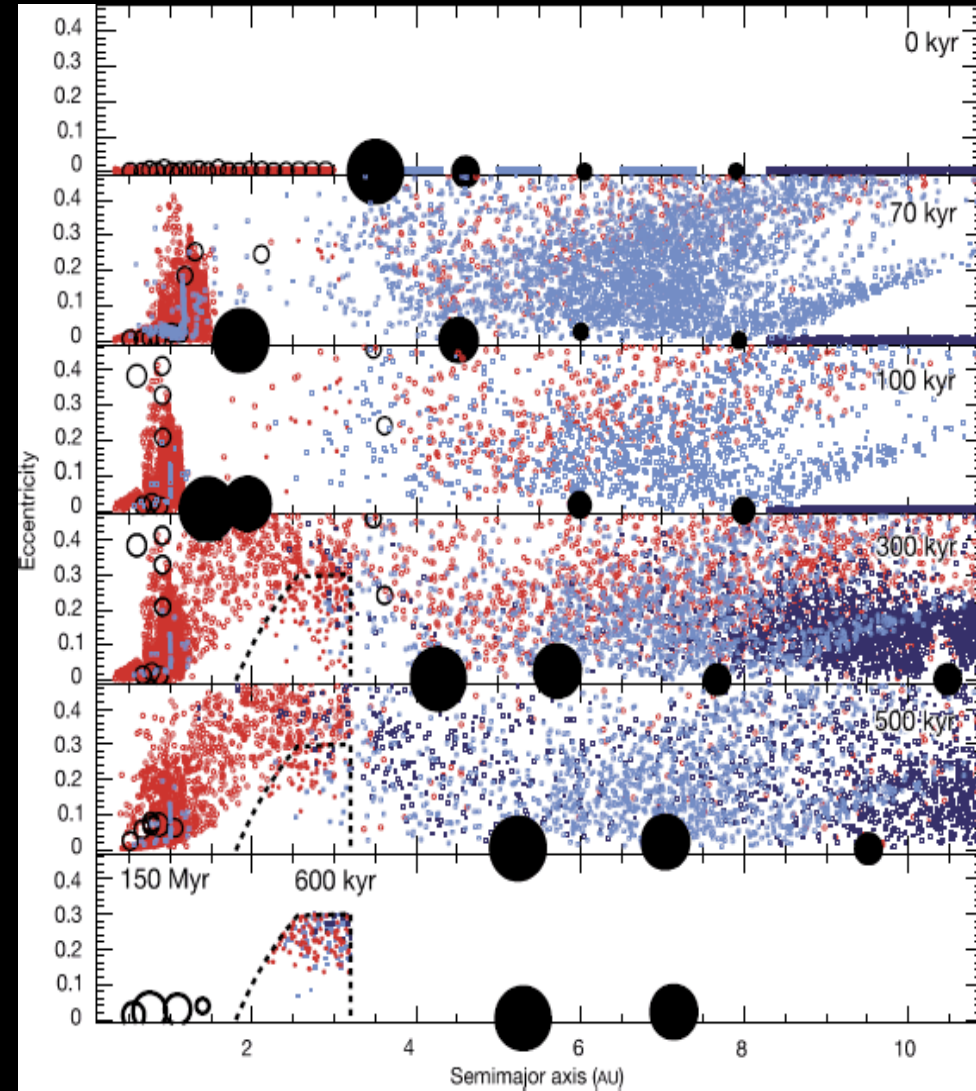
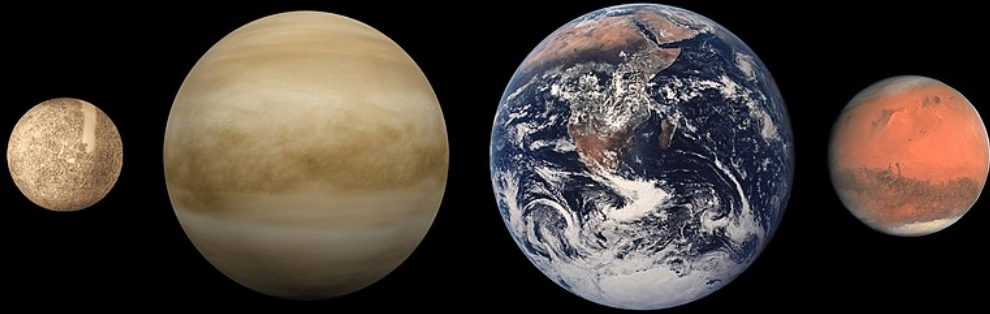
Plot prepared by the Minor Planet Center (2019 Jun 5).

[https://ssd.jpl.nasa.gov/tools/orbit\\_viewer.html](https://ssd.jpl.nasa.gov/tools/orbit_viewer.html)



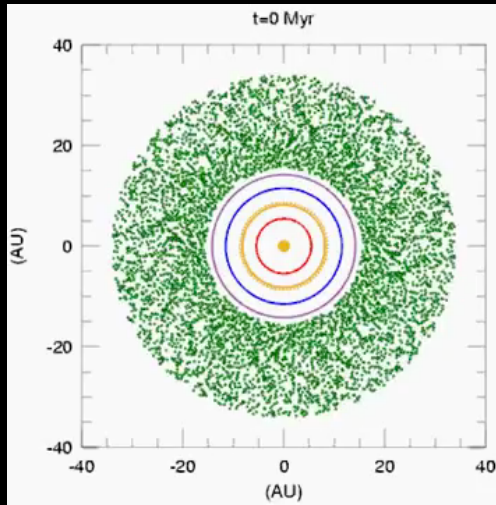


# EL GRAN VIRAJE...

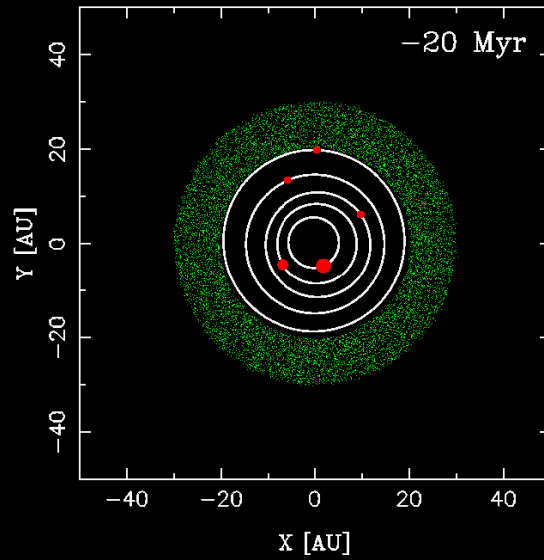


Walsh et al. (2011)

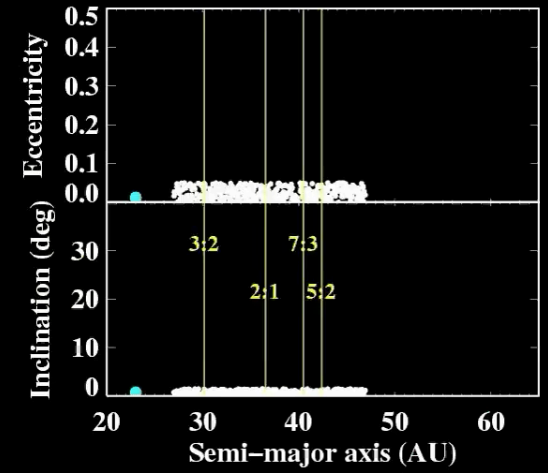
# ... Y EL MODELO DE NIZA



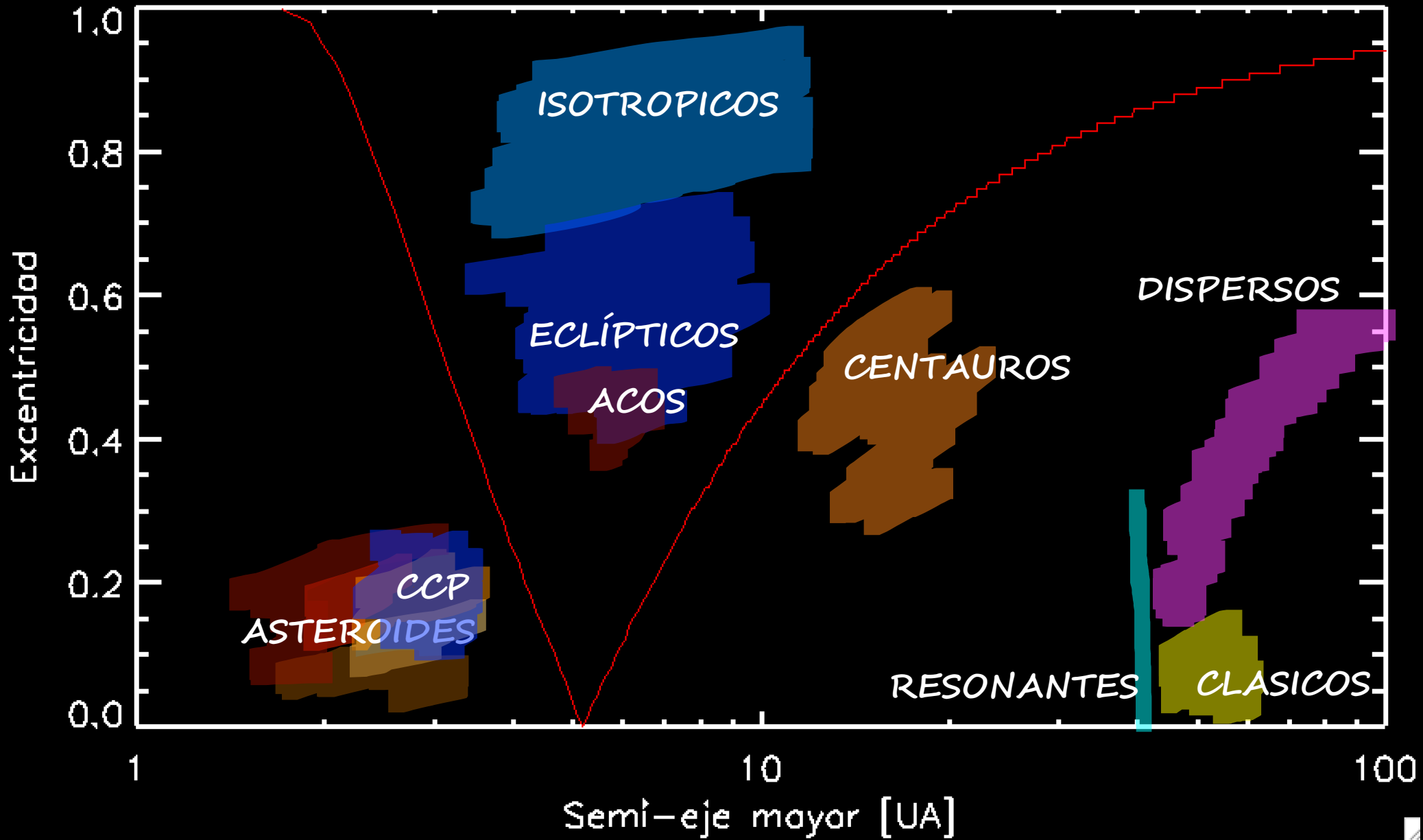
Gomes et al., 2005



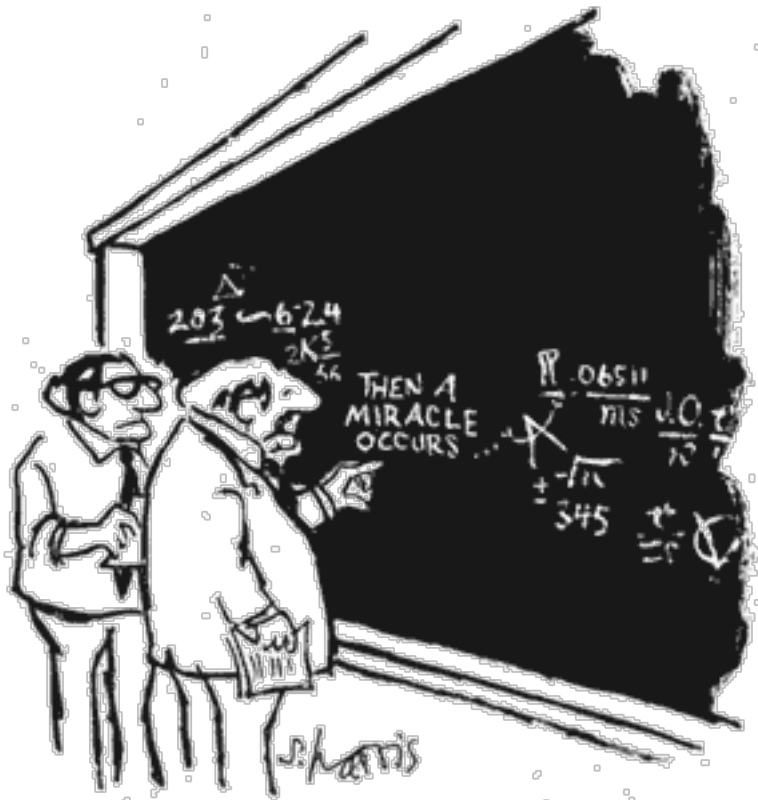
David Nesvorný / SWRI



<https://w.astro.berkeley.edu/~echiang/im/im.html>



¡MUCHAS GRACIAS!



"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."