Komete

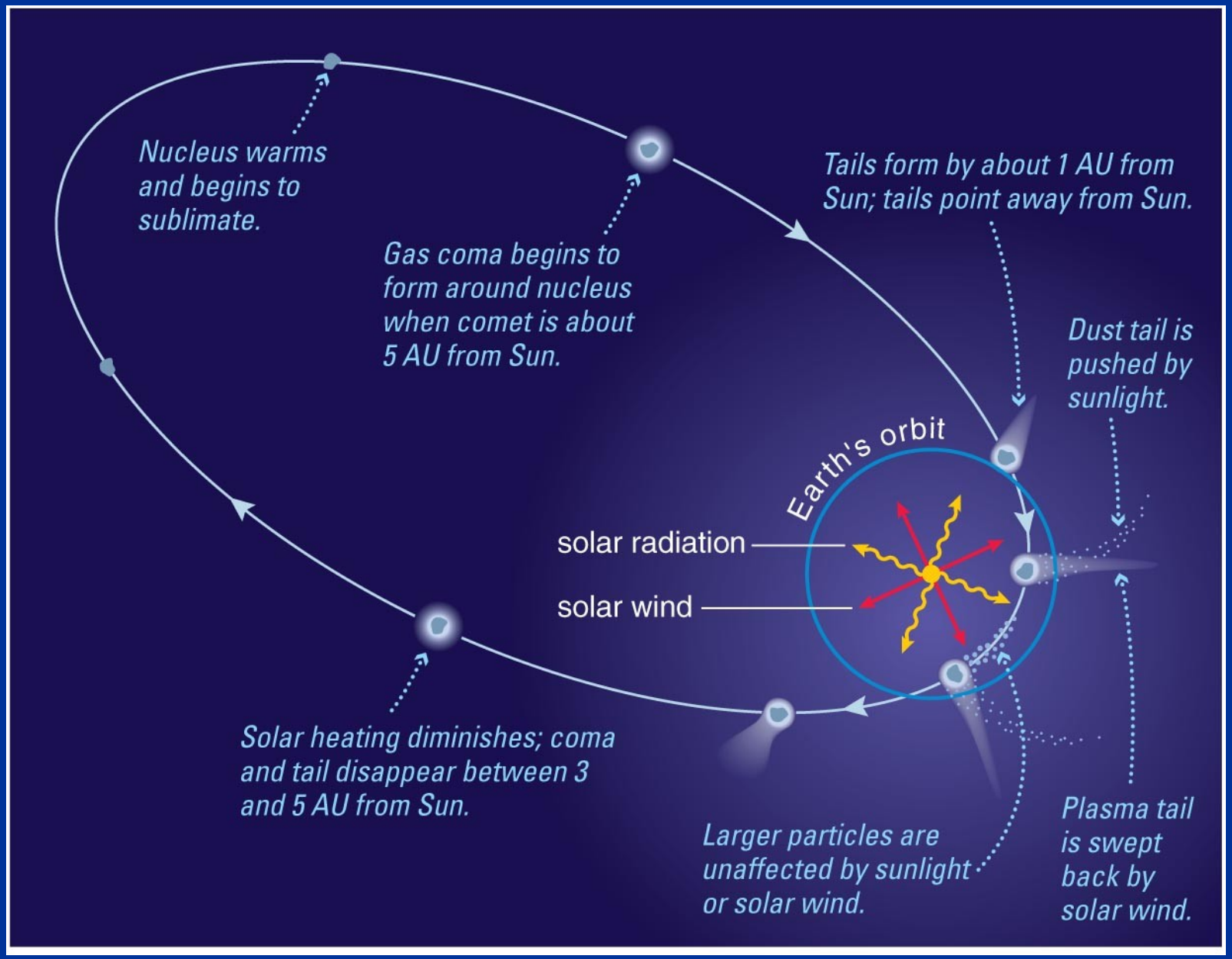
Komete

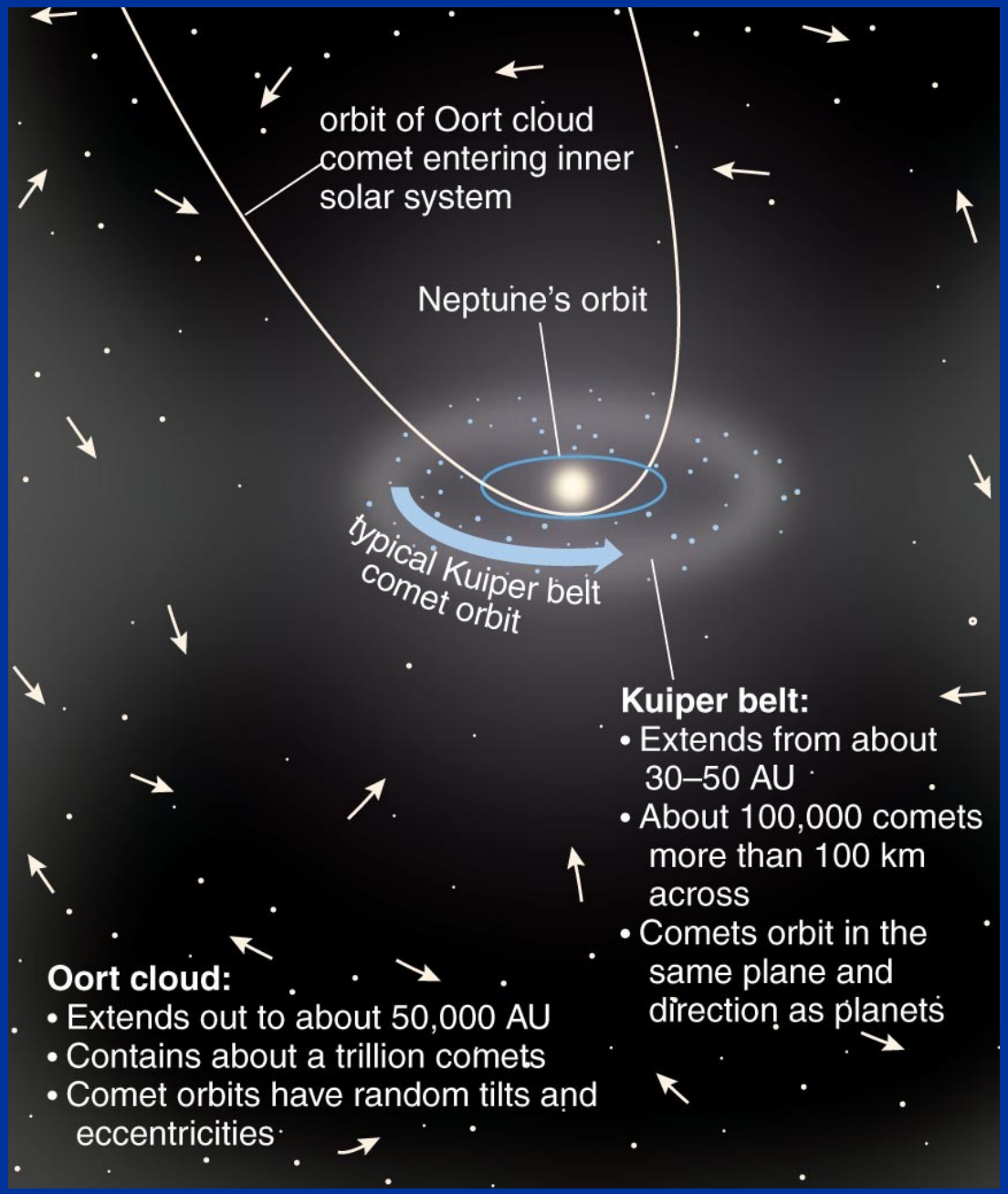
- “Prljave grudve snega” - prašina i led
- Veoma ekscentrične orbite
- U blizini Sunca se pojavljuje rep
- Rezervoari: Kajperov pojas i Ortov oblak, (ali i Glavni asteroidni prsten?)

Neke činjenice o kometama

- **Nastale su izvan snežne linije pa sadrže dosta leda**
- **Jezgra kometa zovemo i “prljavim grudvama snega”**
- **Većina kometa nema repove**
- **Većina kometa je stalno zalađena jer se nalazi u spoljašnjim delovima Sunčevog sistema**
- **Samo se kod kometa koje ulaze u unutrašnji deo Sunčevog sistema pojavljuje rep**

Rep raste kako se kometa približava Suncu



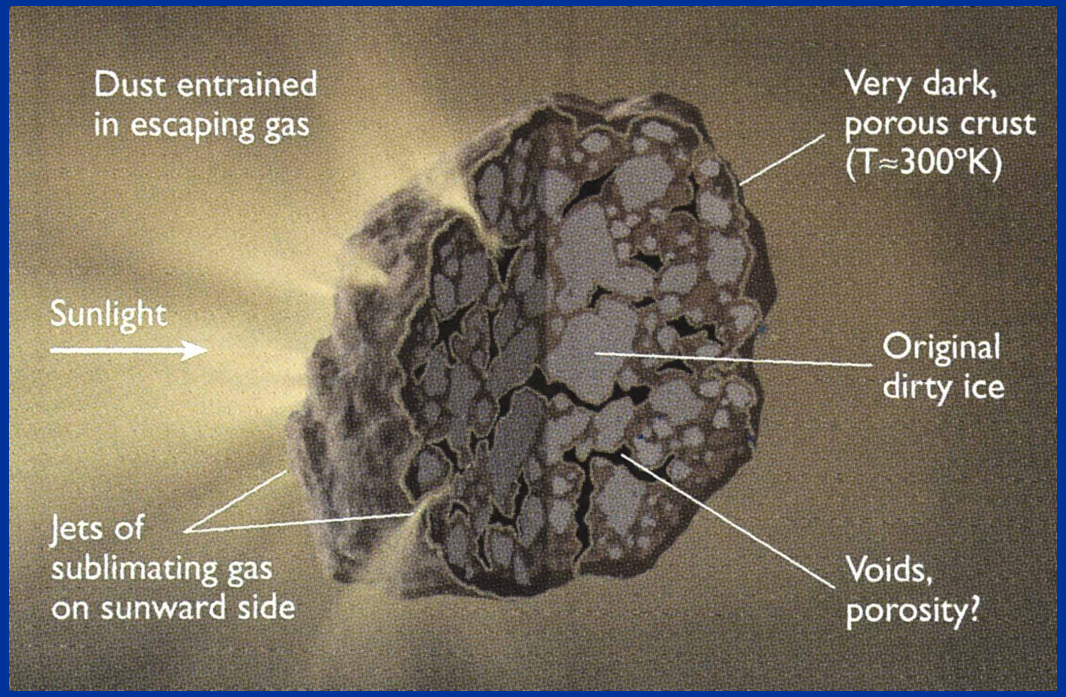


Samo manji broj kometa ulazi u unutrašnji deo Sunčevog sistema

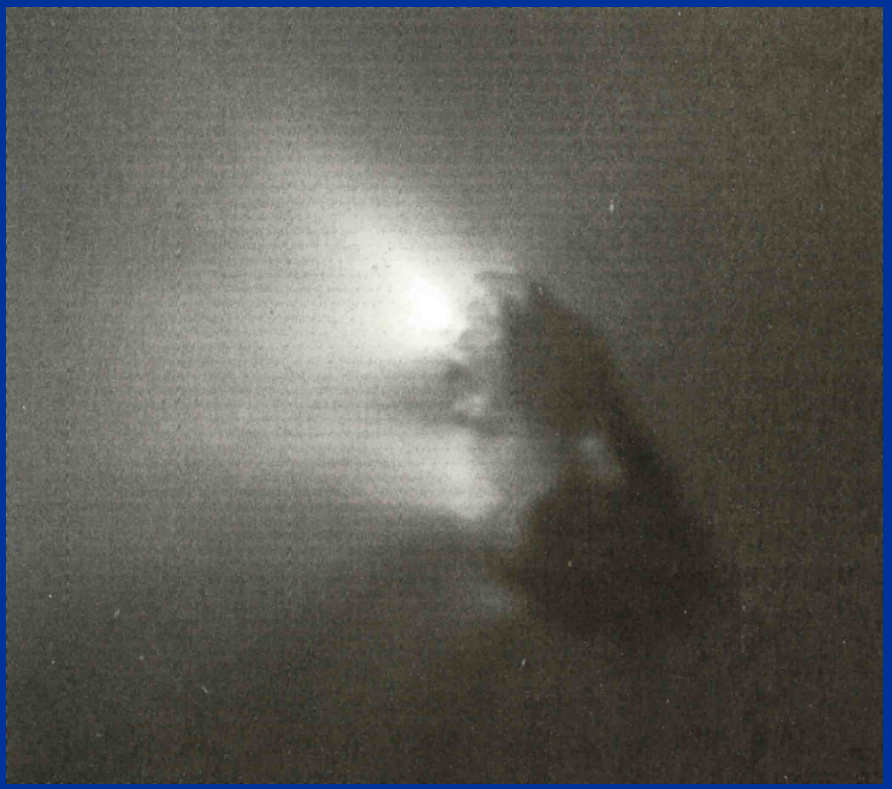
***Ortov oblak*:**
Potpuno slučajne orbite koje se protežu i do oko 50 000 AJ

***Kajperov pojas*:**
Normalne orbite na rastojanju 30-50 AJ, koje leže relativno blizu ravni ekliptike

Jezgra kometa



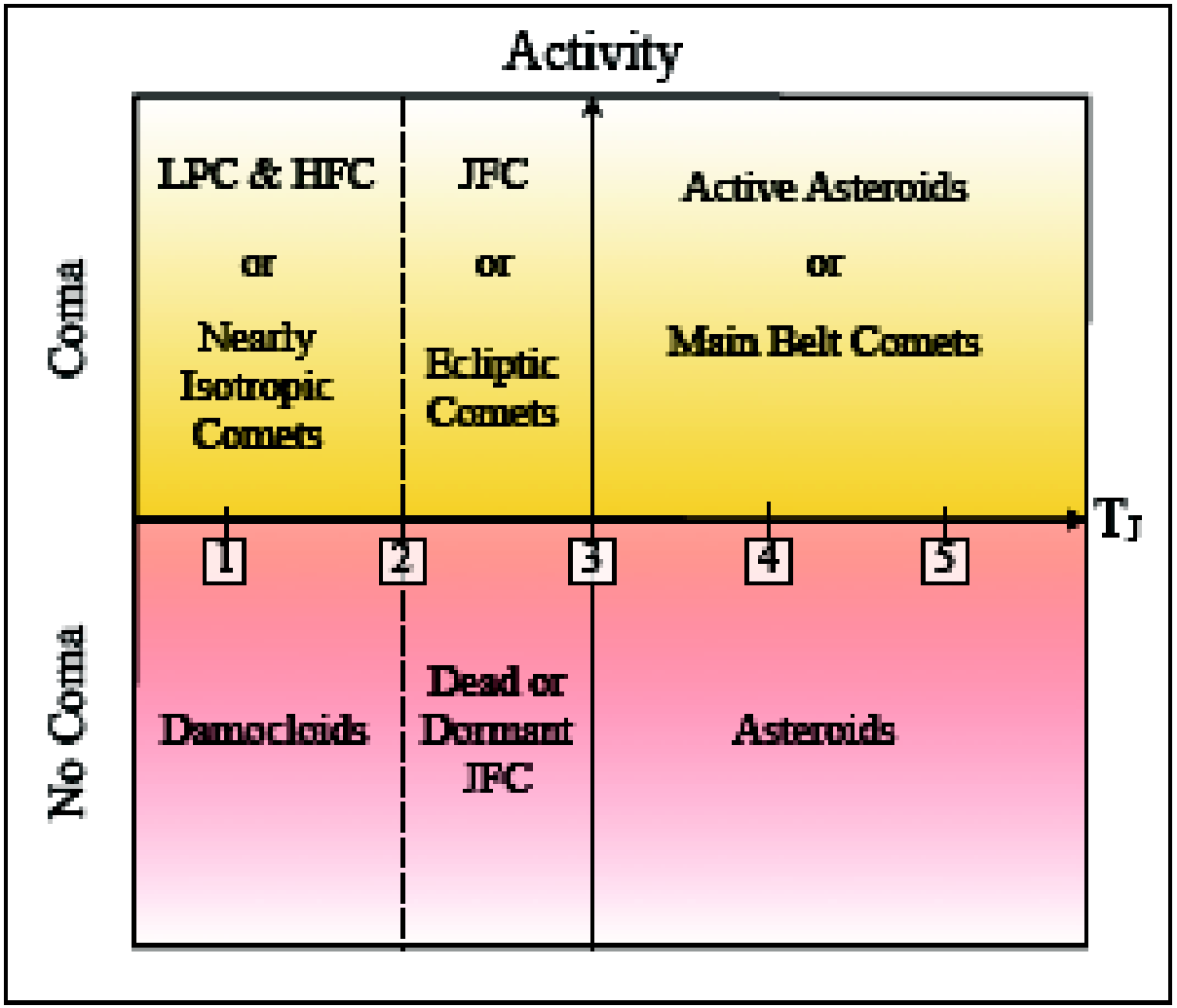
Jezgro Halejeve komete



Podela kometa

1. Kratko-periodične (T < 200 god.)
   - Jupiterova familija kometa (T < 20 god.)
     - Komete tipa Enke (orbite unutar orbite Jupitera)
     - Komete tipa Halej (20< T < 200 god.)
2. Dugo-periodične (T > 200 god.)

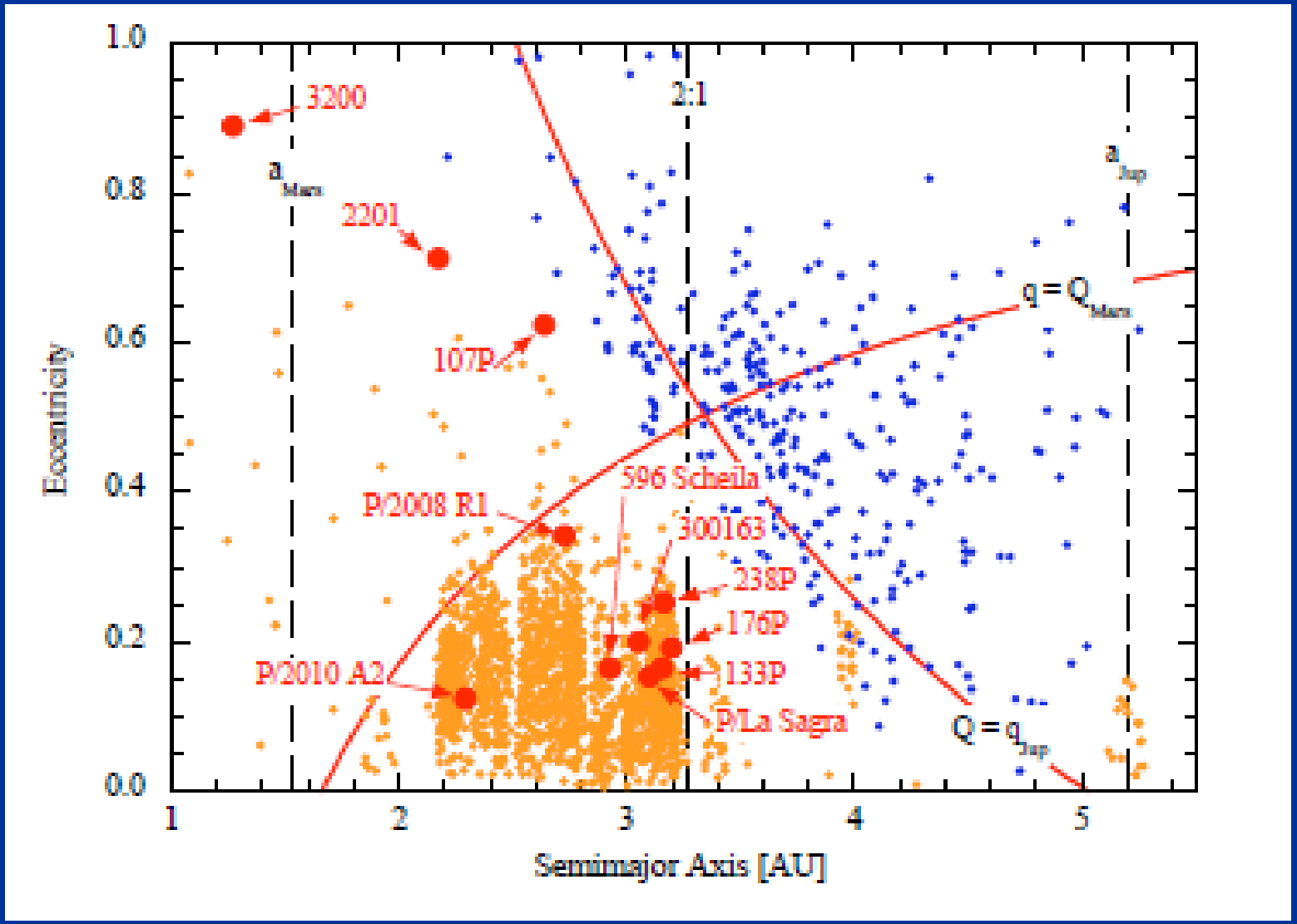
Komete ili asteroidi?



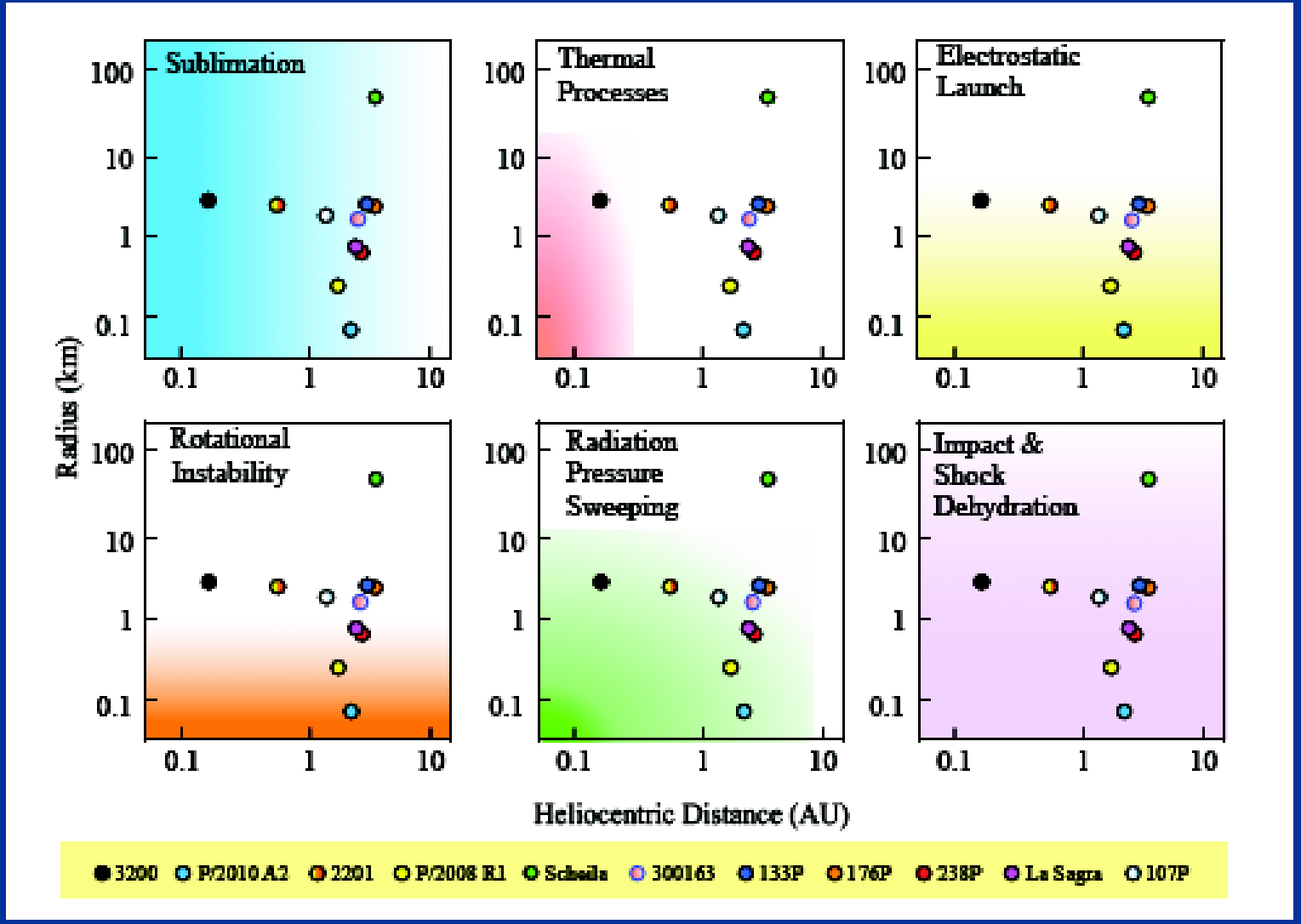
Tiserandov parametar

$$T_J = \frac{a_J}{a} + 2\left[(1-e^2)\frac{a}{a_J}\right]^{1/2} cos(i)$$

Aktivni asteroidi: gde ih sve nalazimo?



Aktivni asteroidi: mehanizmi aktivacije



Komete u asteroidnom prstenu

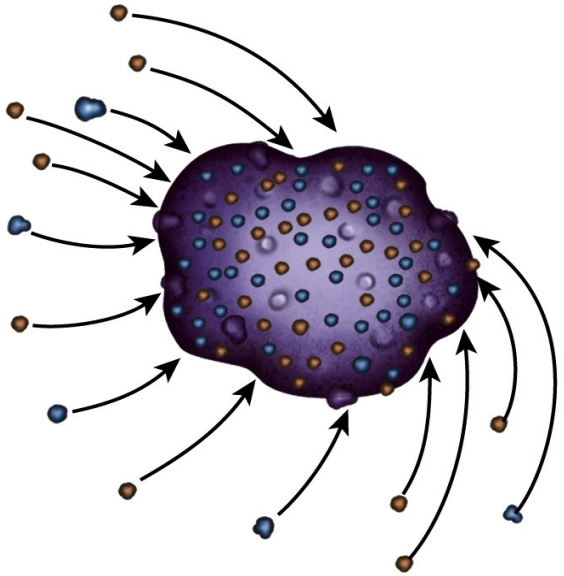
Značaj:

- Moguće je da su takvi objekti dopremili vodu na Zemlji
- Informacije o lokaciji snežne linije

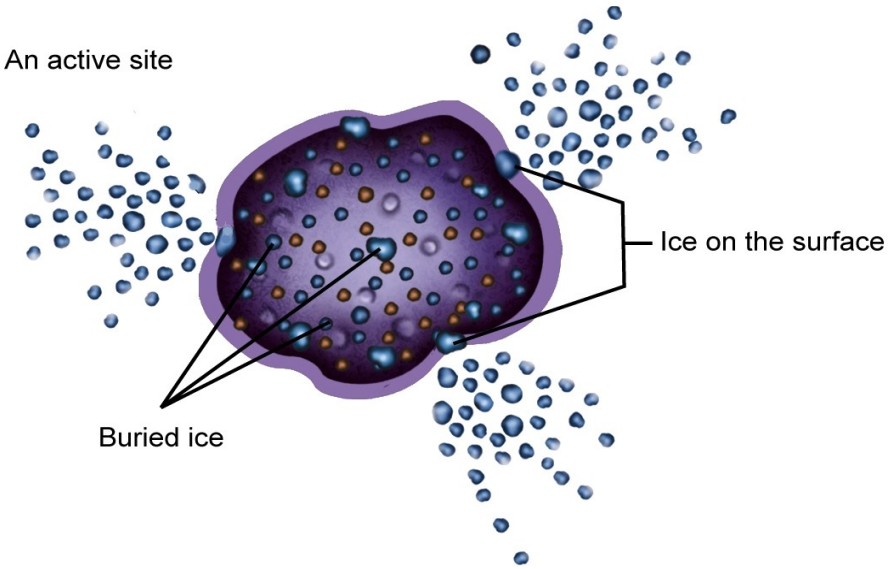
Problem:

- Kako je led opstao na toj udaljenosti od Sunca

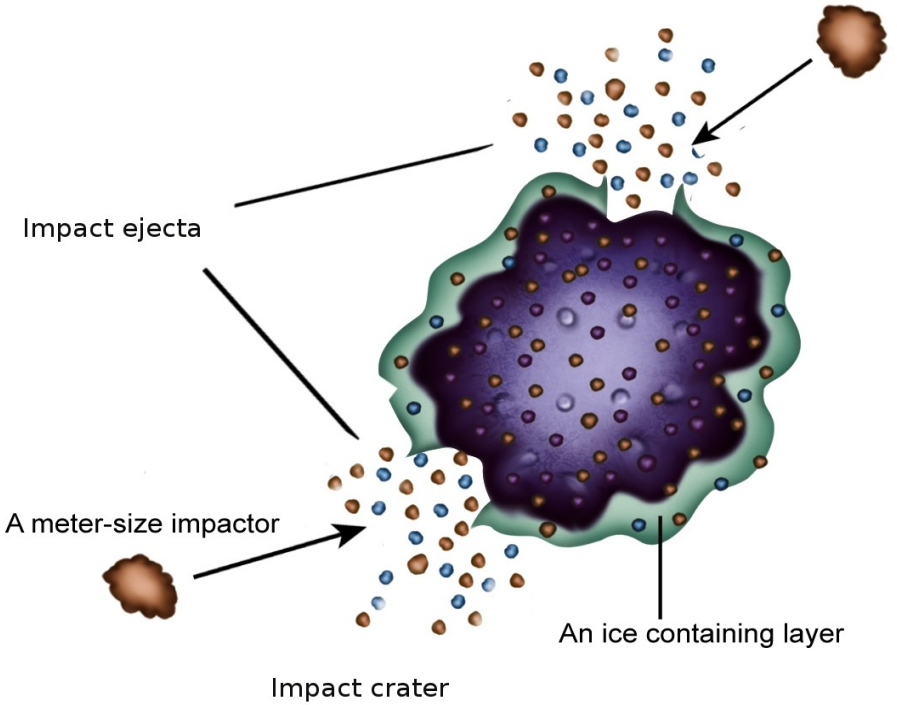
Phase 1: Accretion of an ice-bearing planetesimal



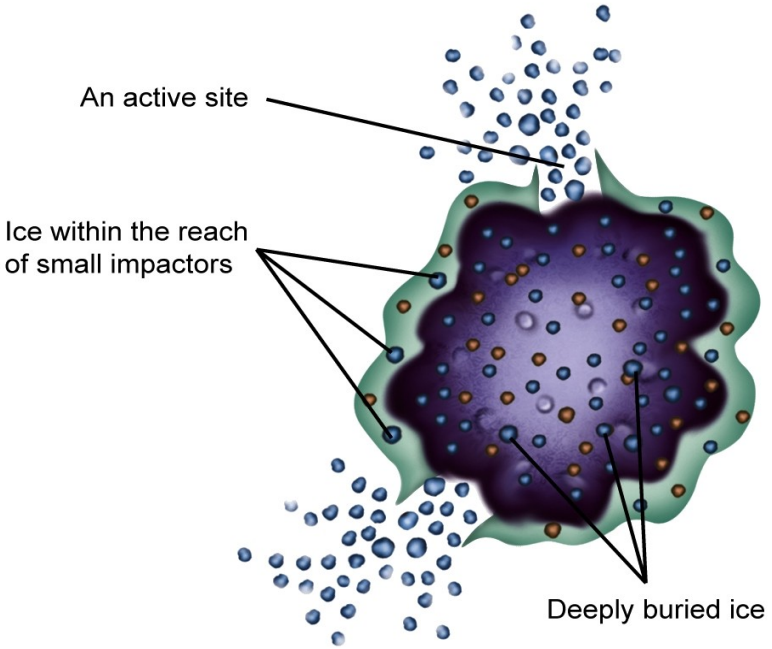
Phase 2: Sublimation of ice located at surface



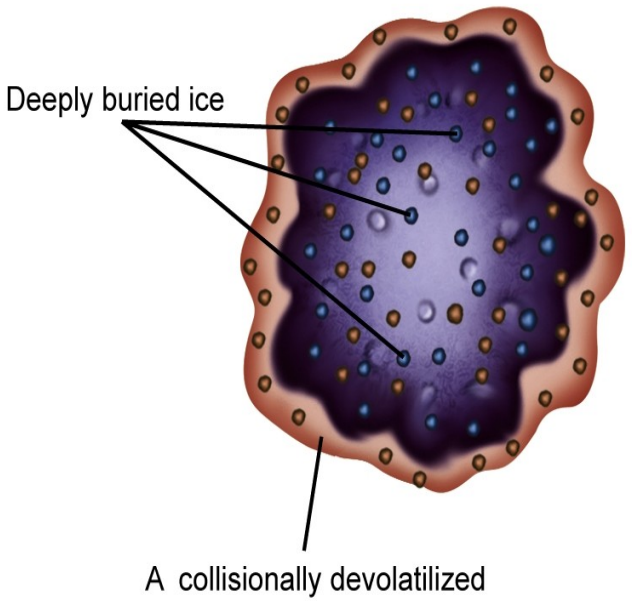
Phase 3: Subsurface ice, of an ice-bearing asteroid, has been excavated by impacts of small objects



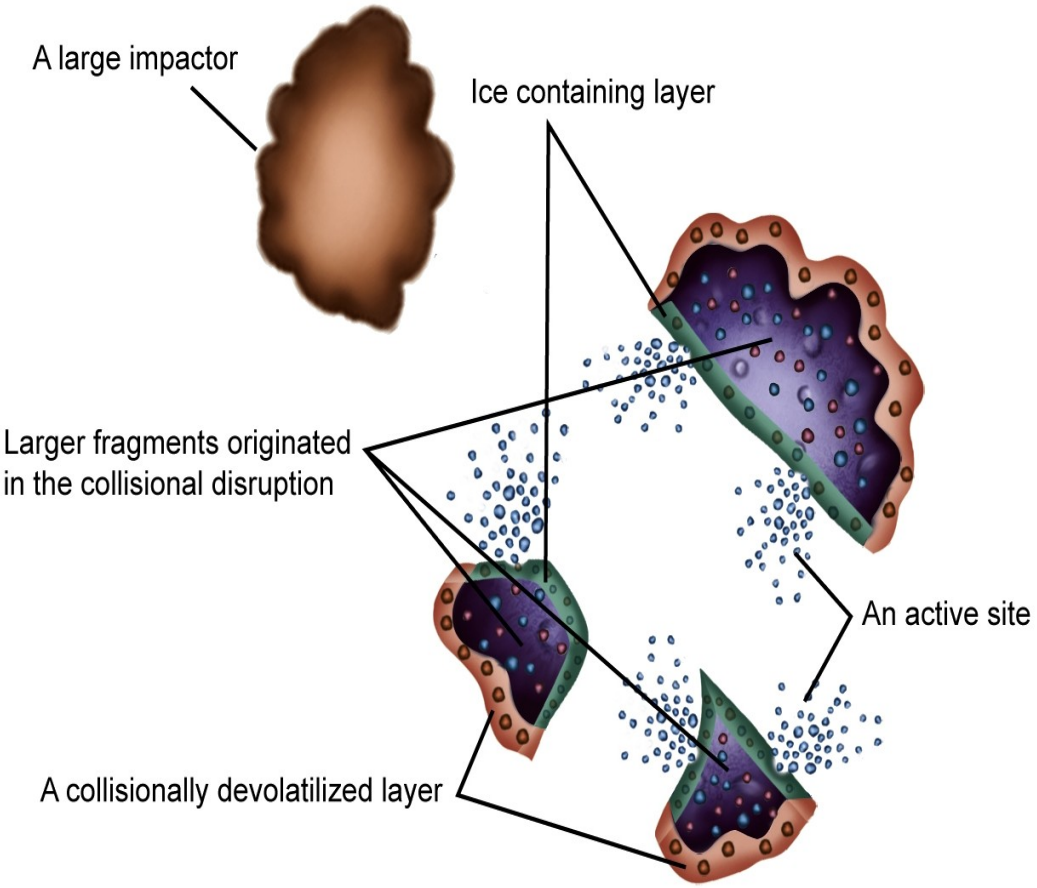
Phase 4: Sublimation of ice exposed on the surface



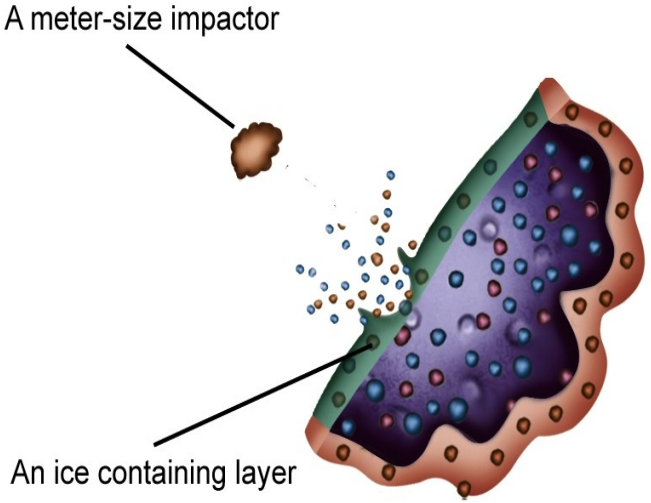
Phase 5: A near-surface layer is collisionally devolatilized



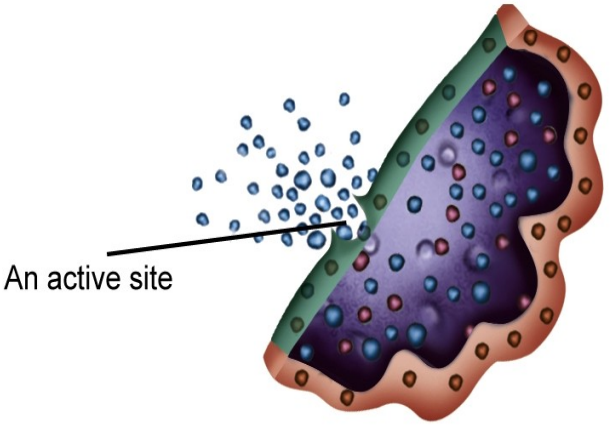
Phase 6: Collisional disruption of an ice-bearing asteroid



Phase 7: A fragment being impacted by small impactor



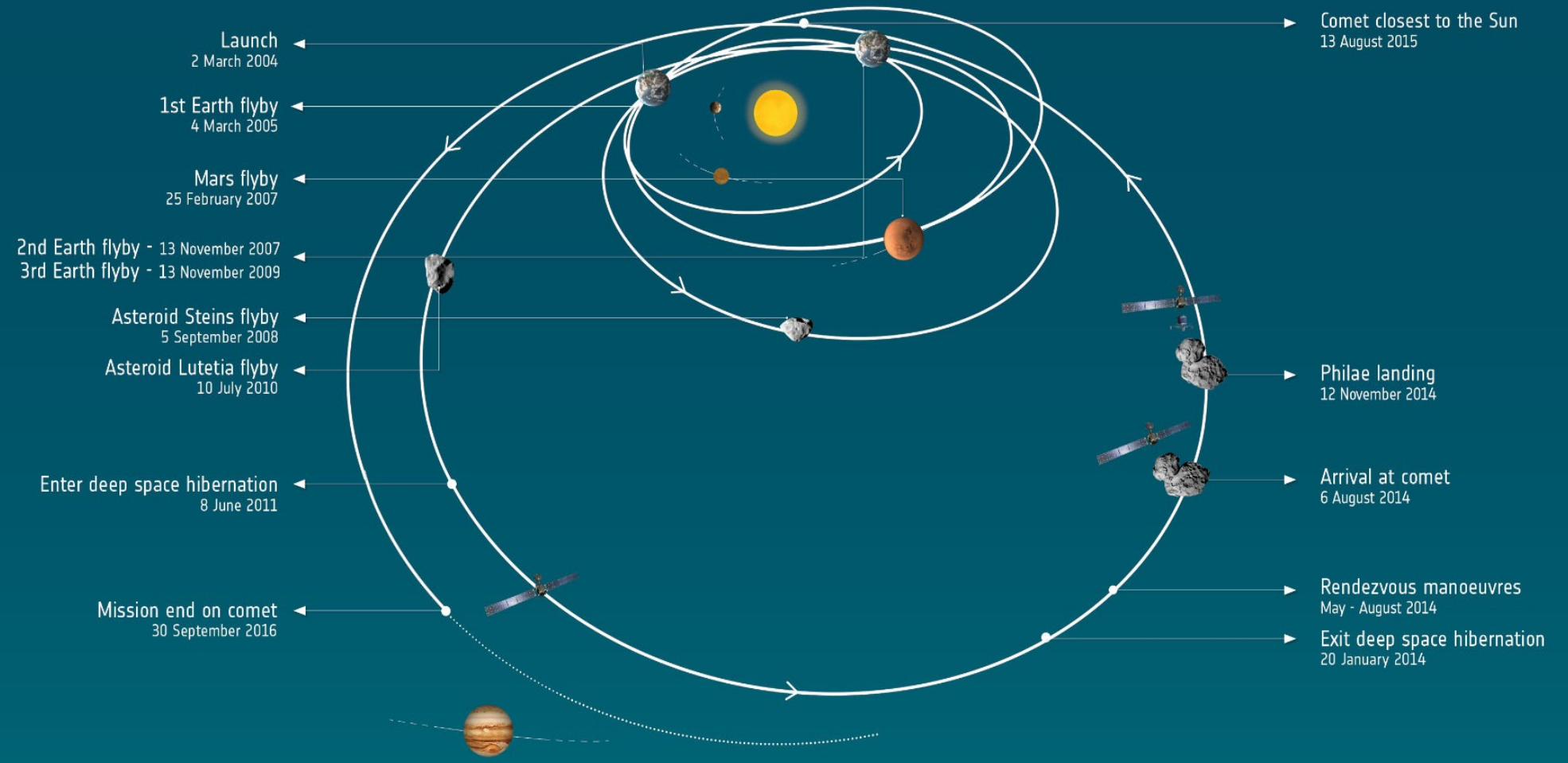
Phase 8: A recently observed main-belt comet

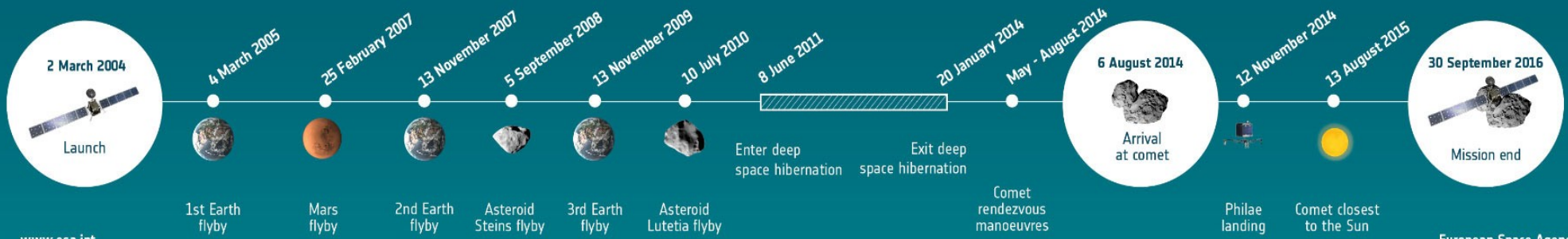



CHASING A COMET
THE ROSETTA MISSION

→ ROSETTA'S JOURNEY 2004–16

esa





www.esa.int

European Space Agency

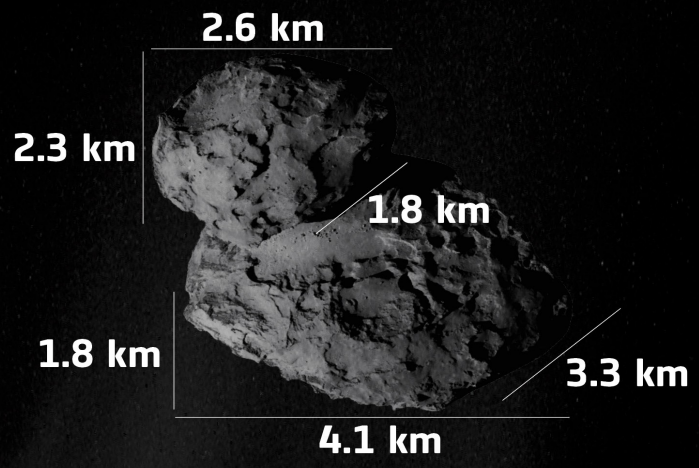
→ COMET 67P/CHURYUMOV–GERASIMENKO'S VITAL STATISTICS

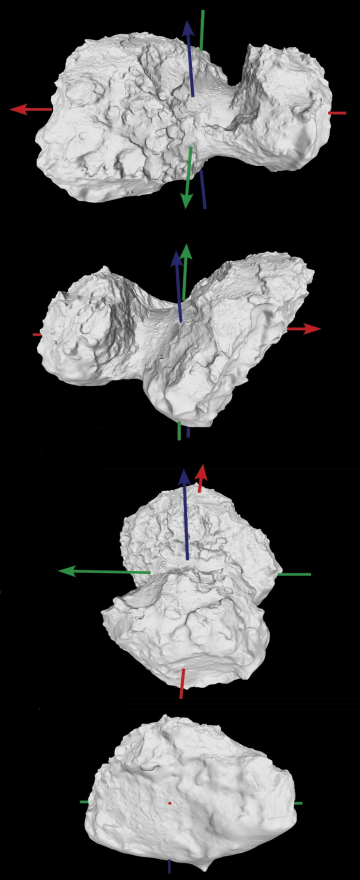
21.4 km³
Volume

1.0 × 10¹³ kg
Mass

470 kg/m³
Density

70–80%
Porosity





Rotation period
12.4043 hours

Spin axis:
69.3°
Right Ascension

64.1°
Declination

52°
Obliquity of the comet's rotational axis

4
Dust/gas ratio

5.3 × 10⁻⁴
D/H ratio

Average water vapour production
300 ml/s → June 2014
600 ml/s → July 2014
1200 ml/s → August 2014

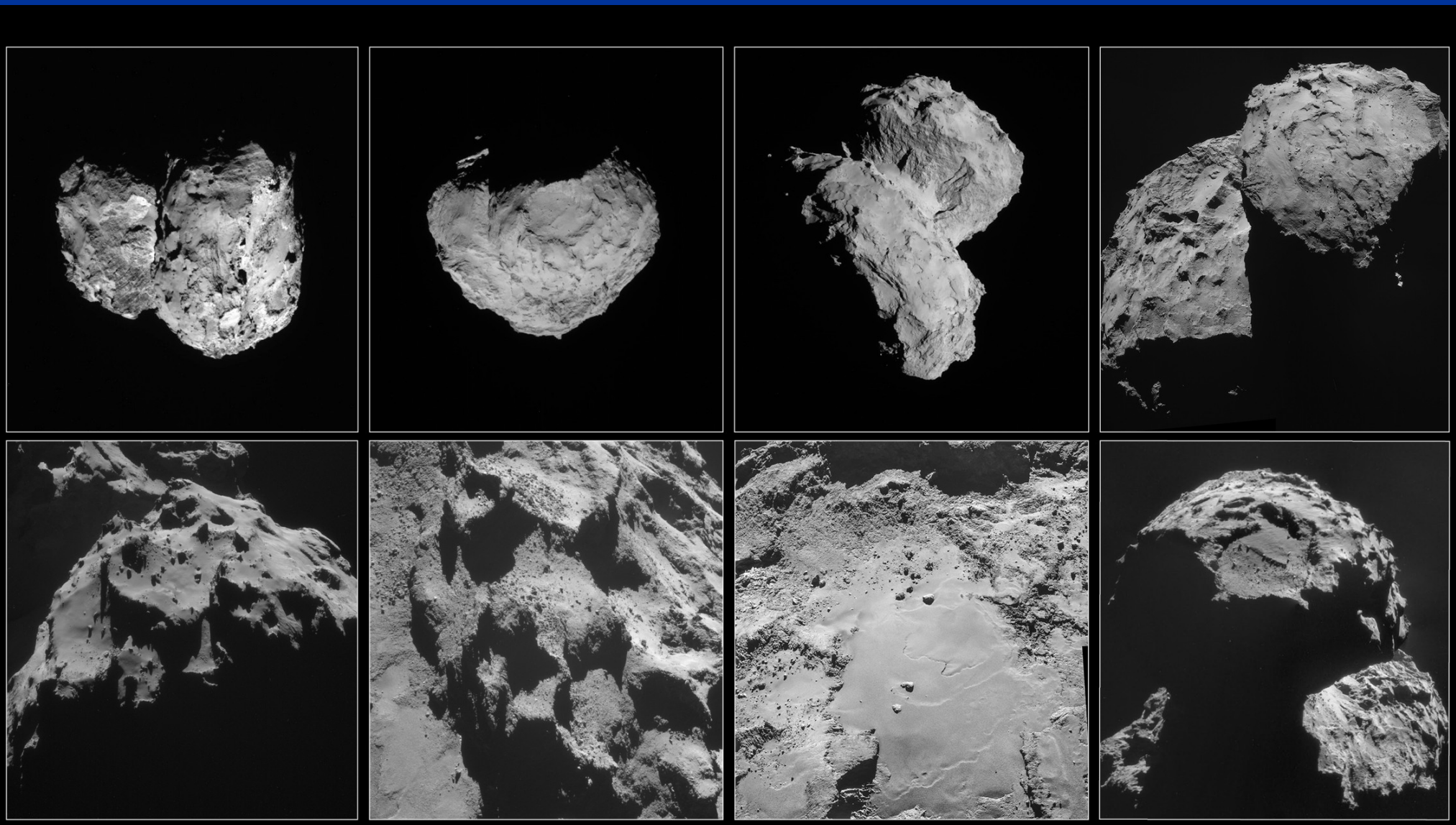
–93°C to –43°C
Surface temperature

–243°C to –113°C
Subsurface temperature

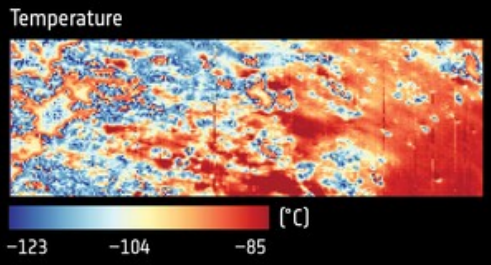
6%
Average albedo

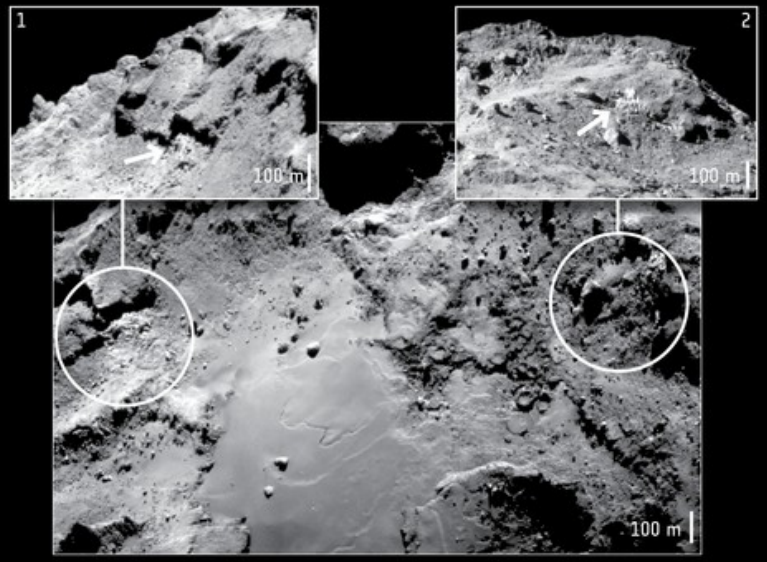
Rotation/shape model: OSIRIS; surface temperature: VIRTIS; subsurface temperature: MIRO; water production rate: MIRO; D/H: ROSINA; dust/gas: GIADA, MIRO, ROSINA; volume: OSIRIS; mass: RSI; density: RSI/OSIRIS; albedo: OSIRIS, VIRTIS; comet images: NavCam
Data based on values published in January 2015

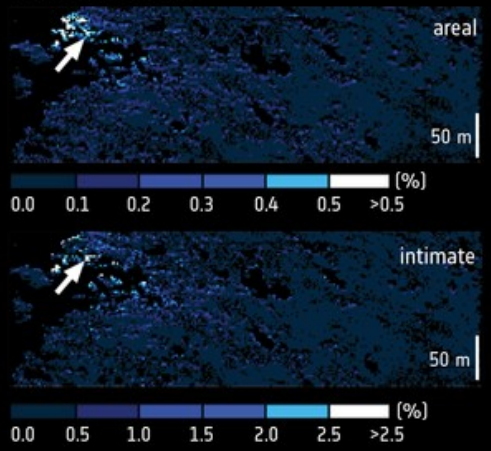
European Space Agency

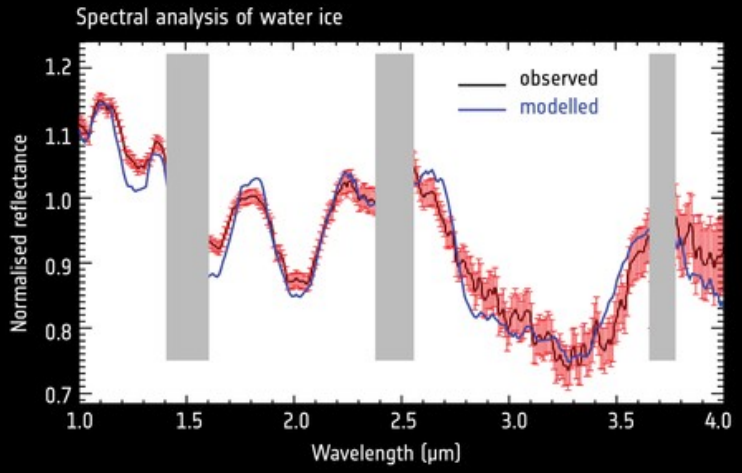


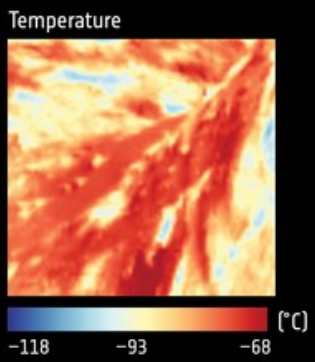
→ WATER ICE IN IMHOTEP











Infrared analyses by Rosetta's VIRTIS instrument between September and November 2014 reveal water ice in two distinct locations in the Imhotep region of Comet 67P/Churyumov–Gerasimenko.

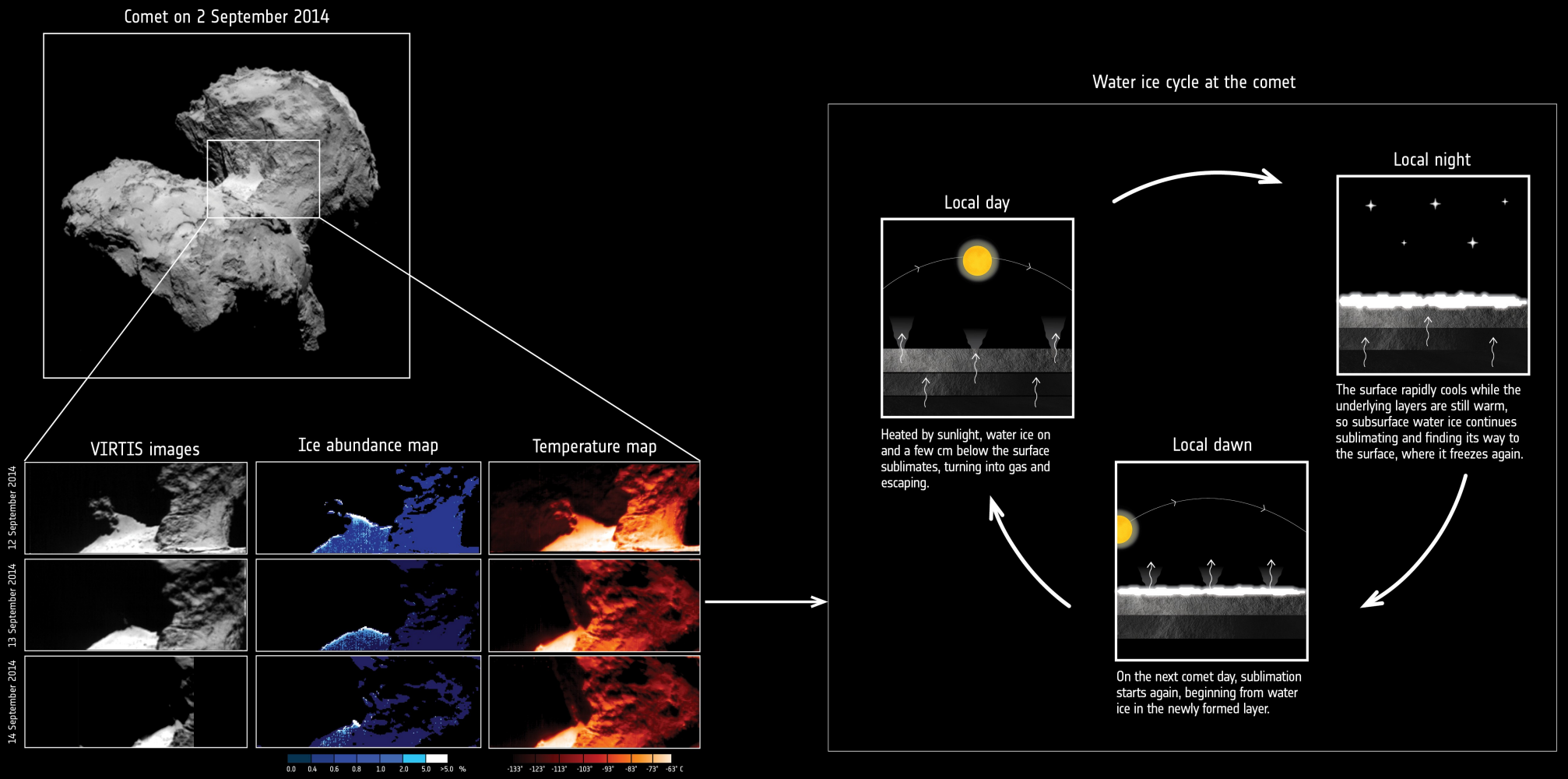
The locations of the two icy regions are shown in navigation camera images (top centre) and in VIRTIS colour images. The ice is associated with cliff walls and debris falls and has an average temperature of about −120°C.

The bottom set of images show the water ice abundance with respect to dark comet material under different grain mixing regimes, where "areal" mixing concerns larger water ice grains (millimetre–sized) side–by–side with dark grains, and "intimate" mixing concerns grains a few tens of micrometres mixed with the dark material in the same pixel. The spectral analysis is for one pixel in region 1 (as indicated in the water ice abundance map) and shows the actual spectrum compared to the best-fit model. It shows that 1.2% of the pixel comprises pure water ice with a large grain size (1.96 mm) and 98.8% is an intimate mix of 3.4% water ice with peak grain size 58 µm, and the remaining amount dark material.

www.esa.int

European Space Agency

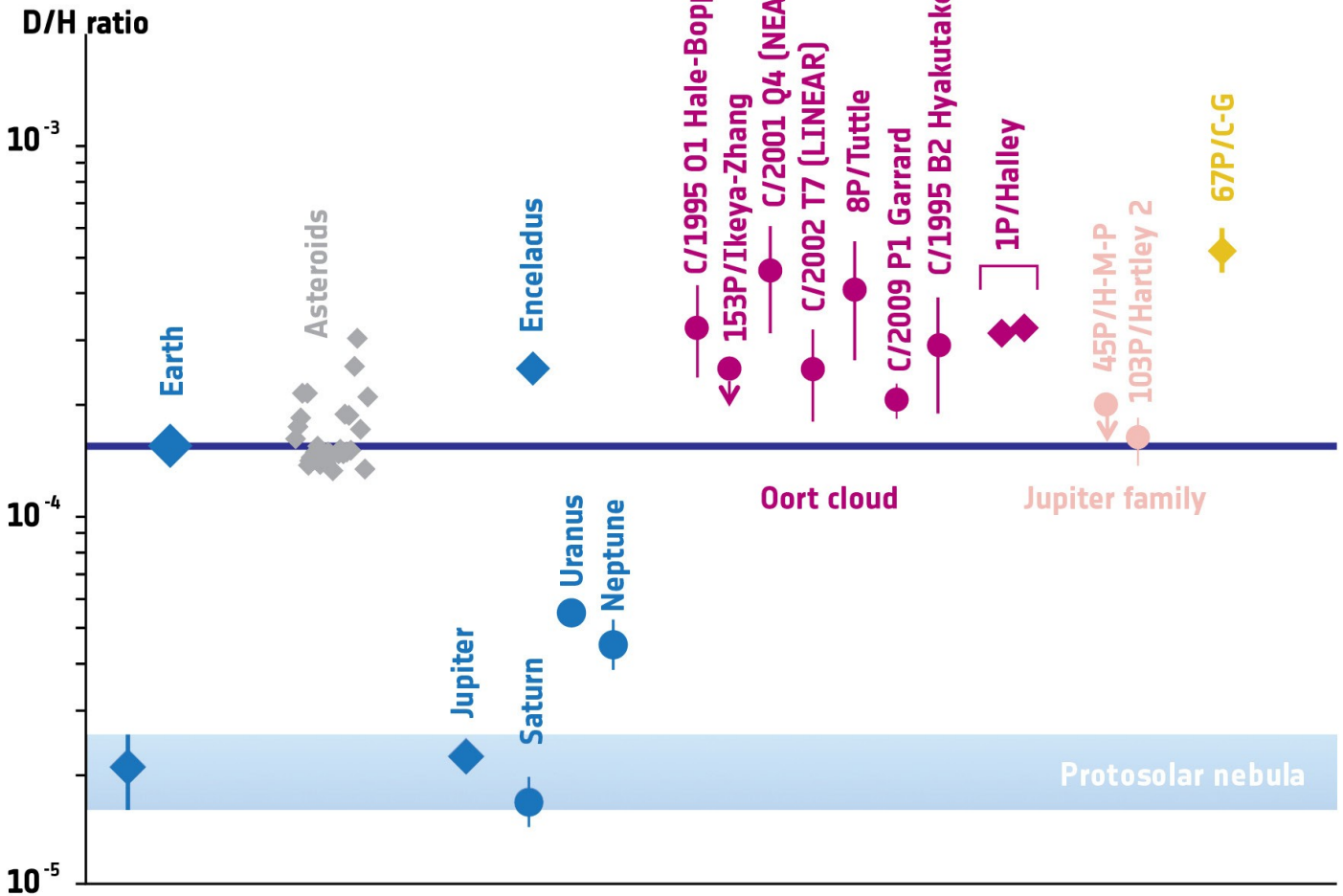
→ THE CYCLE OF WATER ICE AT COMET 67P/CHURYUMOV–GERASIMENKO

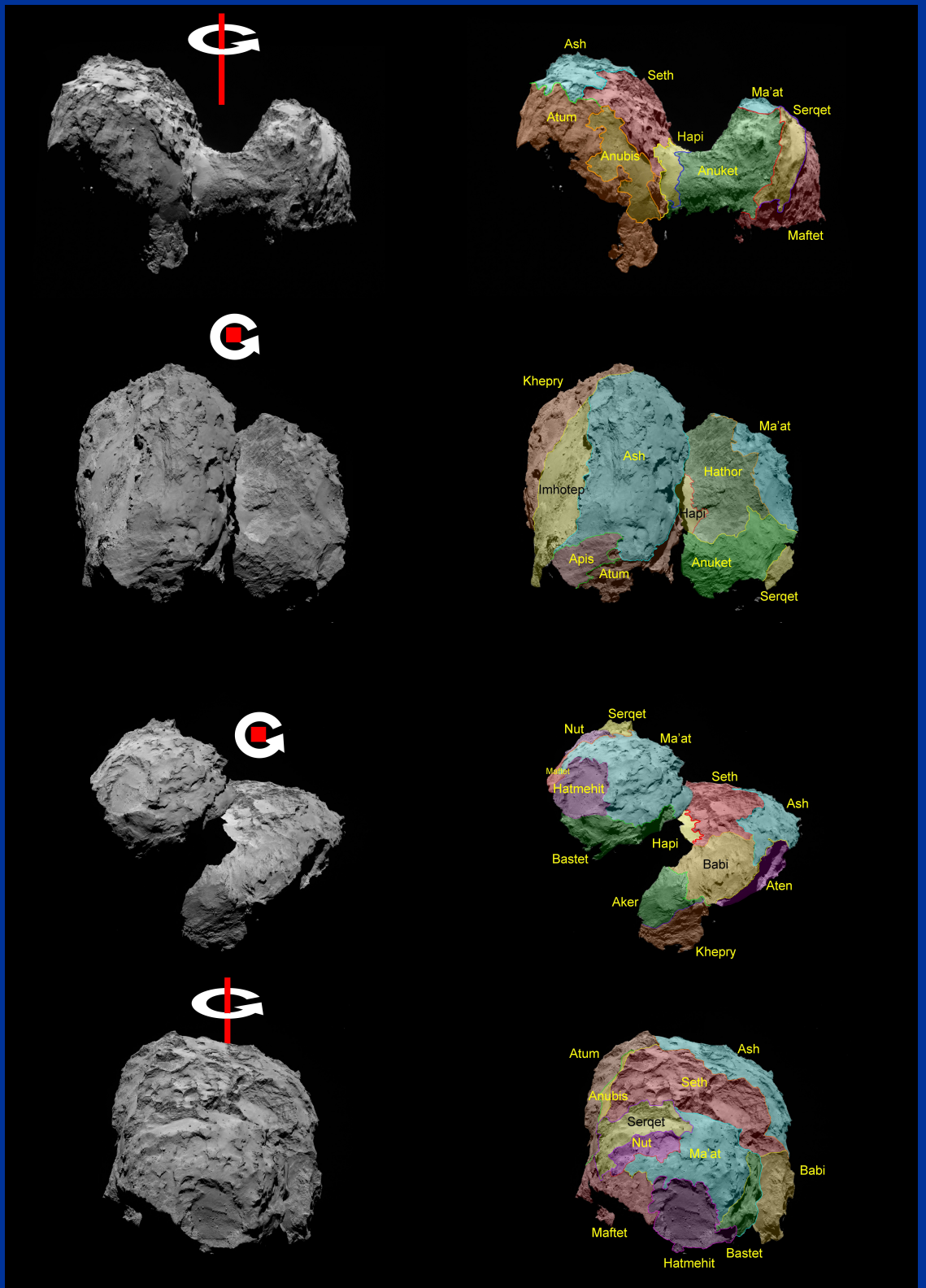


www.esa.int

Data: ESA/Rosetta/VIRTIS/INAF-IAPS/OBS DE PARIS-LESIA/DLR; M.C. De Sanctis et al (2015); Comet: ESA/Rosetta/NAVCAM – CC BY-SA IGO 3.0

European Space Agency


D/H ratio
10-3
10-4
10-5
Earth
Asteroids
Enceladus
C/1995 O1 Hale-Bopp
153P/Ikeya-Zhang
C/2001 Q4 (NEAT)
C/2002 T7 (LINEAR)
8P/Tuttle
C/2009 P1 Garrard
C/1995 B2 Hyakutake
1P/Halley
45P/H-M-P
103P/Hartley 2
67P/C-G
Oort cloud
Jupiter family
Uranus
Neptune
Jupiter
Saturn
Protosolar nebula


Ash
Seth
Ma'at
Serqet
Atum
Hapi
Anubis
Anuket
Maftet
Khepry
Ma'at
Ash
Hathor
Imhotep
Hapi
Apis
Atum
Anuket
Serqet
Serqet
Nut
Ma'at
Hatmehit
Seth
Ash
Hapi
Bastet
Babi
Aten
Aker
Khepry
Atum
Ash
Seth
Anubis
Serqet
Nut
Ma'at
Babi
Maftet
Hatmehit
Bastet