

A MEDIDA DO UNIVERSO



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O SISTEMA SOLAR
ESTRELAS E NEBULOSAS

A VIA LÁCTEA

GALÁXIAS

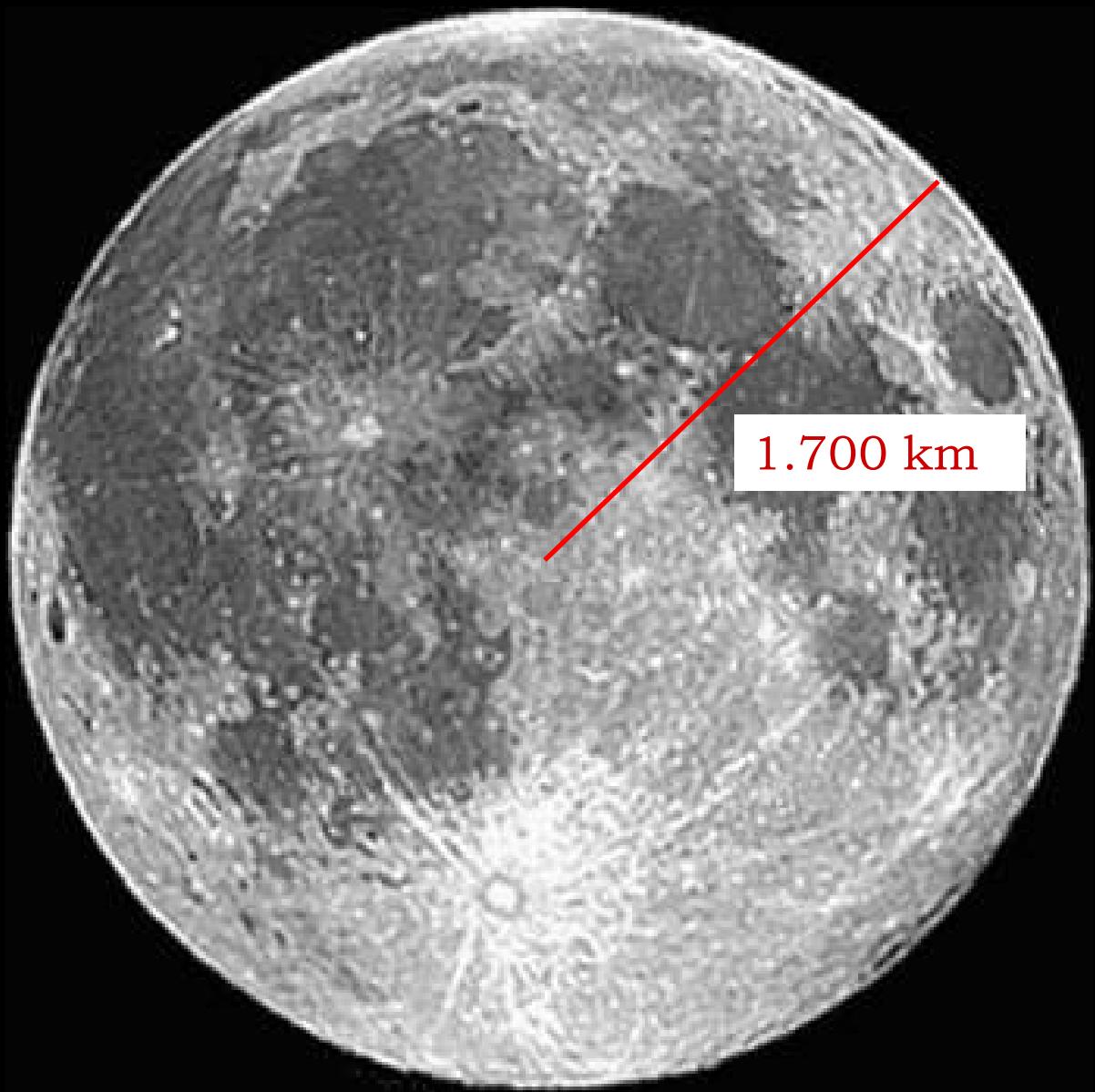
AGLOMERADOS DE GALÁXIAS



O SISTEMA SOLAR



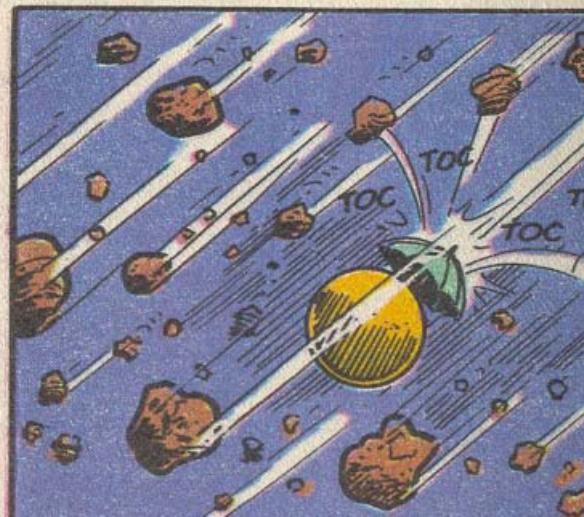
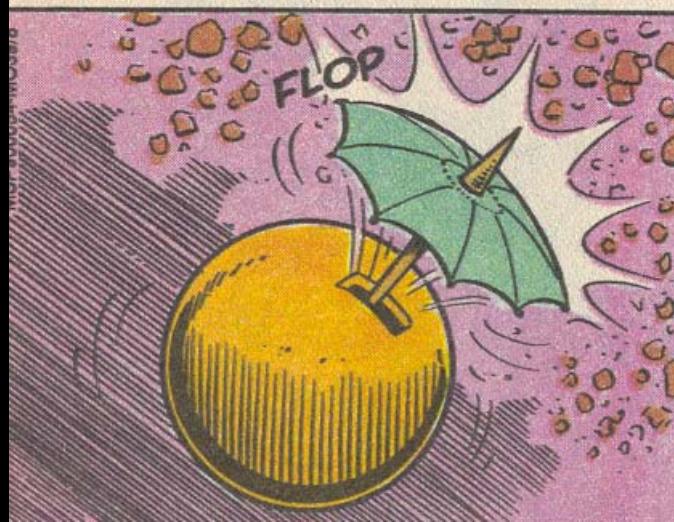
6.400 km

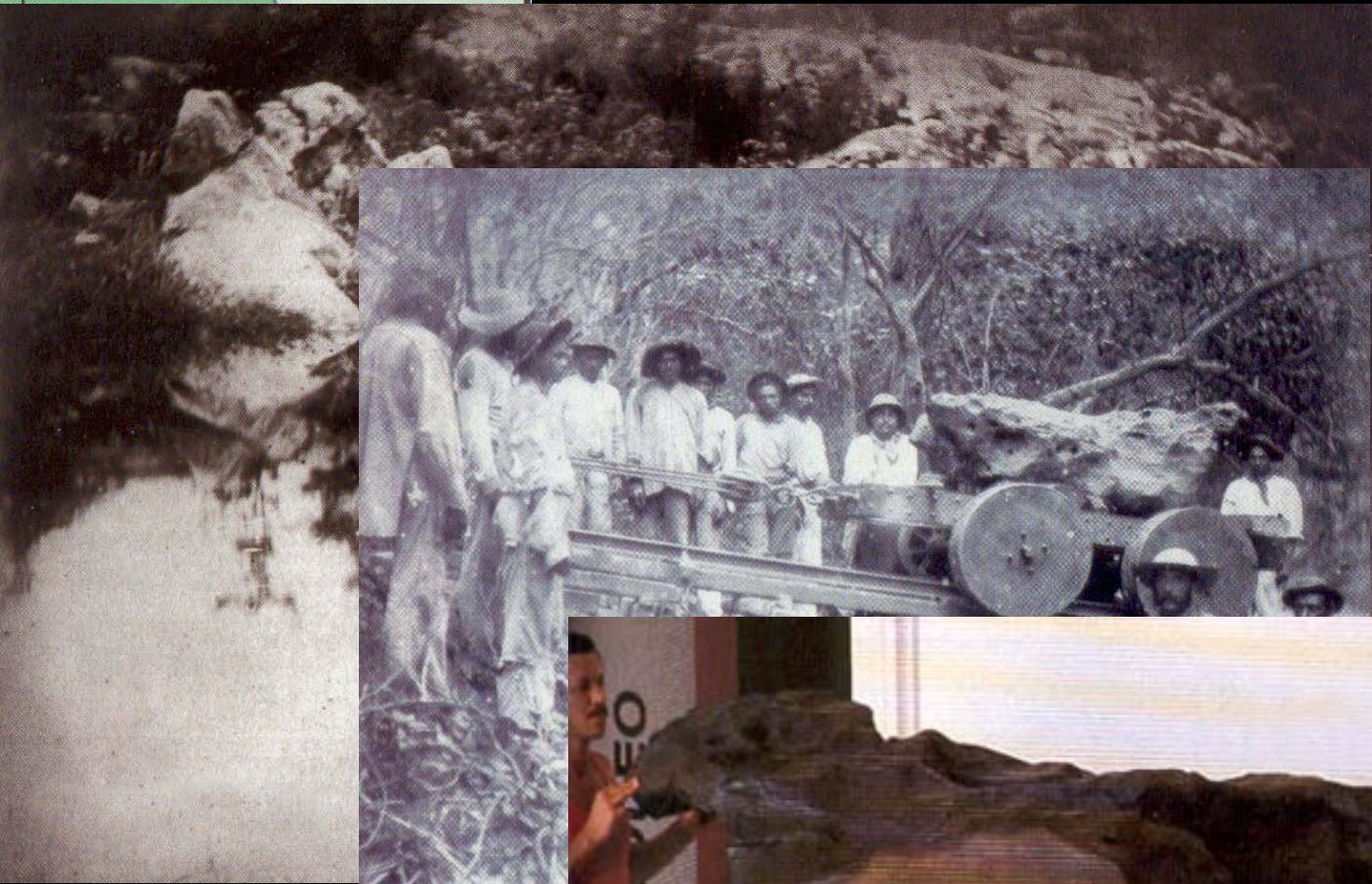
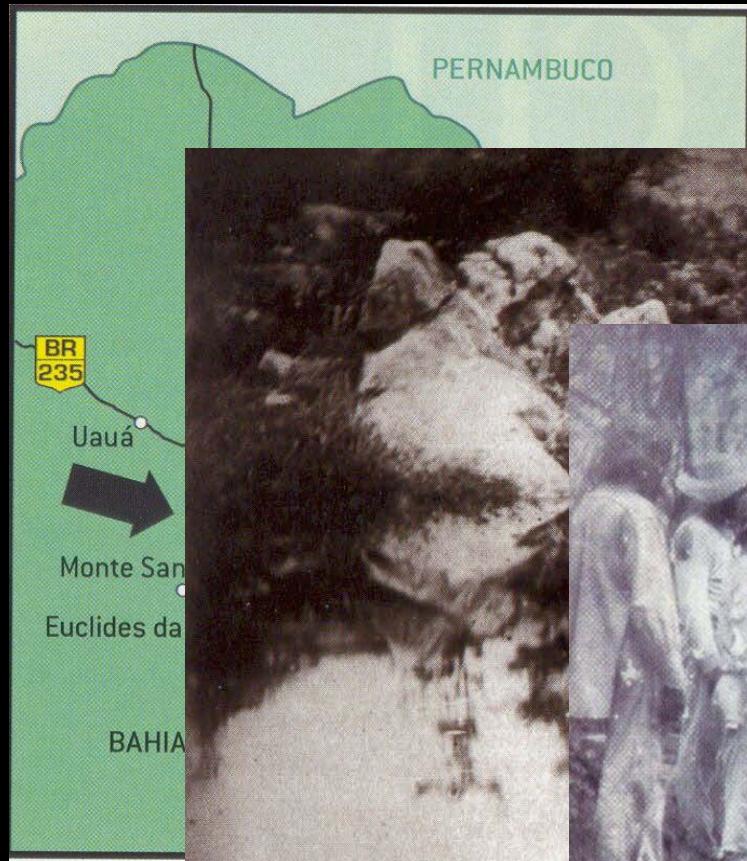


1.700 km



MURILLO





Bendengó
1784

O BENDENGÓ É UM METEORITO
QUE CAIU AQUI, HÁ APROXIMADAMENTE
120 MILHÕES DE ANOS!

AQUI NA VILA
ABOBRINHA?!

NAO! EH! EH! FOI
NO BRASIL, MAIS
PRECISAMENTE
NO SERTÃO DA
BAHIA, E SÓ FOI
DESCOBERTO EM
1784!

É GRANDE
PRA DEDÉU!

"SE É! TEM DOIS METROS E
QUINZE POR UM METRO E MEIO,
E PESA MAIS DE CINCO MIL
QUILOS!"

I ESSES TAR
DI METEORITO
PODE CAÍ NAS
NOSSAS CABE-
ÇA A QUARQUÉ
MOMENTO?

PODEM! MAS
AS CHANCES
DISSO ACON-
TECER SÃO...

...MÍNIMAS!
DEUS
NOS
ACUDA!!
AAAAAH!!

Bendengó
1784



Peekskill

09.10.1992

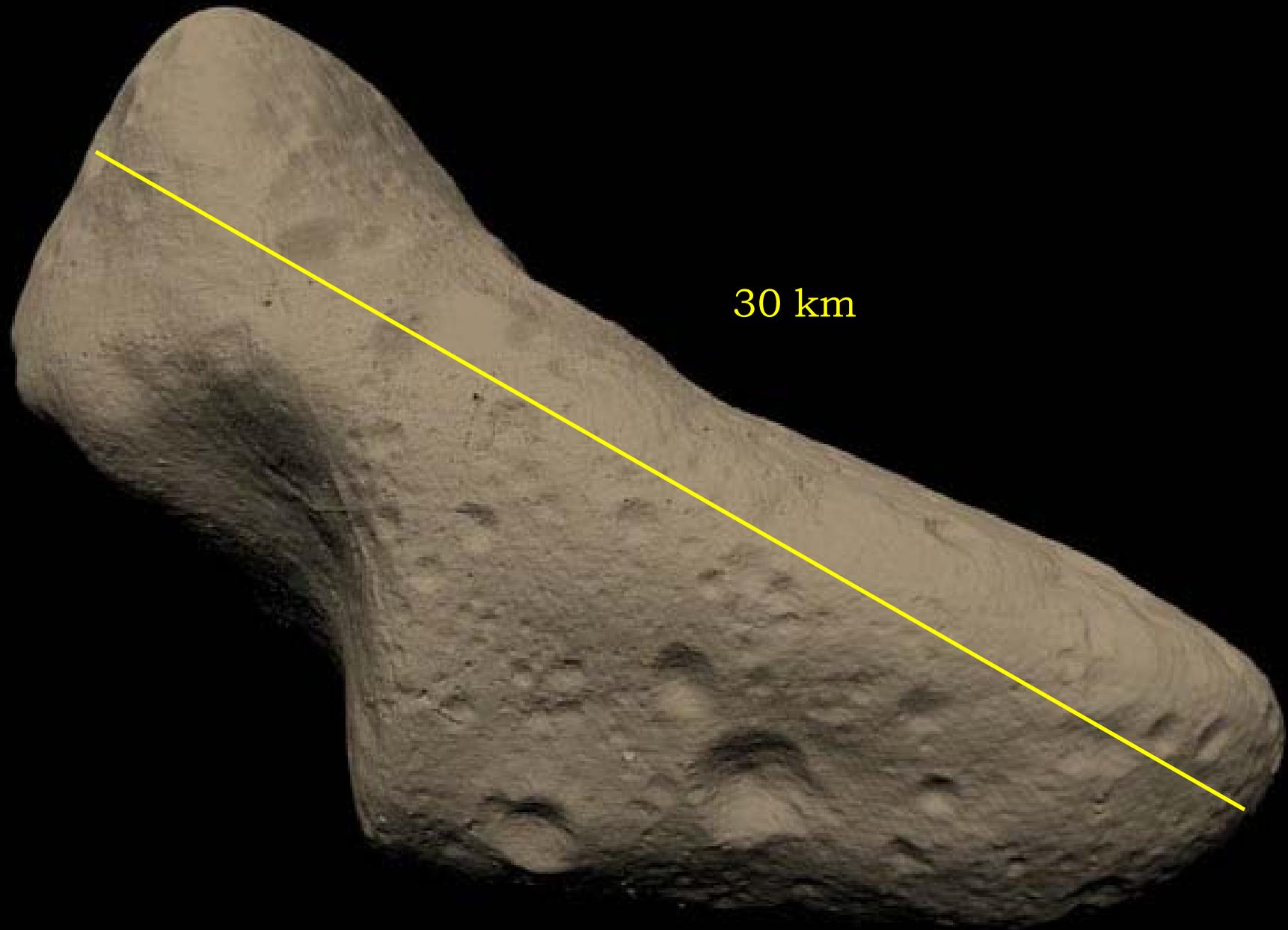


Hodges

30.11.1954



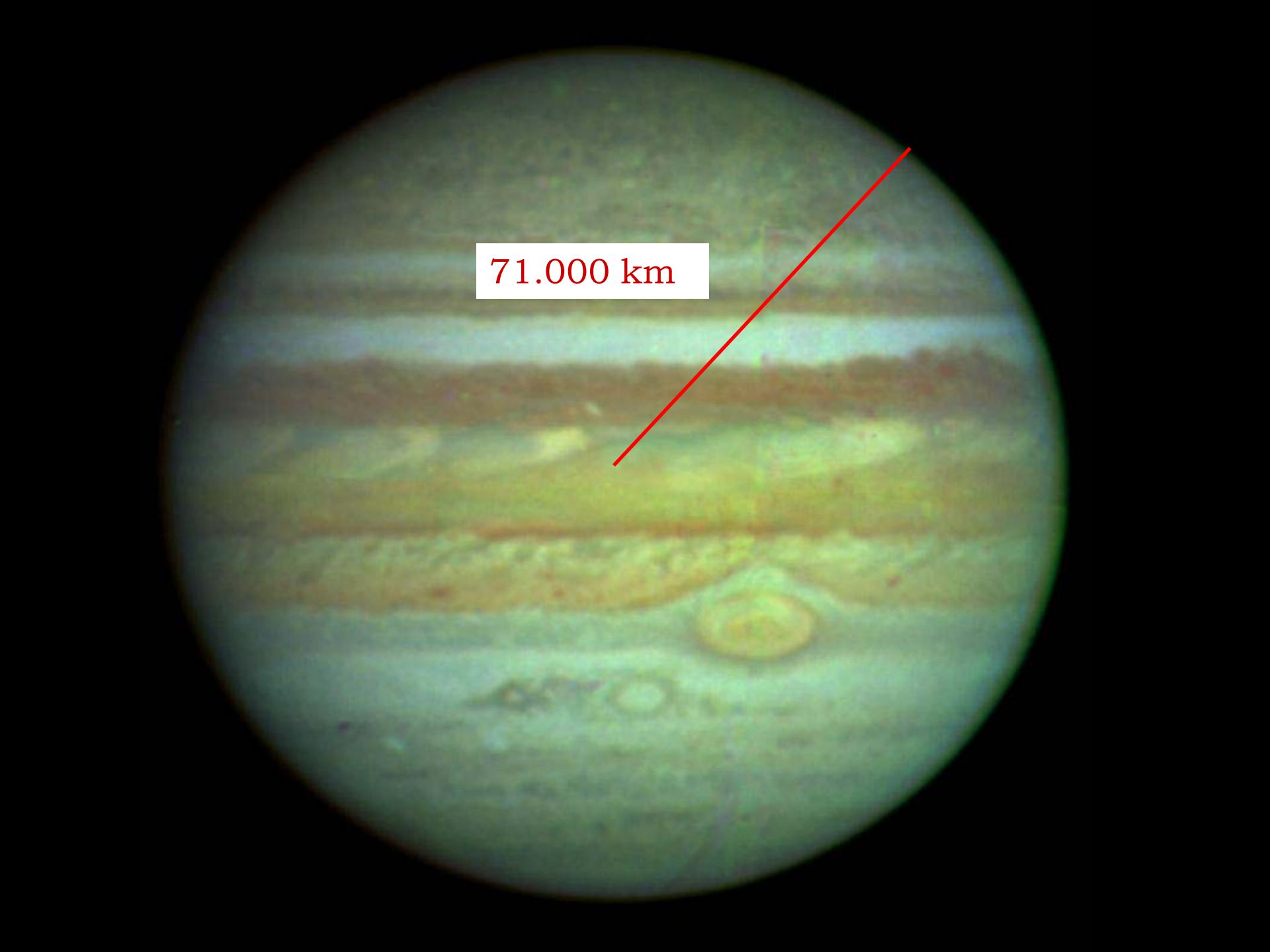




30 km



60.000 km

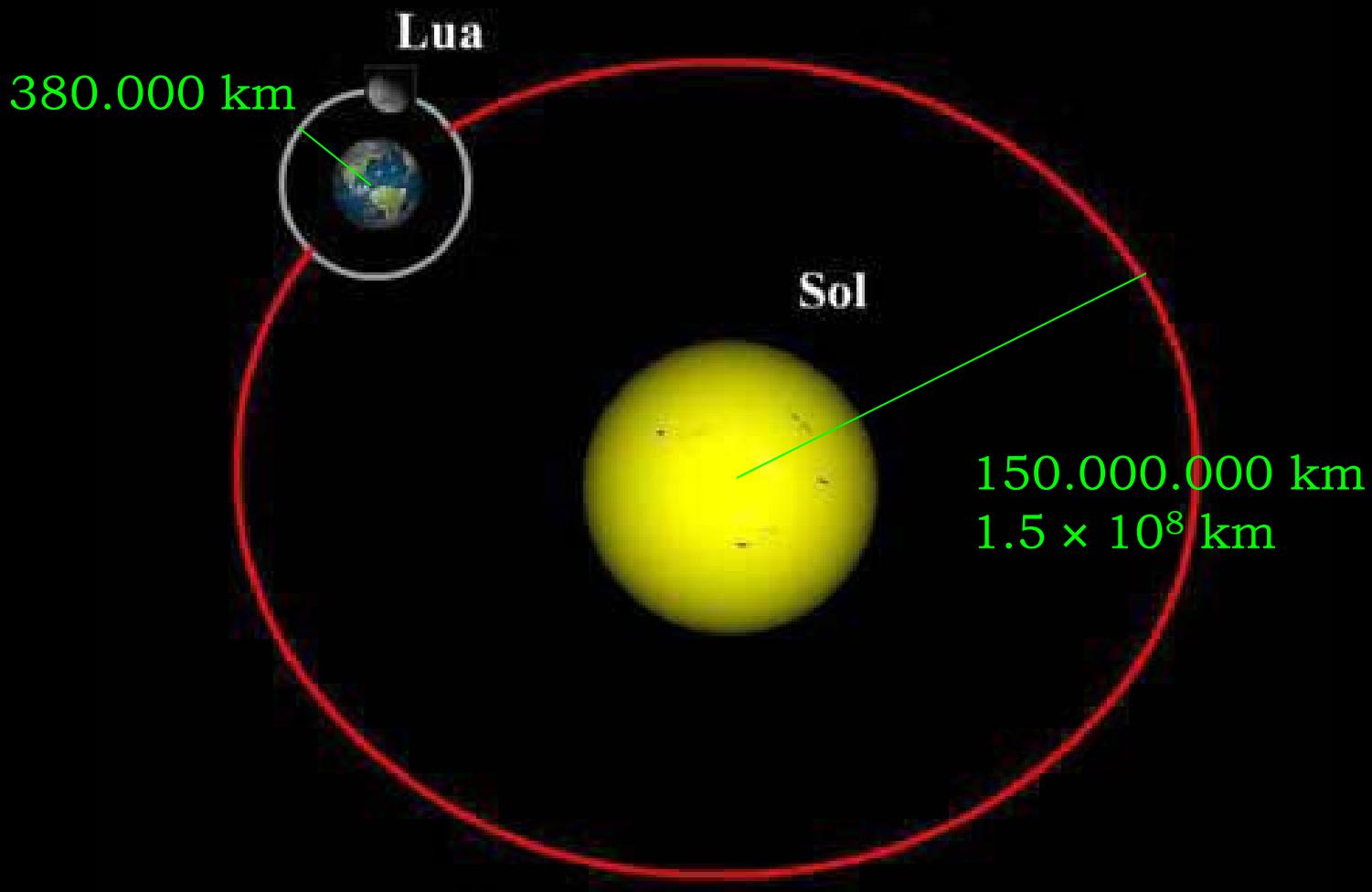


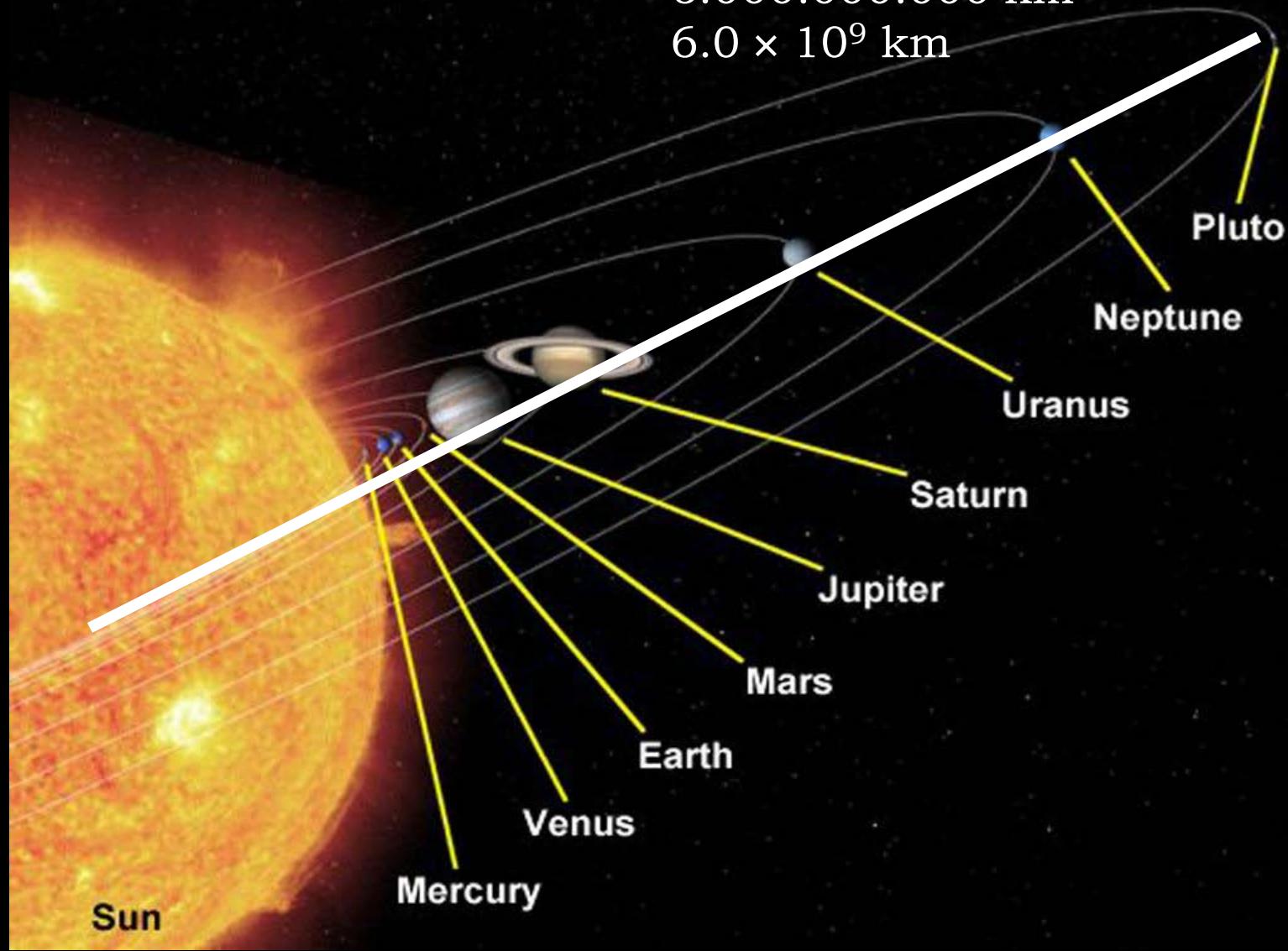
71.000 km

Io

1.800 km

Júpiter



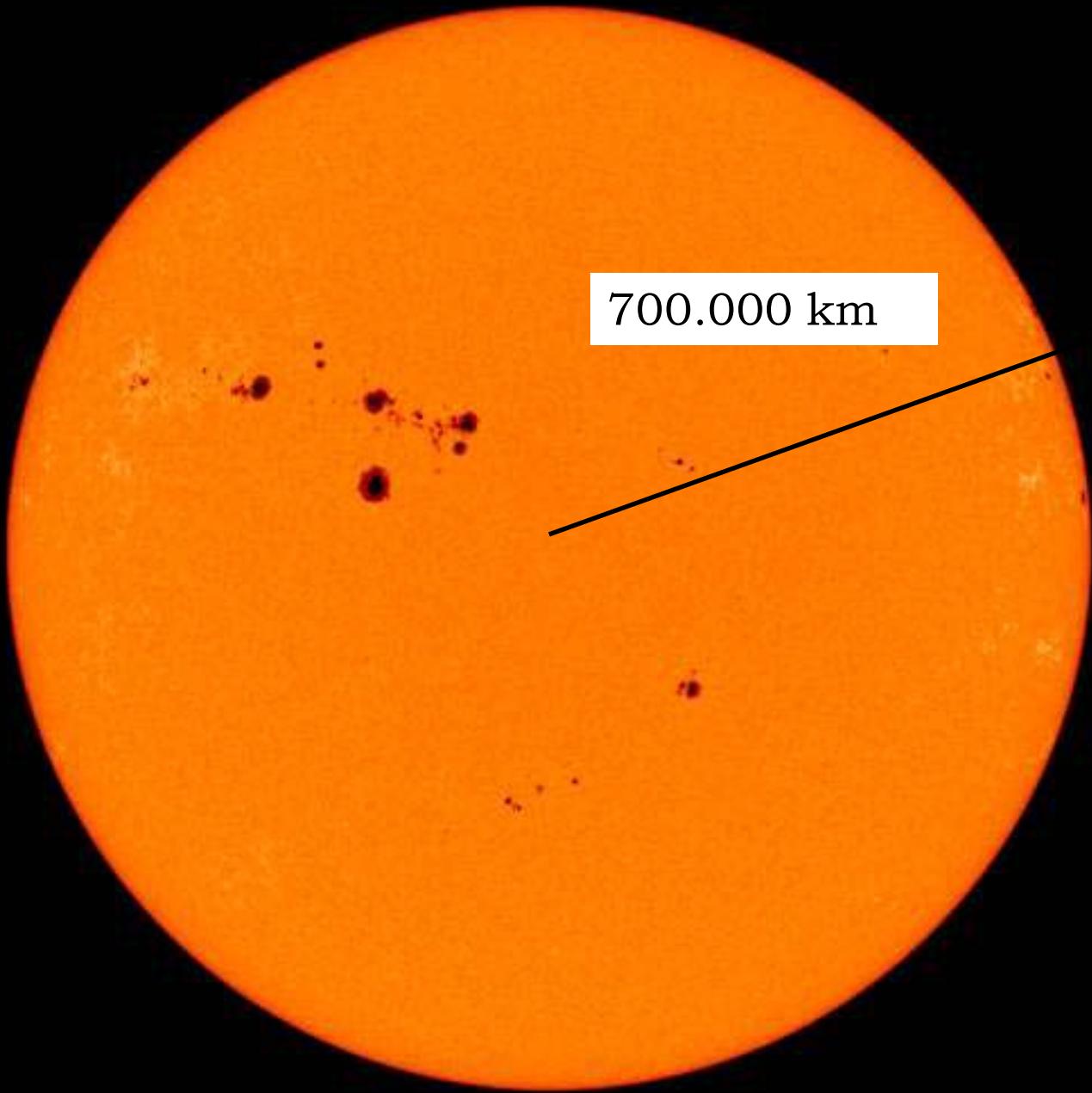


6.000.000.000 km
 6.0×10^9 km

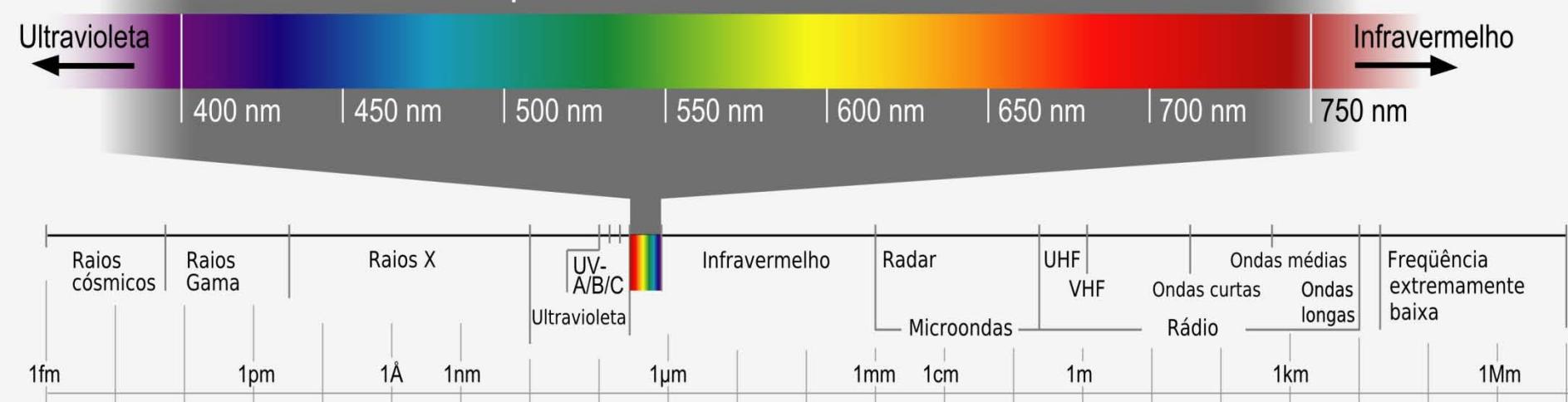


ESTRELAS E NEBULOSAS

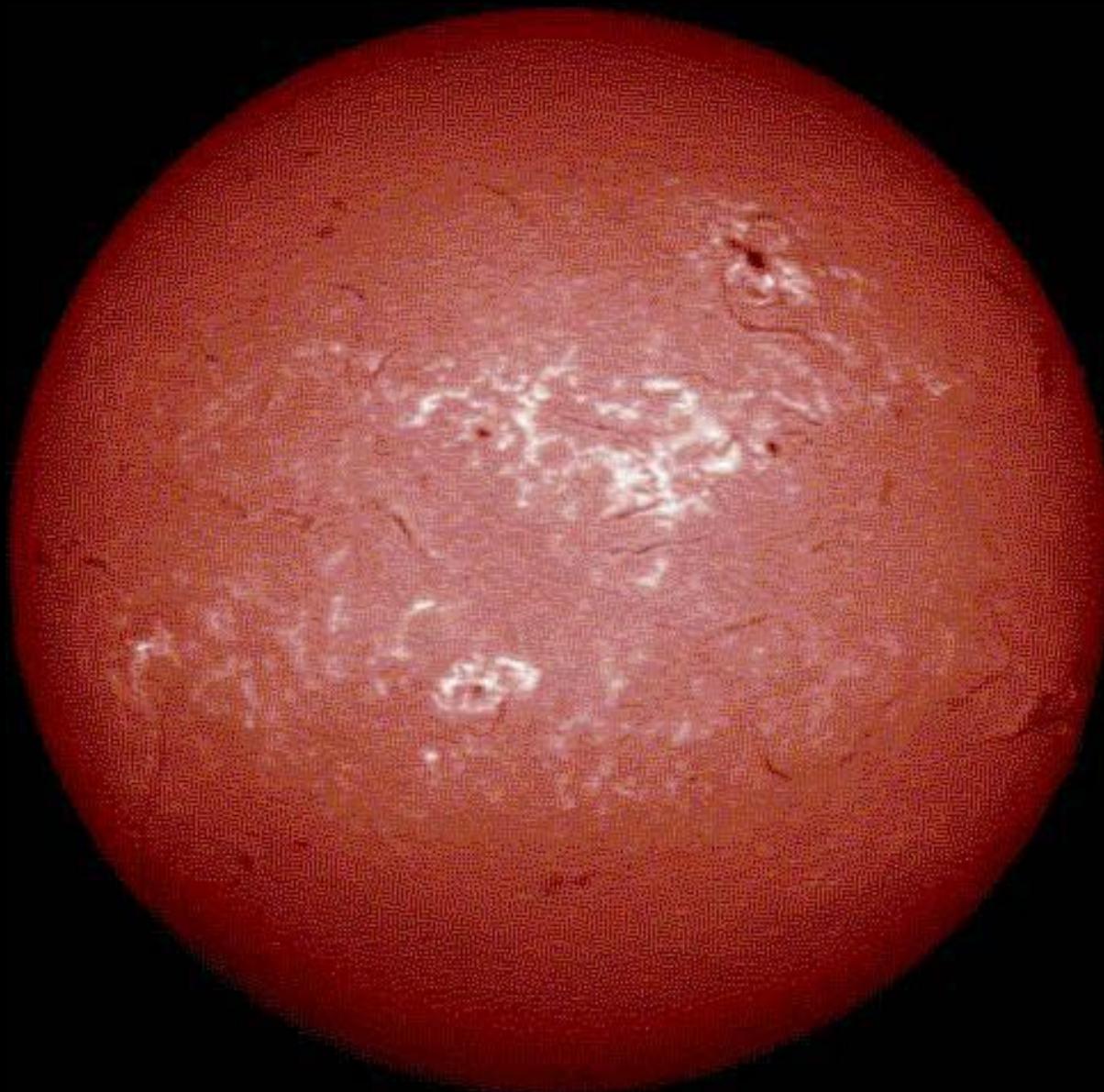
visível



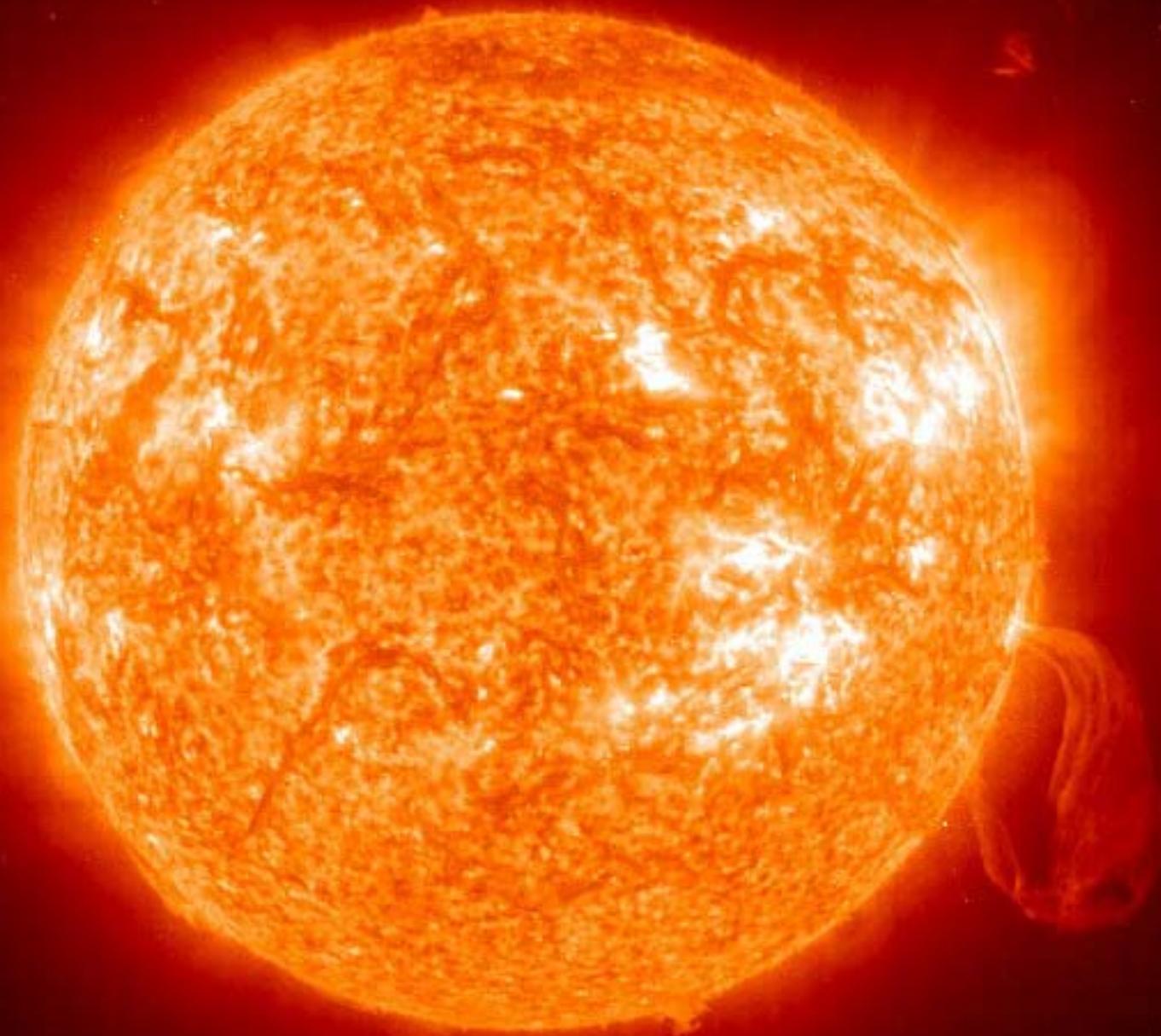
Espectro visível ao Homem



H-alfa

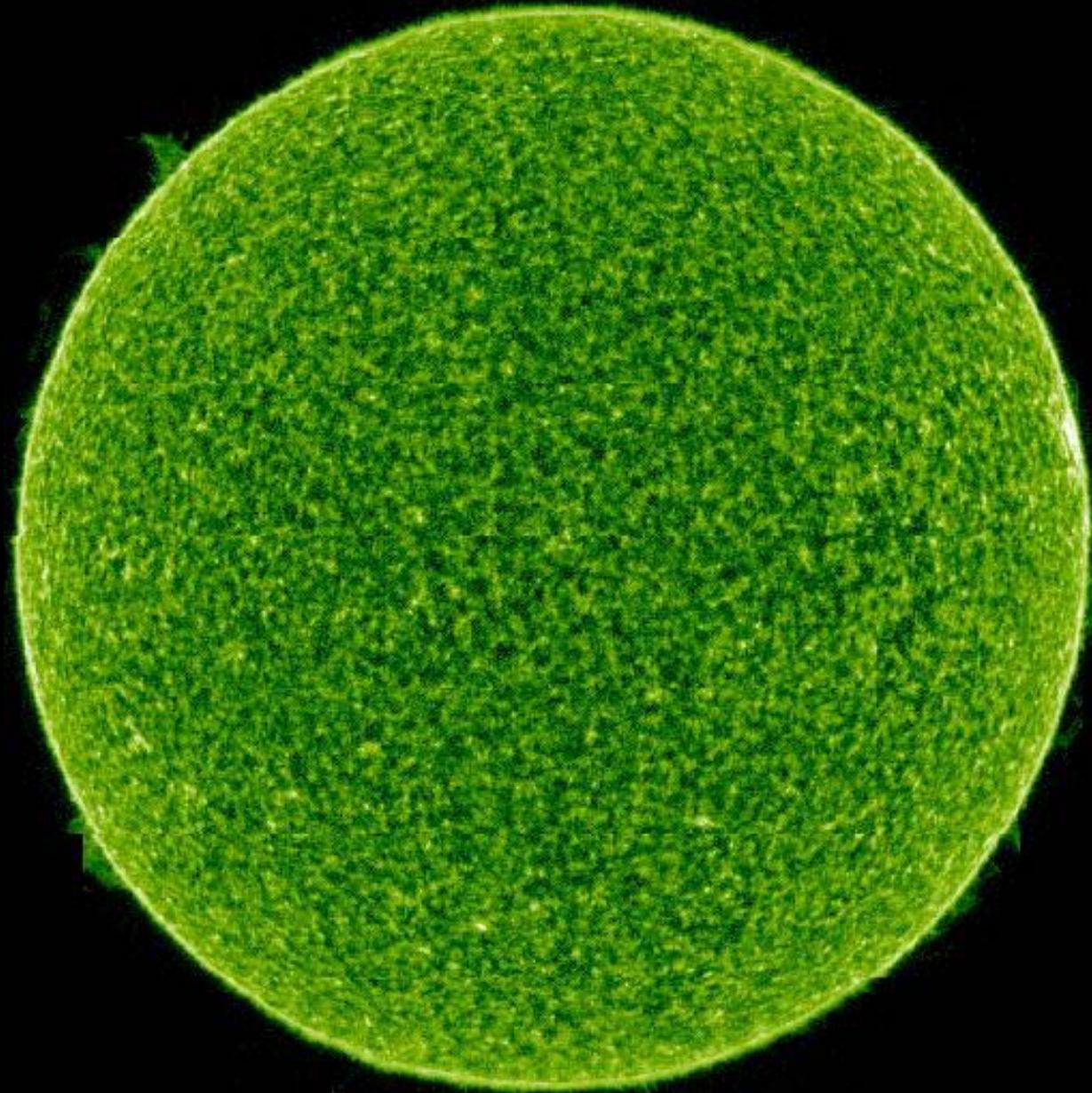


UV



região de
transição

UV/CIV

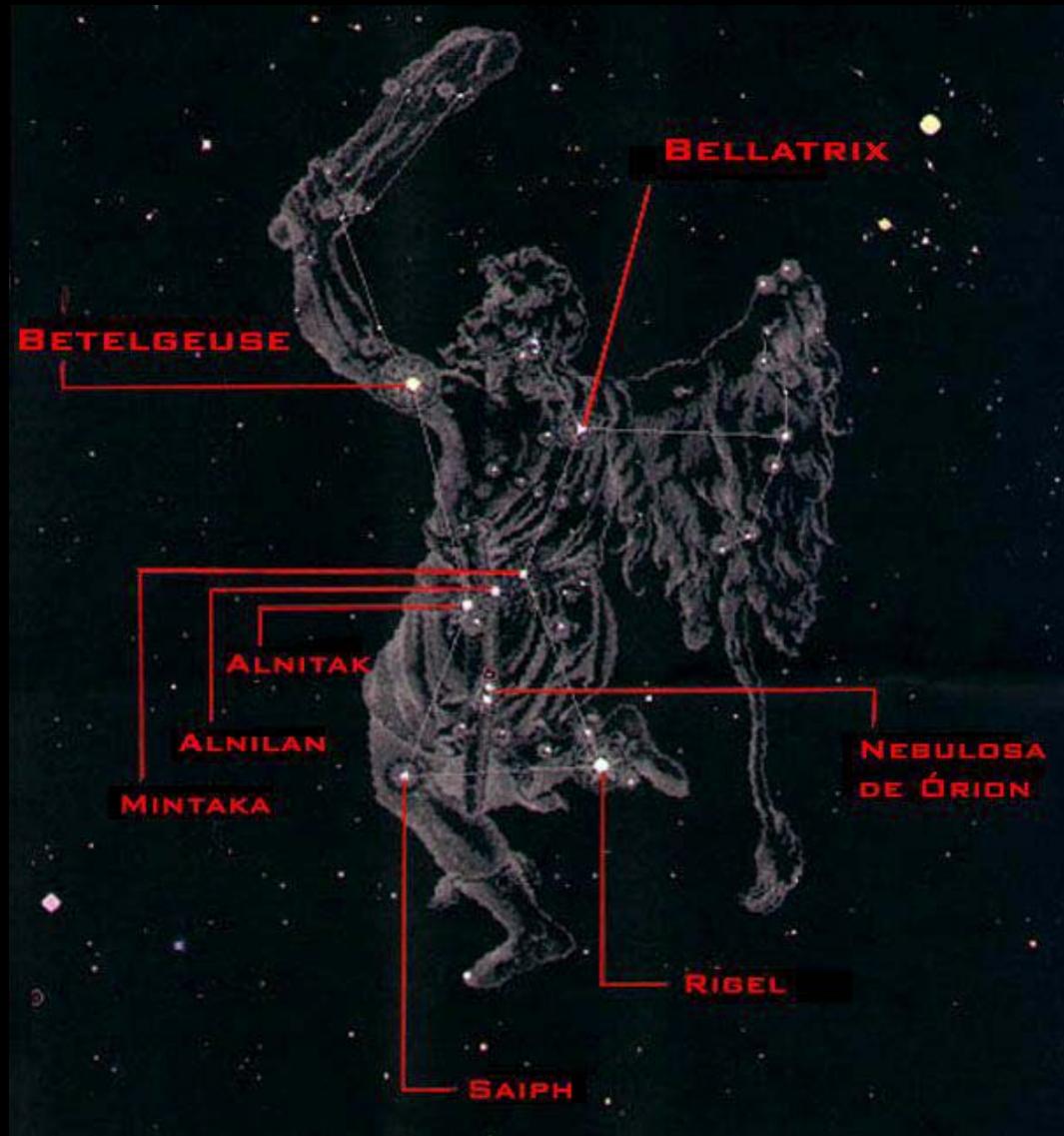


cromosfera
coroa



Diferentes comprimentos de onda:
diferentes processos físicos





MURICIO





Estrelas de campo

Aglomerados abertos



Aglomerados globulares

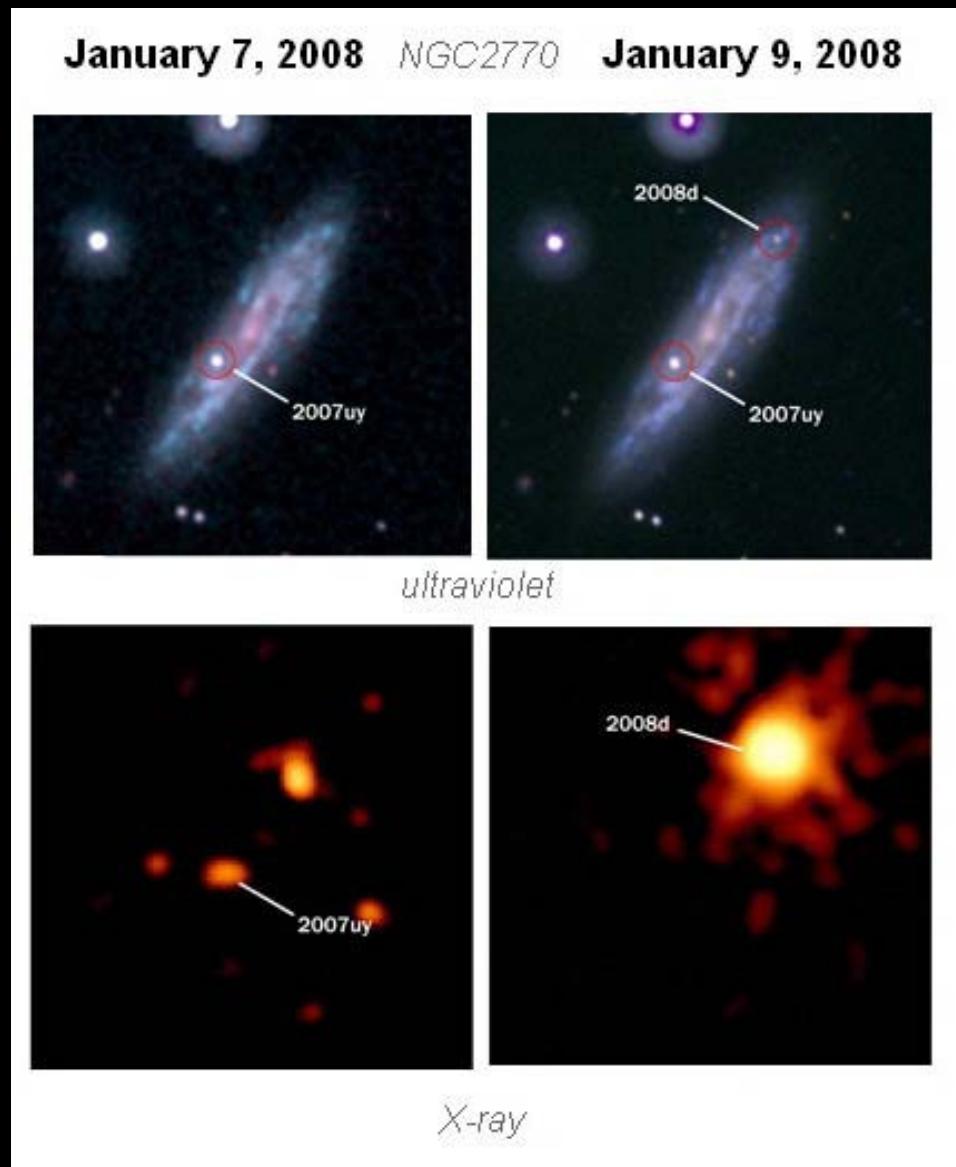


Aglomerados: importantes para estudar a evolução das estrelas

PIRATAS DO TIETÊ - Laerte



Supernovas





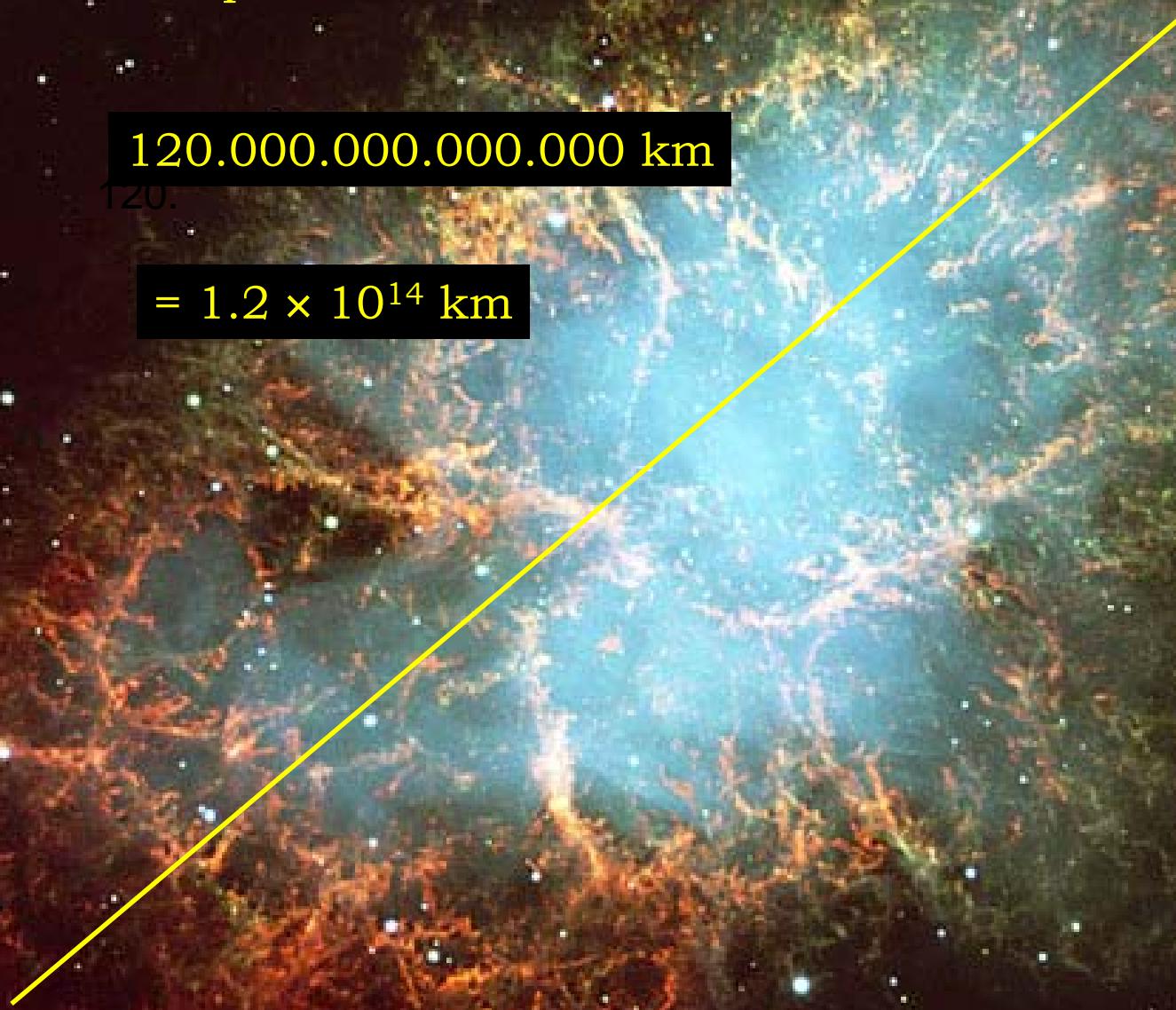
DETESTO ESSAS
SUPERNOVAS!

Restos de supernovas

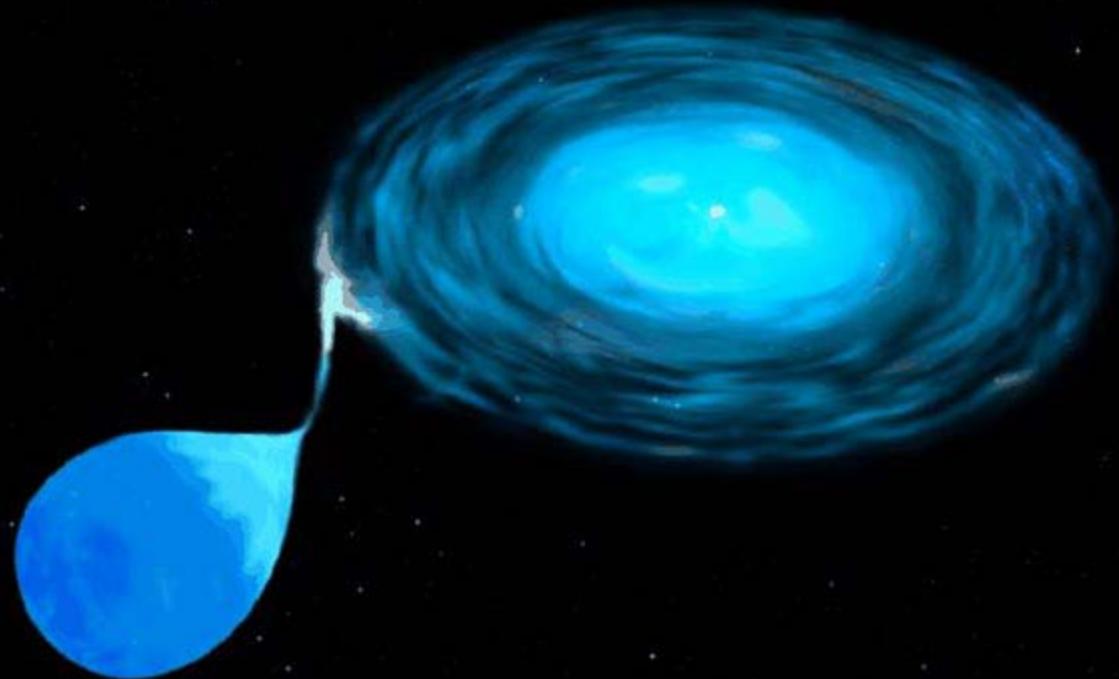
120.000.000.000.000 km

120.

$$= 1.2 \times 10^{14} \text{ km}$$

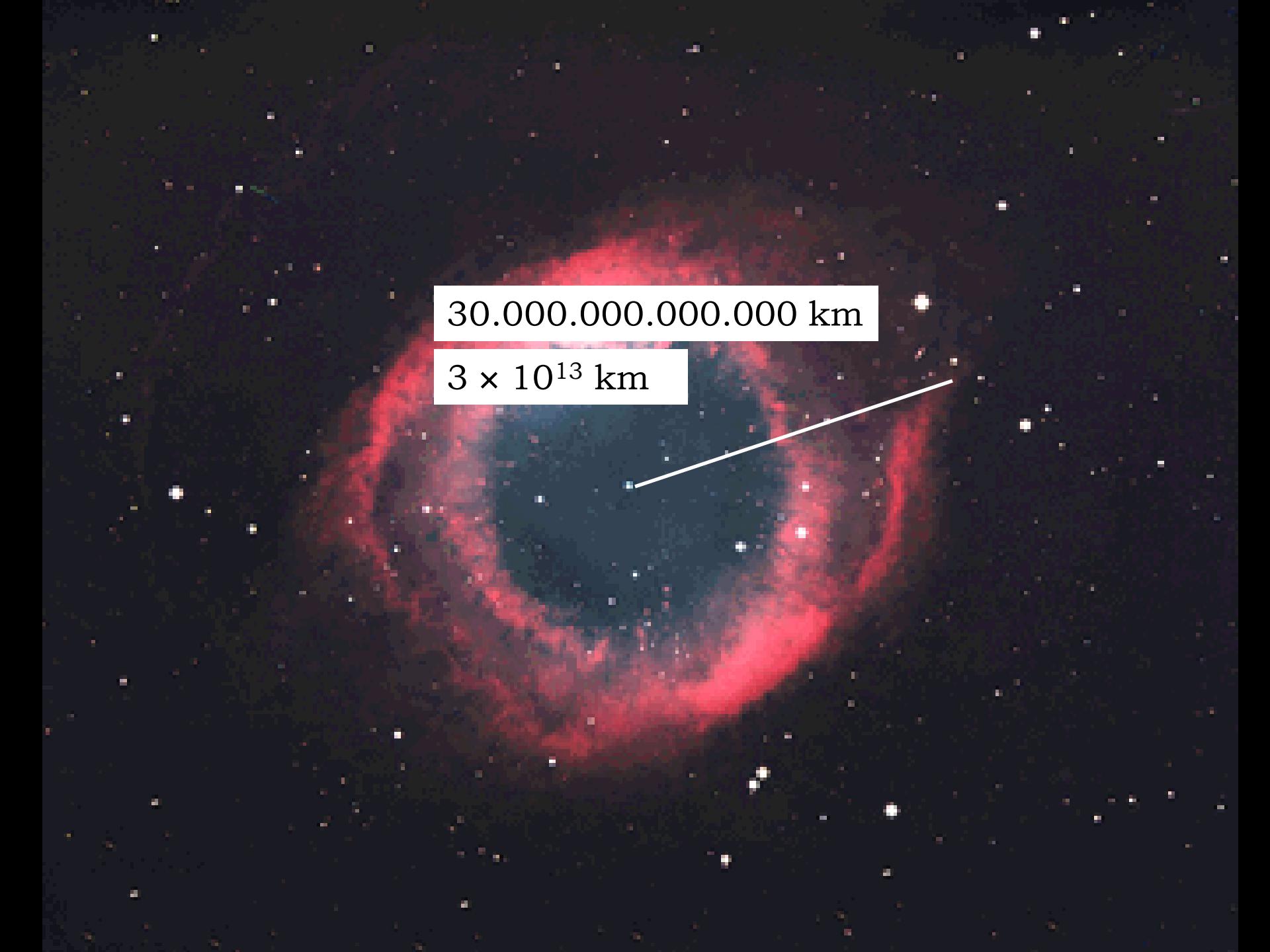


Buracos negros



Nebulosas planetárias

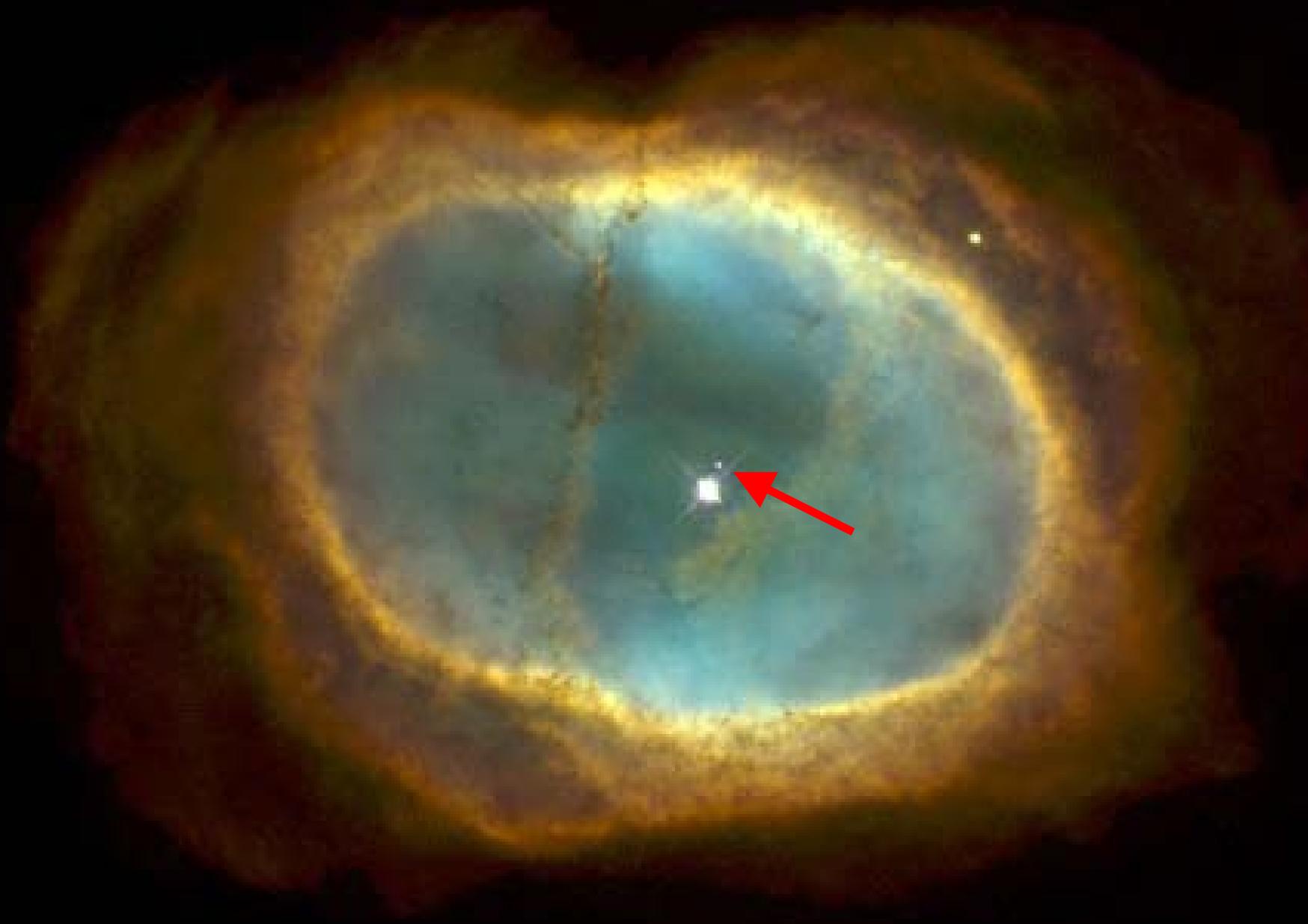


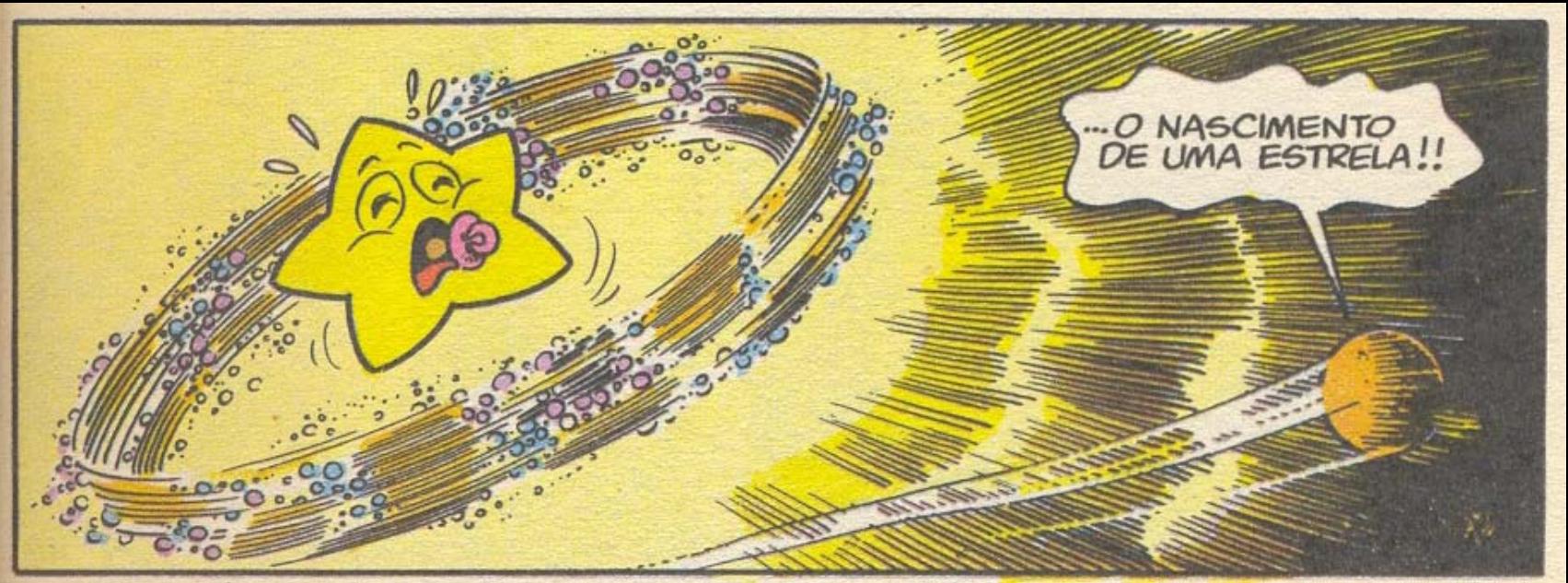
A photograph of a nebula, likely the Lagoon Nebula (M8), showing a bright red glow against a dark background of space. Numerous small white stars of varying brightness are scattered throughout the field.

30.000.000.000.000 km

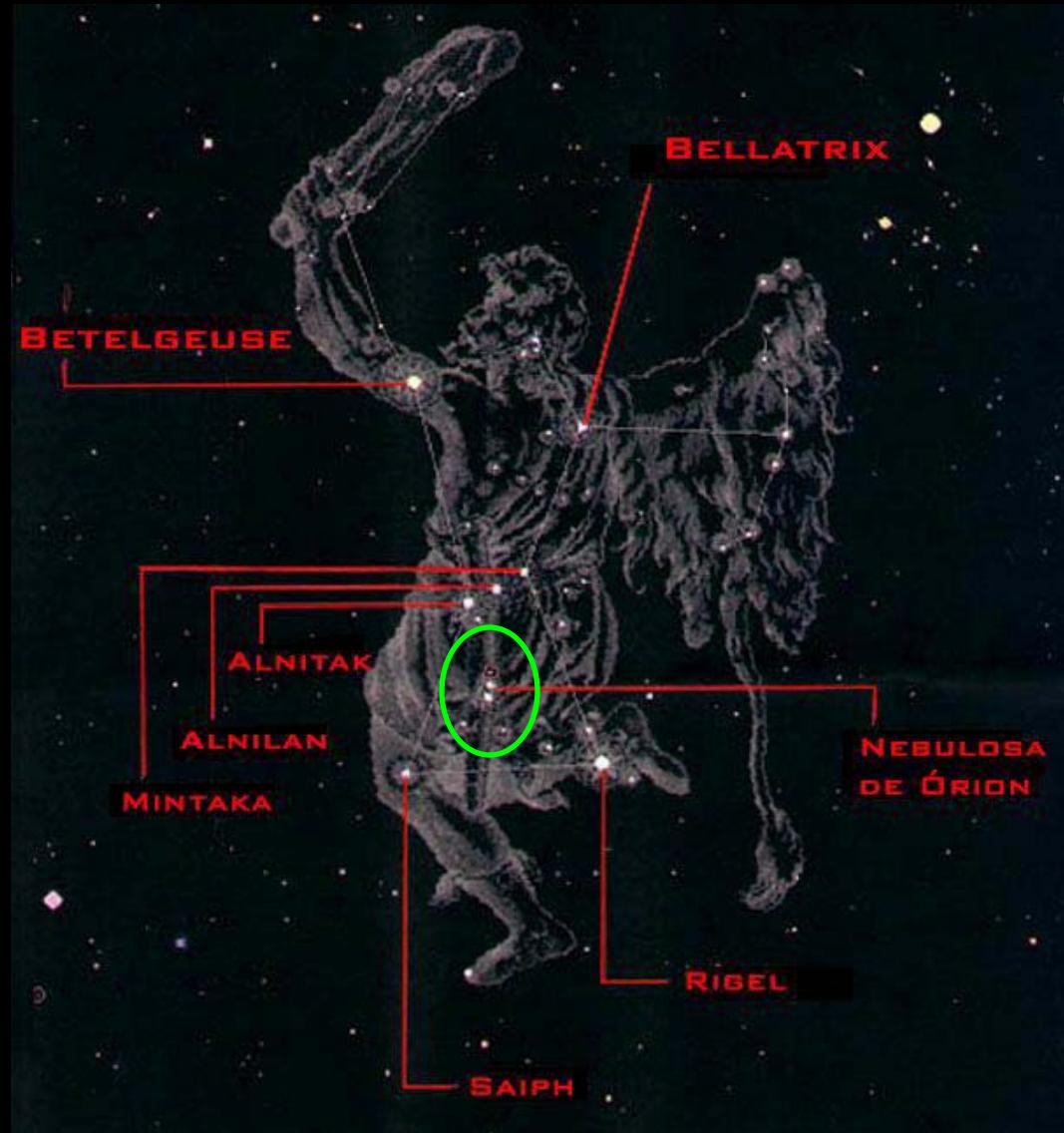
3×10^{13} km





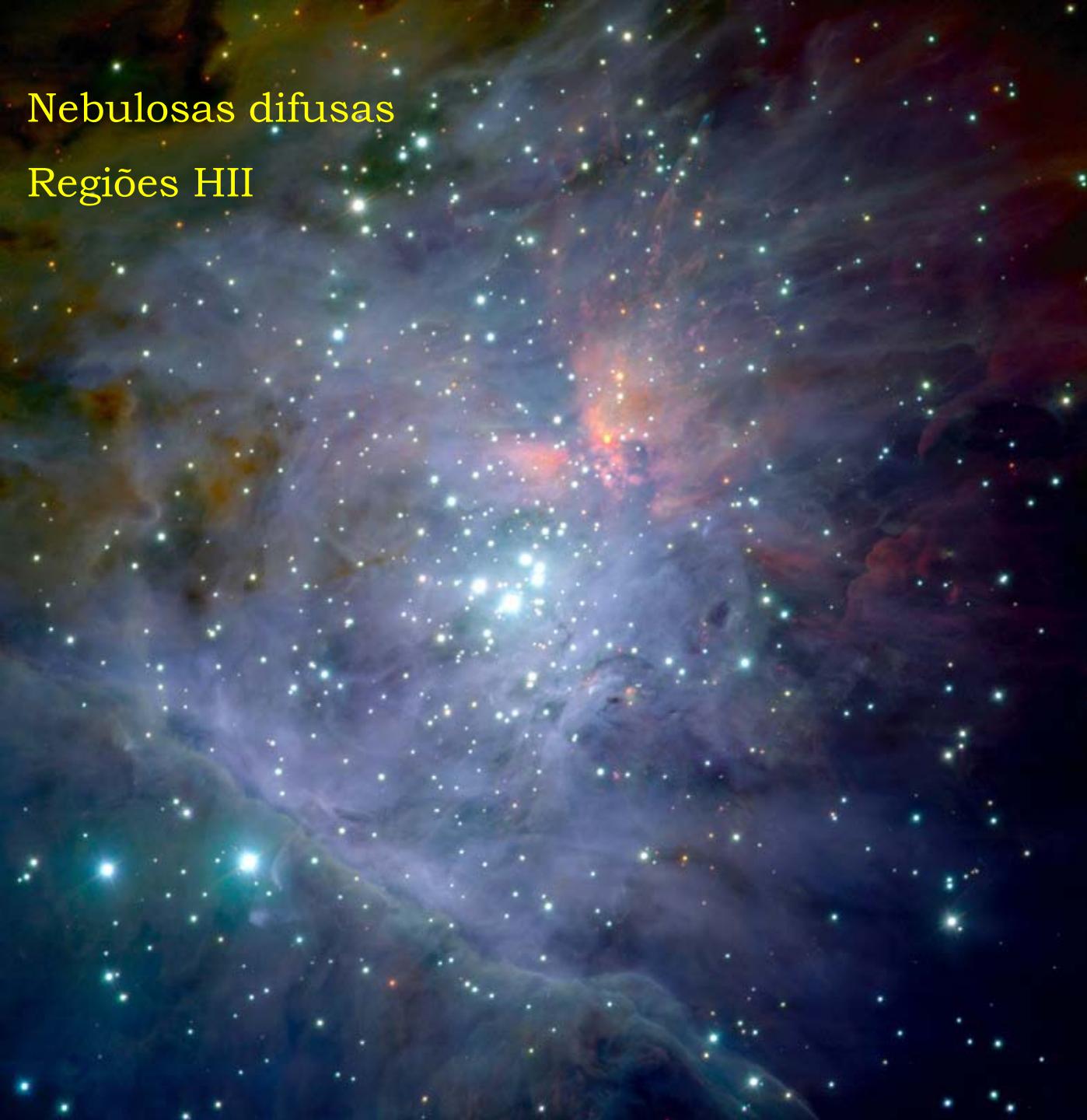


...O NASCIMENTO
DE UMA ESTRELA!!



Nebulosas difusas

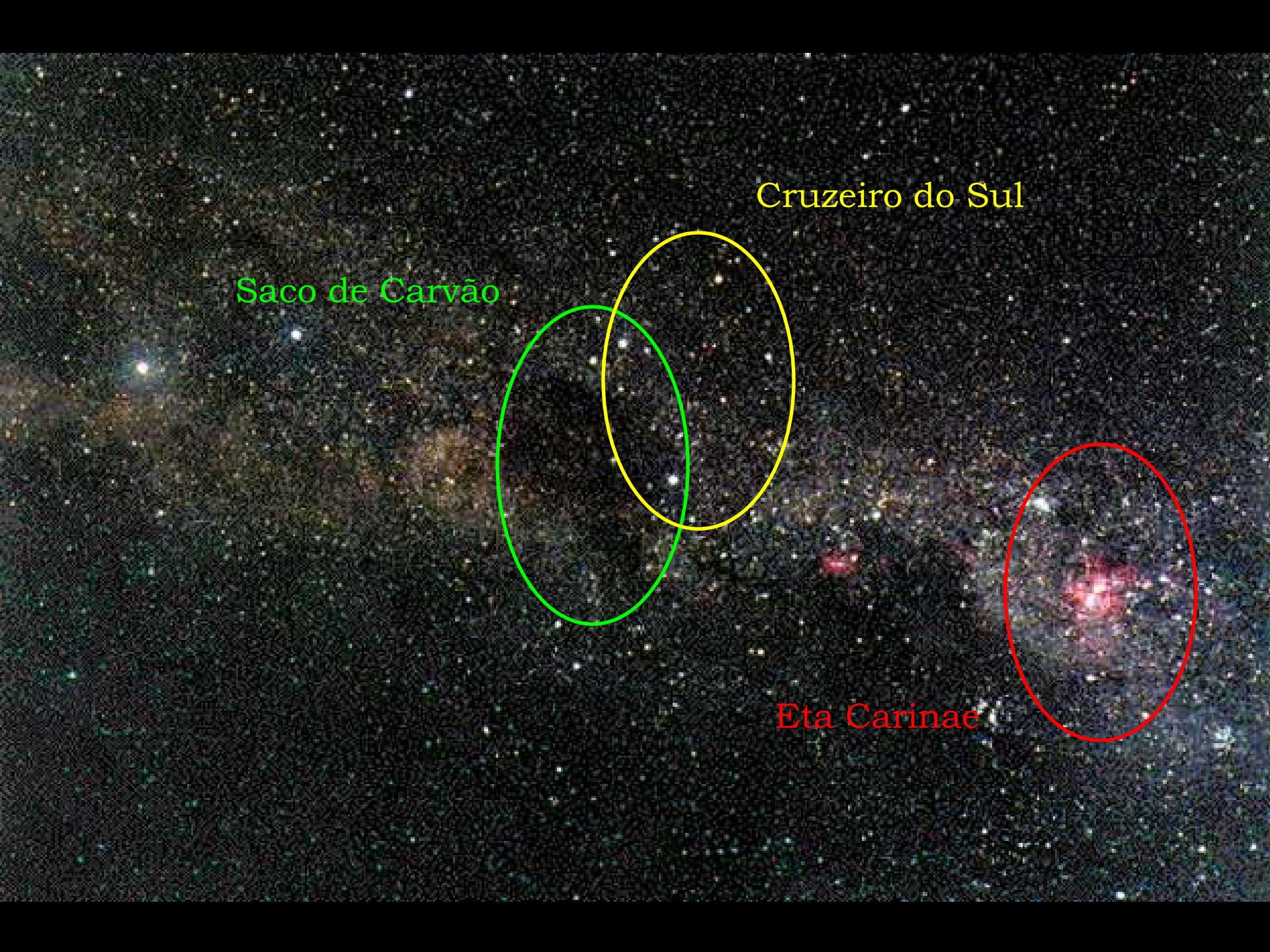
Regiões HII





Nebulosas escuras

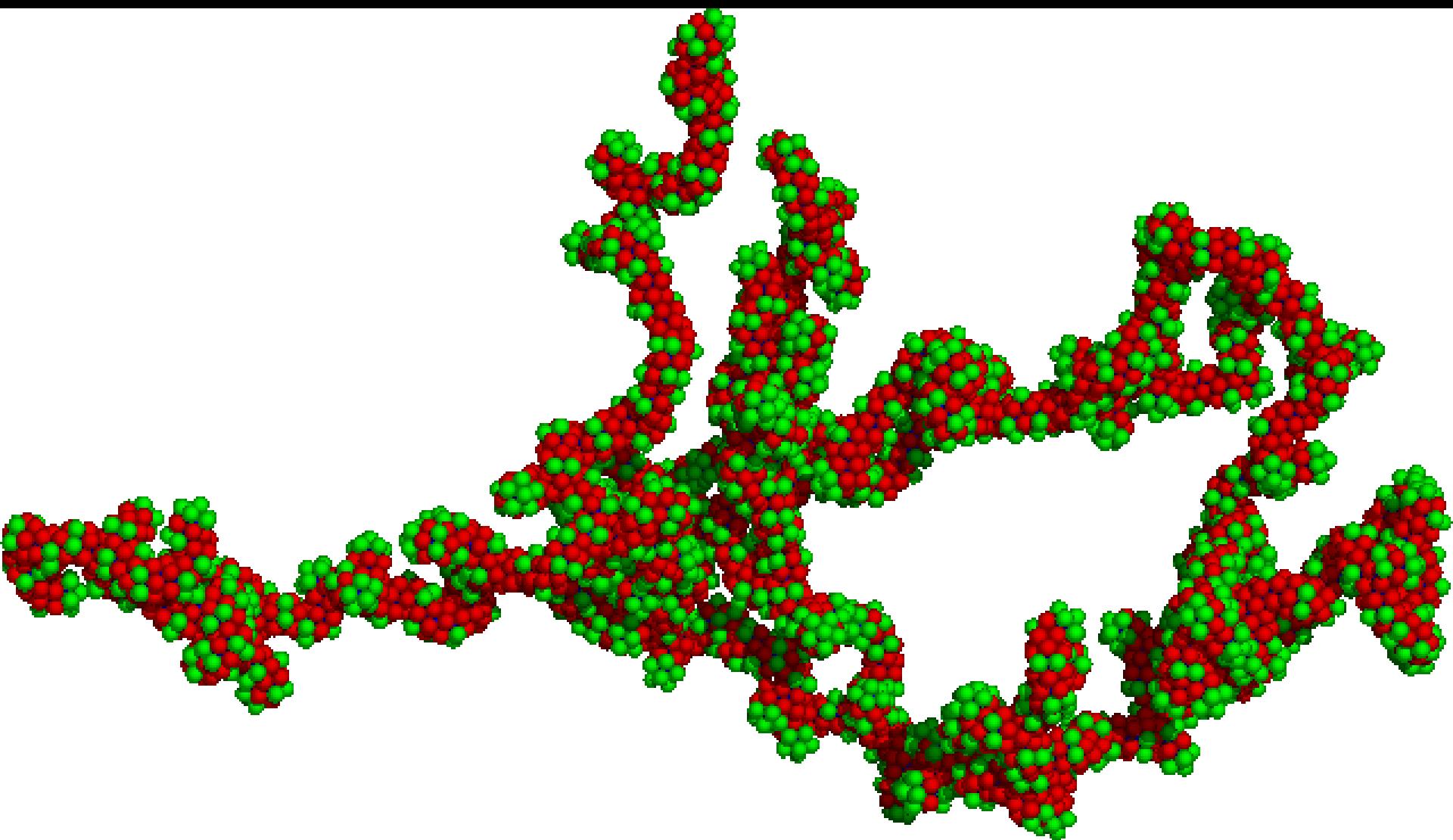




Cruzeiro do Sul

Saco de Carvão

Eta Carinae



Gás

Estrelas

Restos



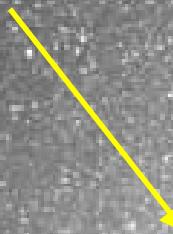
Evolução : gás e estrelas



A VIA LÁCTEA



Via Láctea

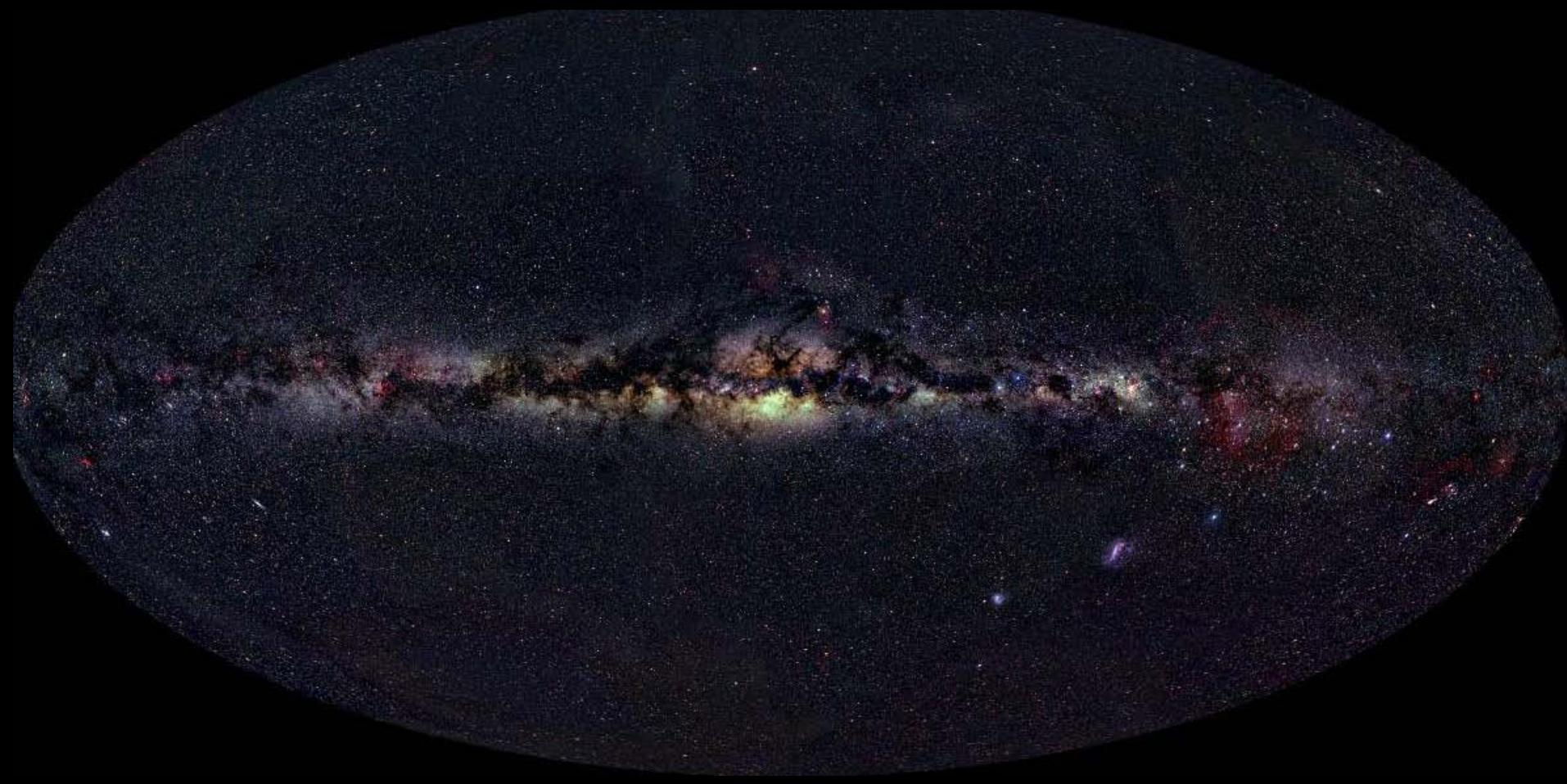


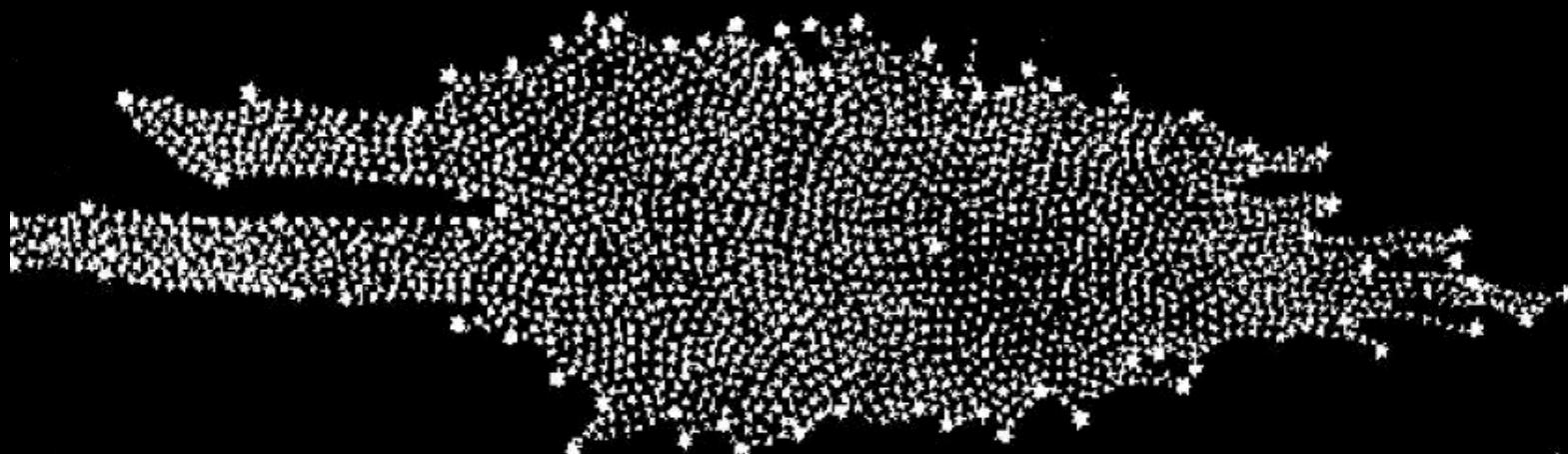




Via Láctea
Jacopo Tintoretto (1518-1594)





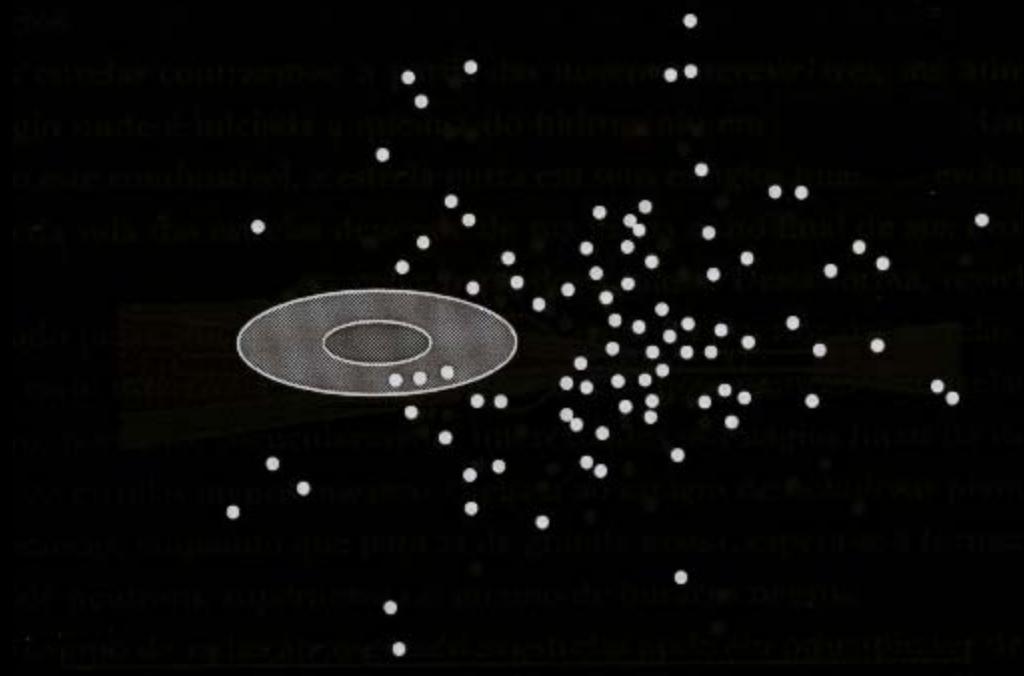


Herschel (1785)

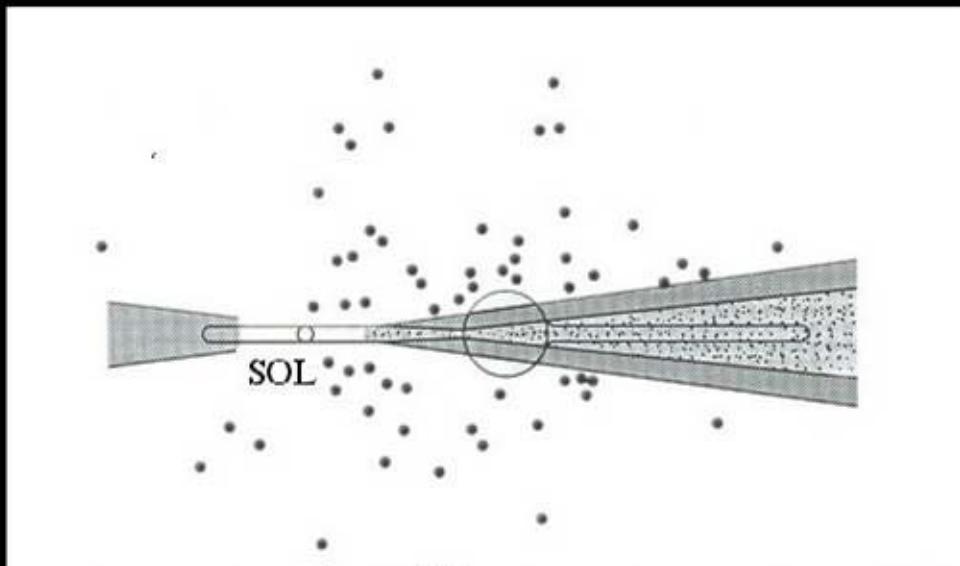
o apreciaras, mostrando numerosas estrellas de menor magnitud que las principales.

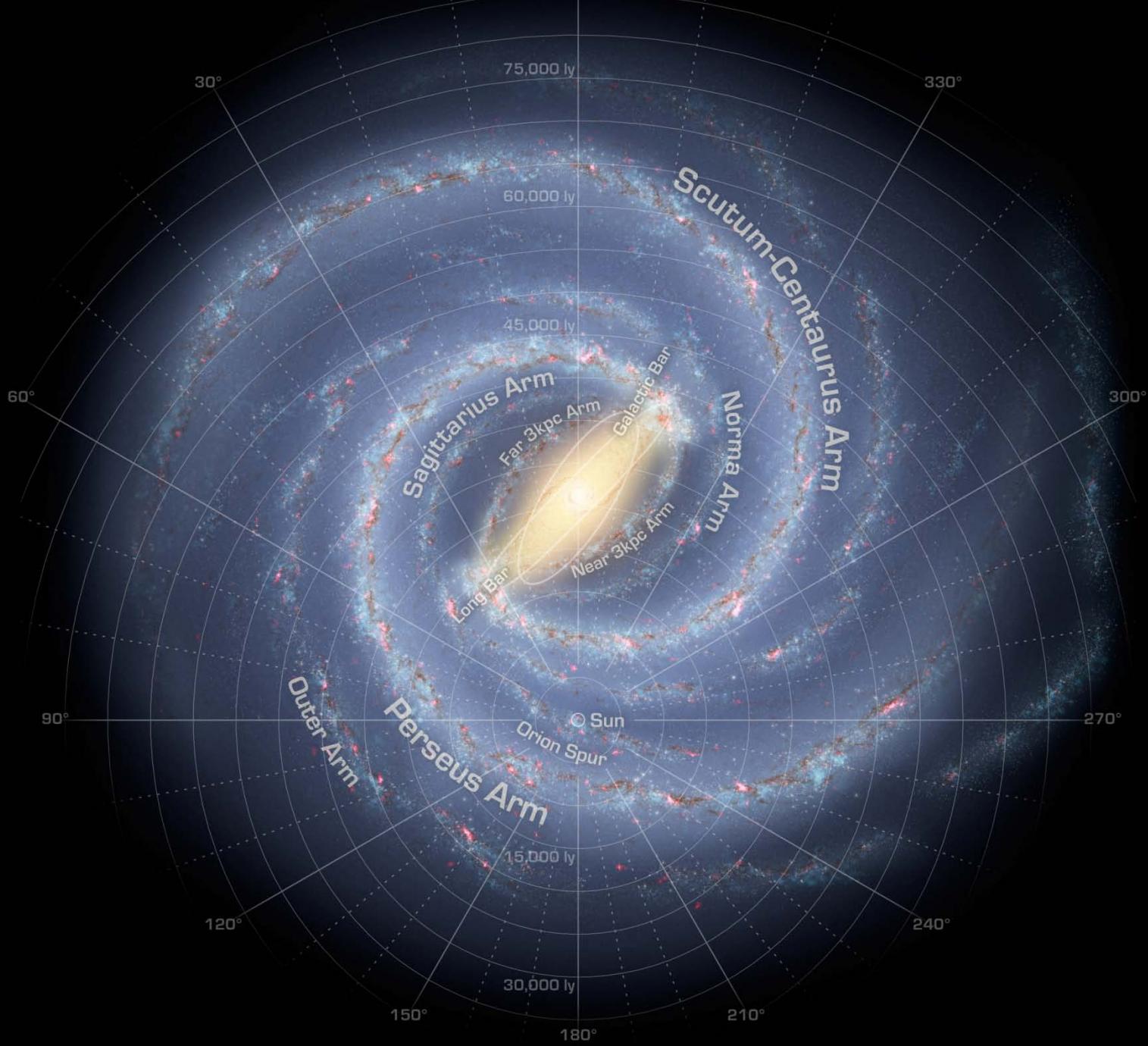
Conviene contrastar lo que se ha visto con el resultado de la observación anterior, que muestra una distribución más o menos uniforme de las estrellas en el campo de visión. La diferencia es evidente, ya que esta figura es más compacta y densa, y las estrellas están más próximas entre sí.

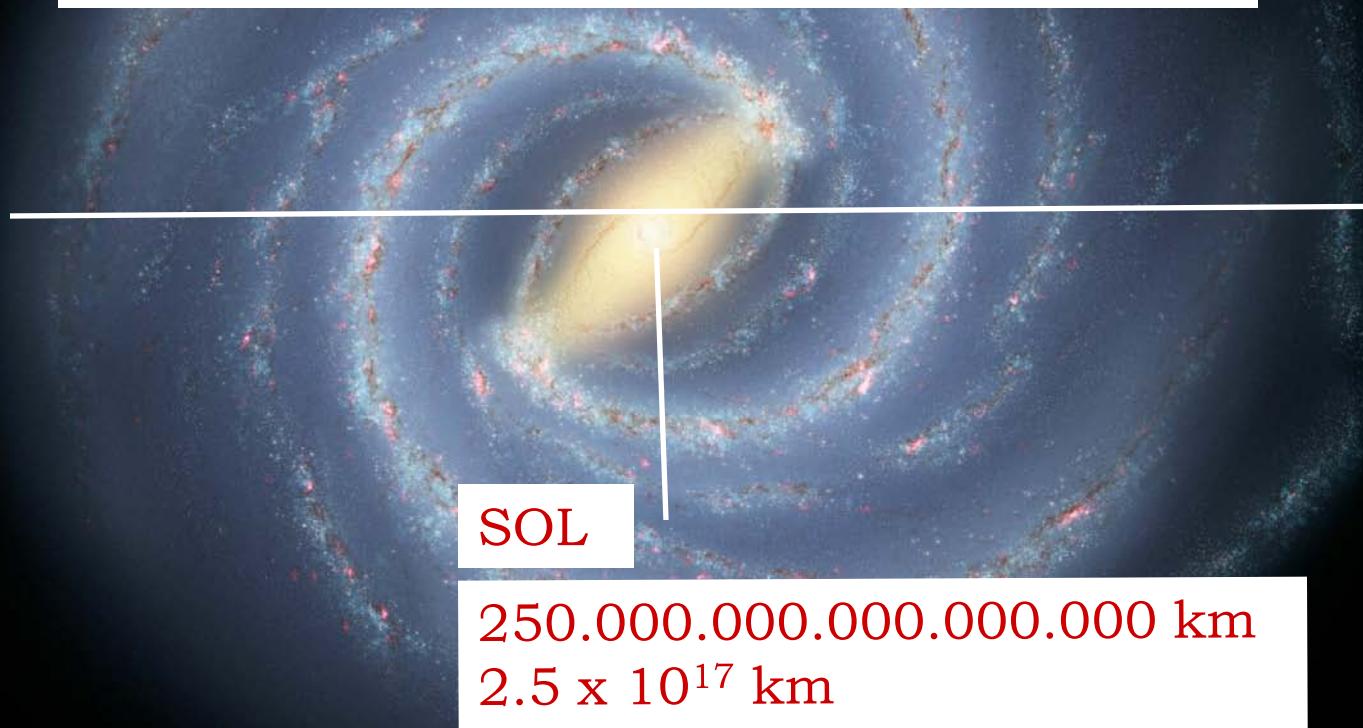
Kapteyn (1920)



BRAÇOS ESPIRAIS





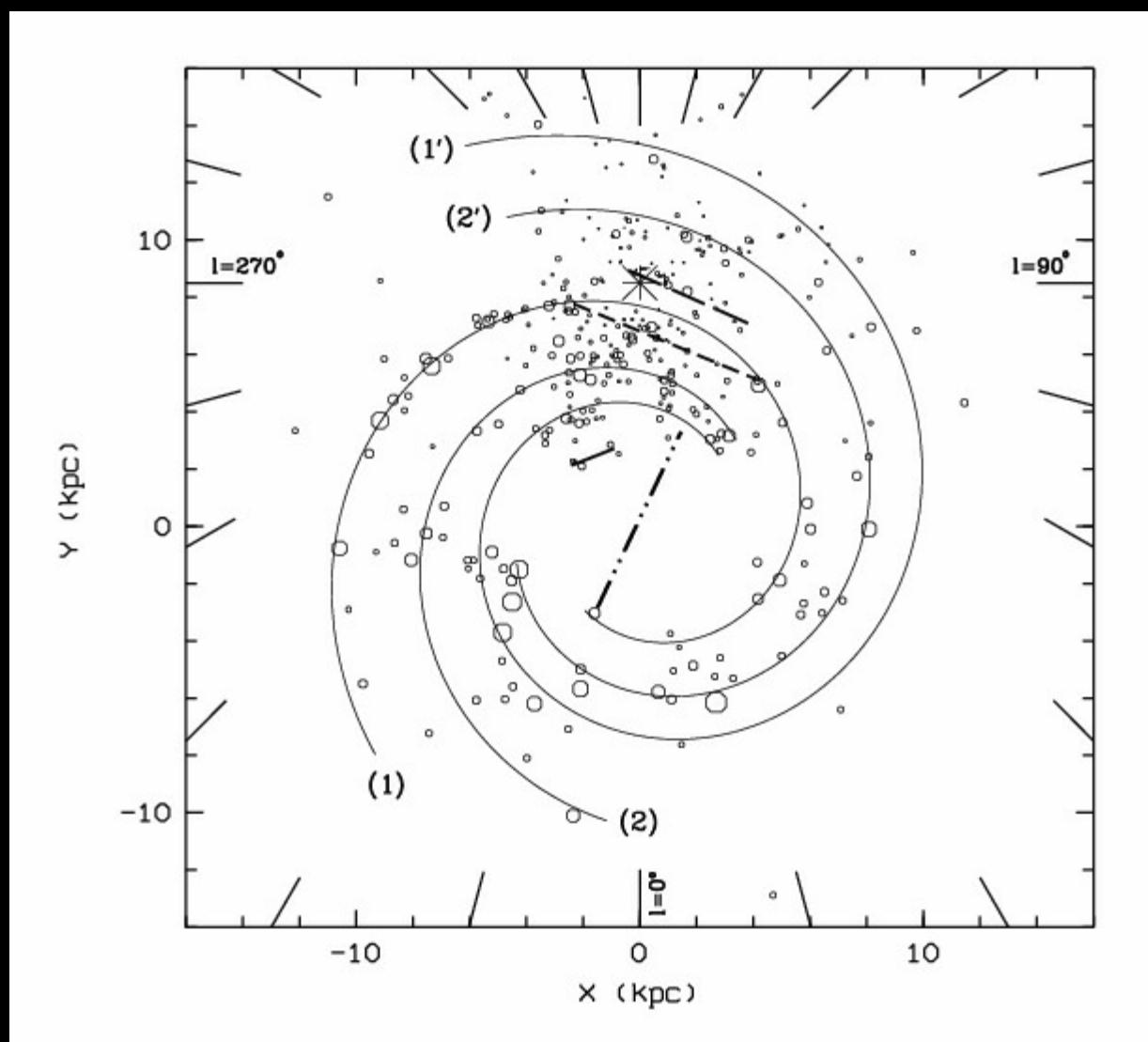


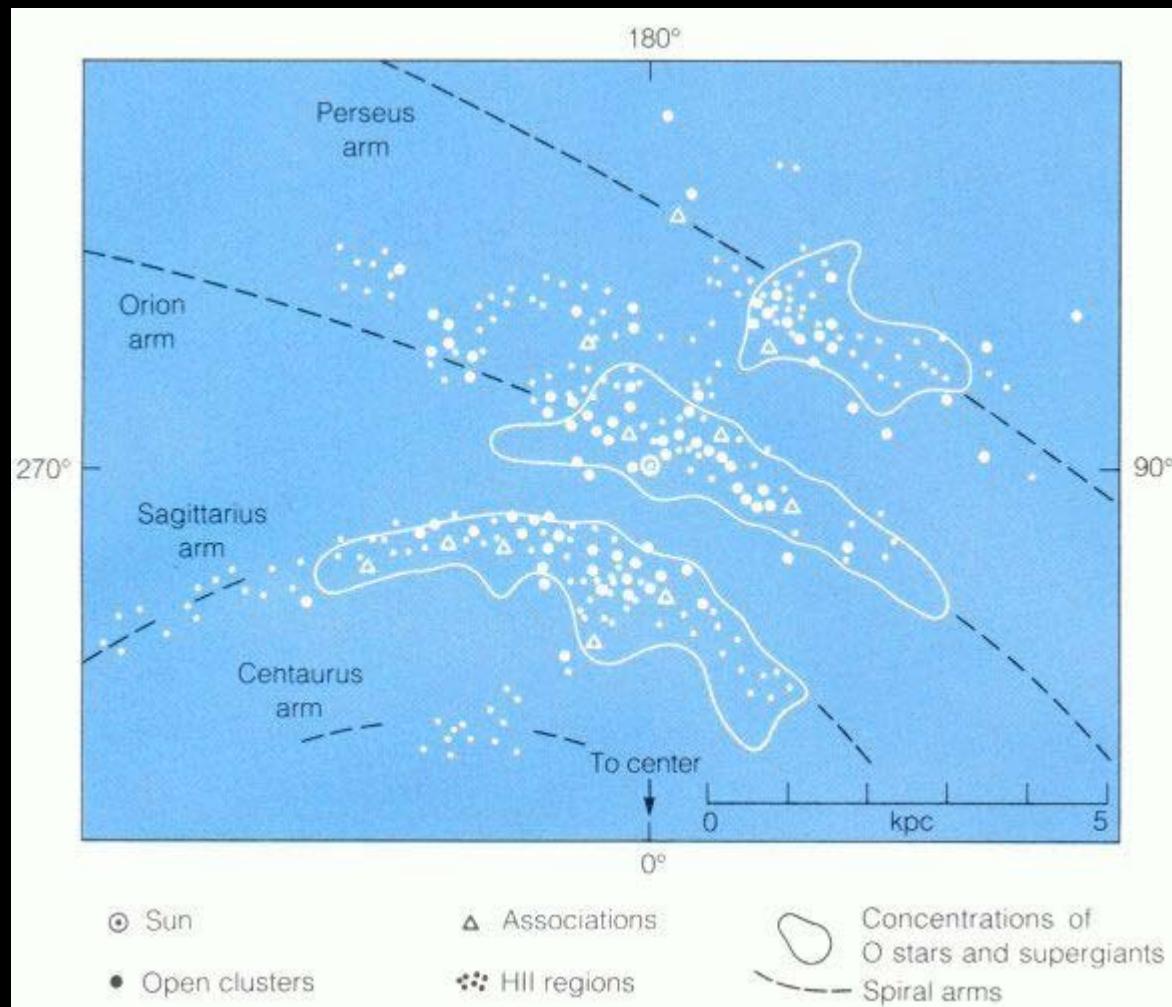
1.000.000.000.000.000 km = 10^{18} km
100.000 anos luz
30.000 pc = 30 kpc

SOL

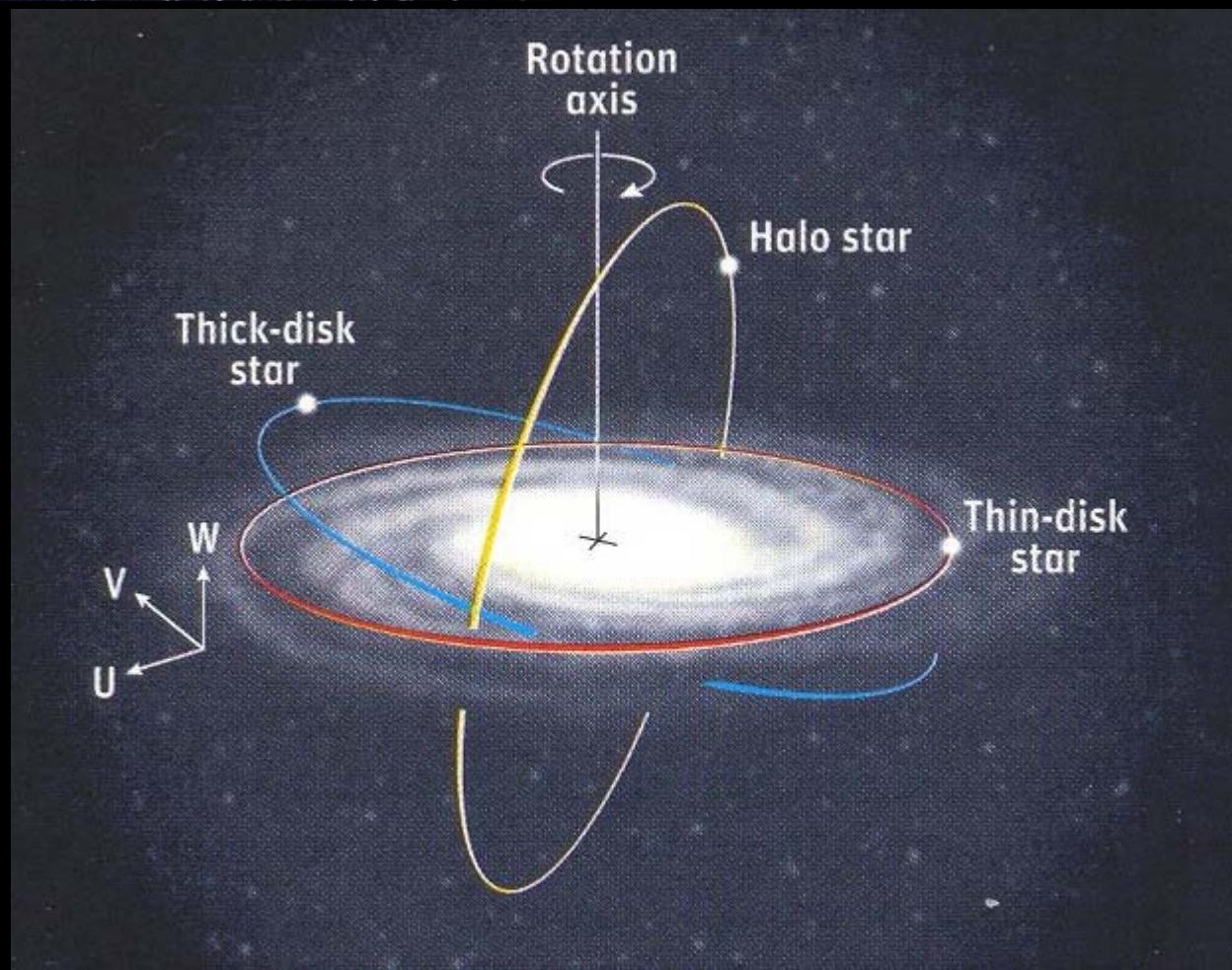
250.000.000.000.000.000 km
 2.5×10^{17} km
26.000 anos luz
8.000 pc = 8 kpc

Regiões HII: Mapeamento dos braços espirais



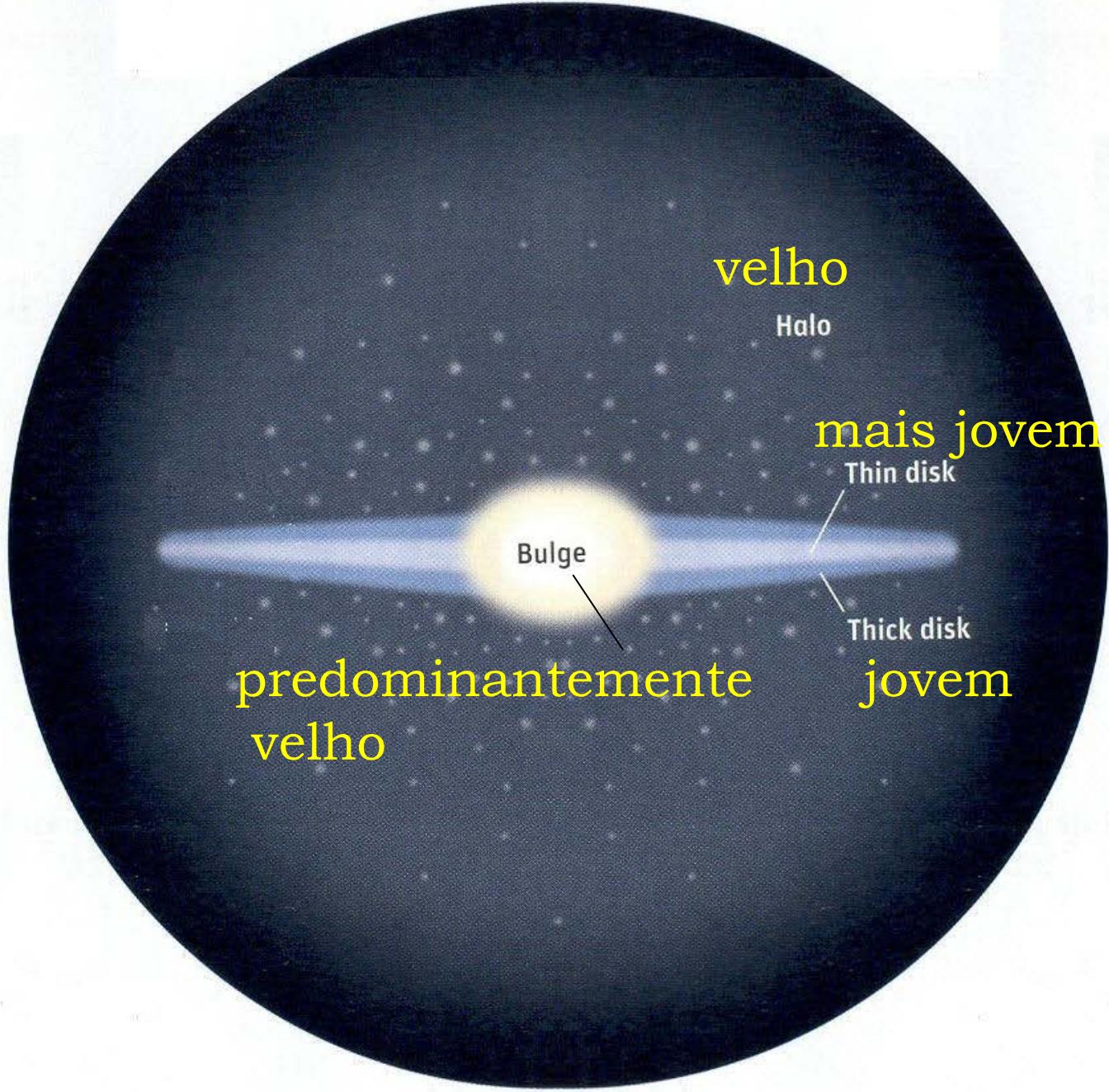


Movimentos das estrelas na Galáxia



O centro da Galáxia





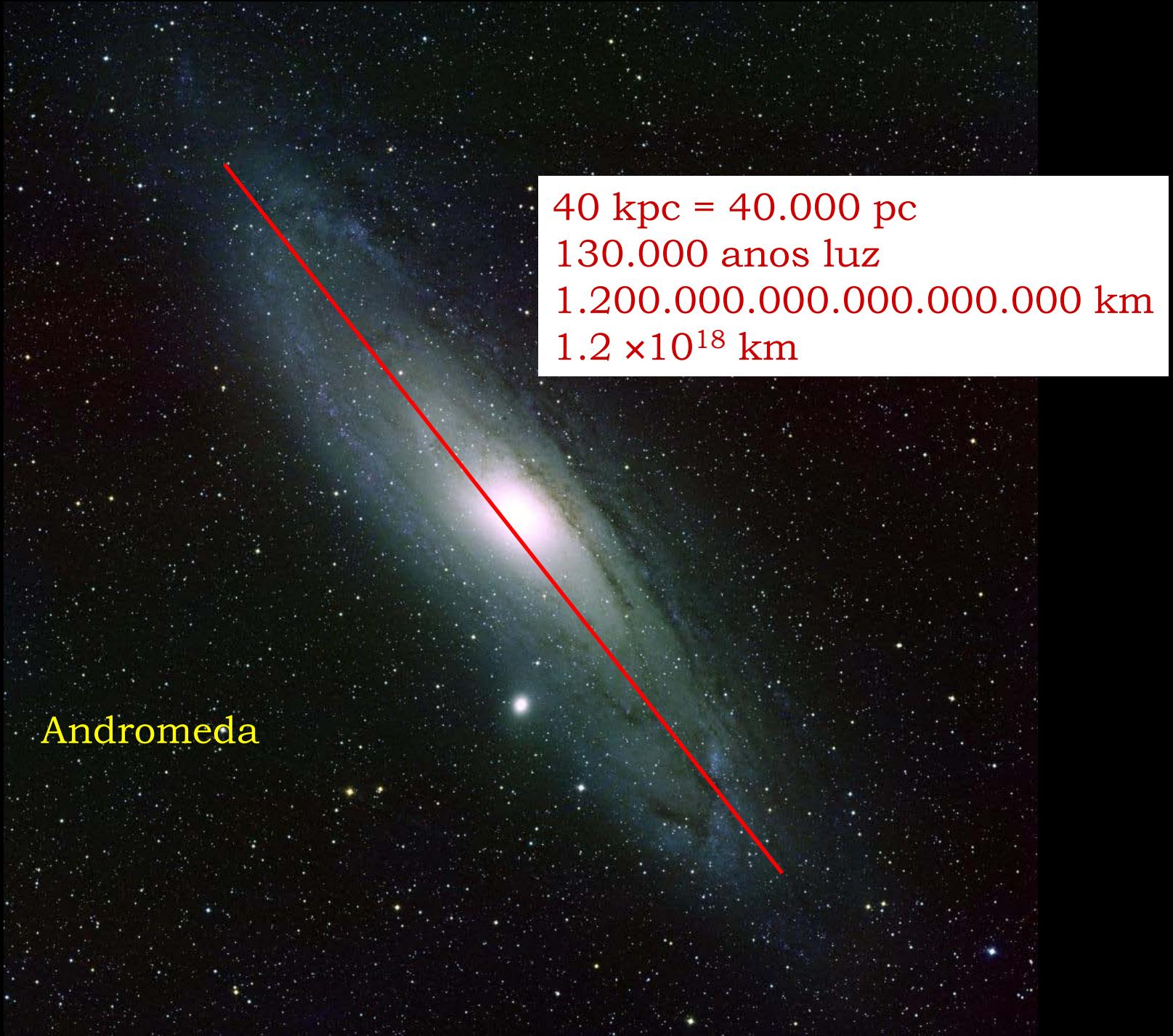


GALÁXIAS



Nuvens de Magalhães





40 kpc = 40.000 pc

130.000 anos luz

1.200.000.000.000.000 km

1.2×10^{18} km

Andromeda

M51



Braços
espirais

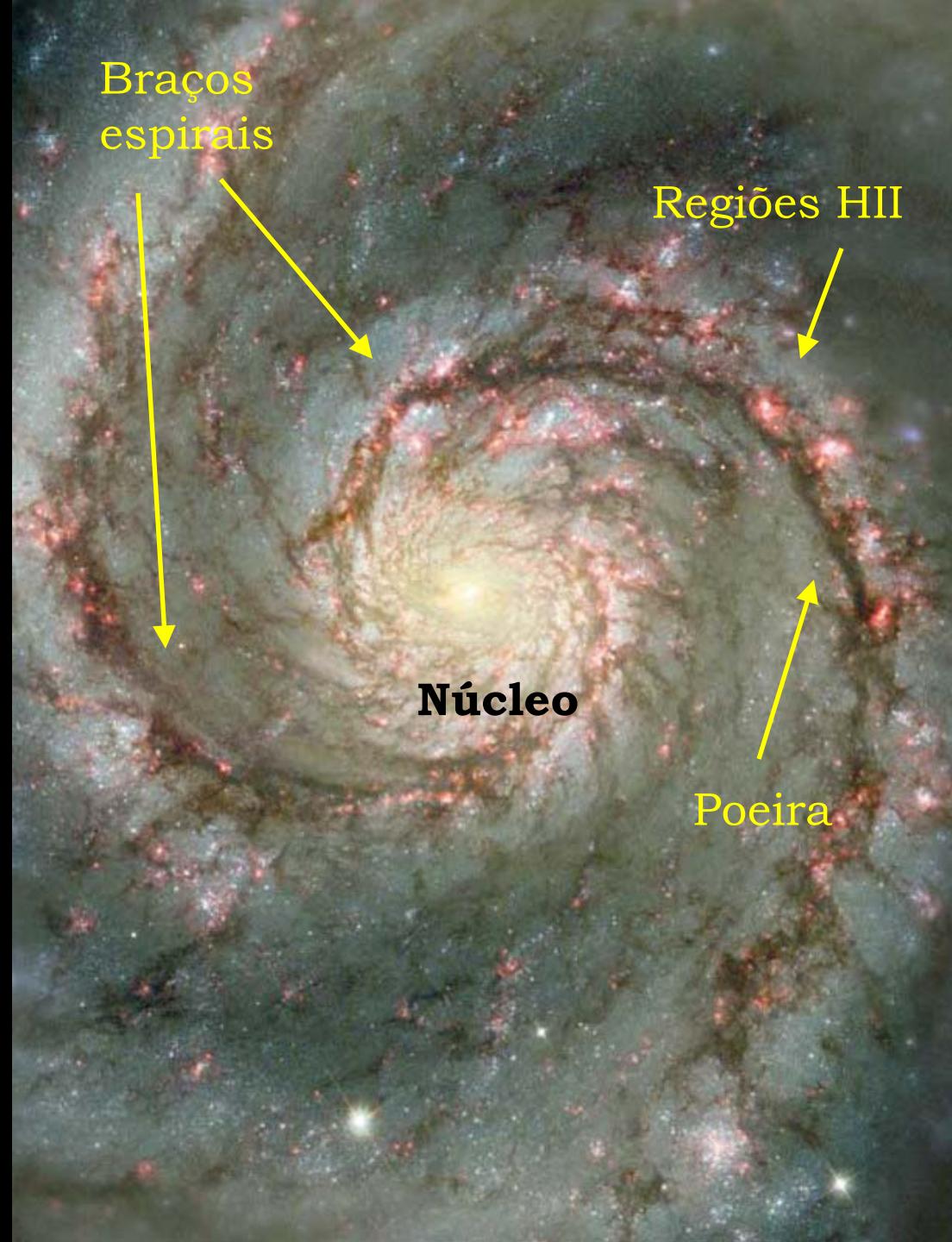


Regiões HII



Núcleo

Poeira



Galáxias espirais



Galáxias espirais



Tipos de Galáxias



Galáxia elíptica



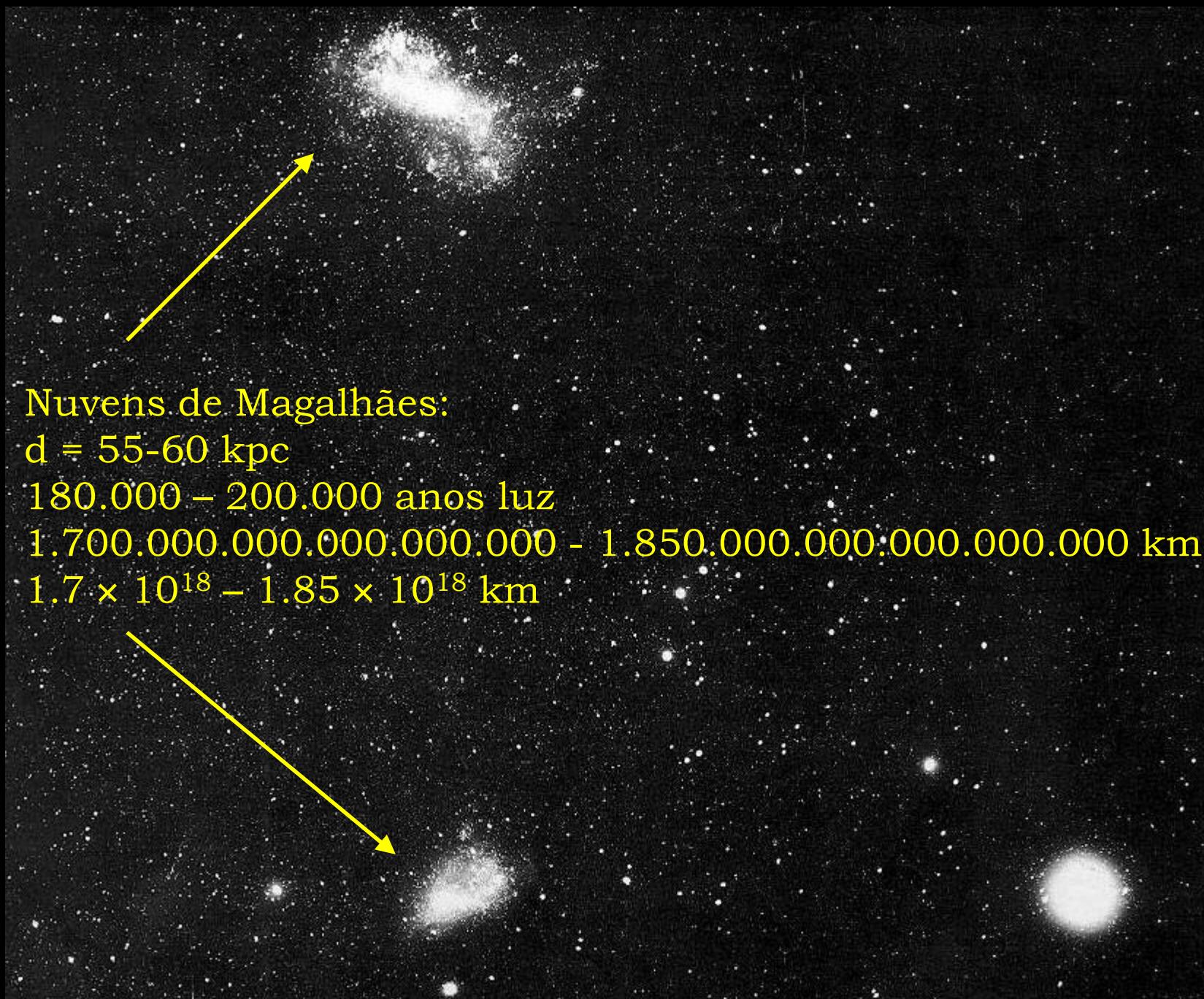
Galáxias irregulares

SMC



LMC





Nuvens de Magalhães:

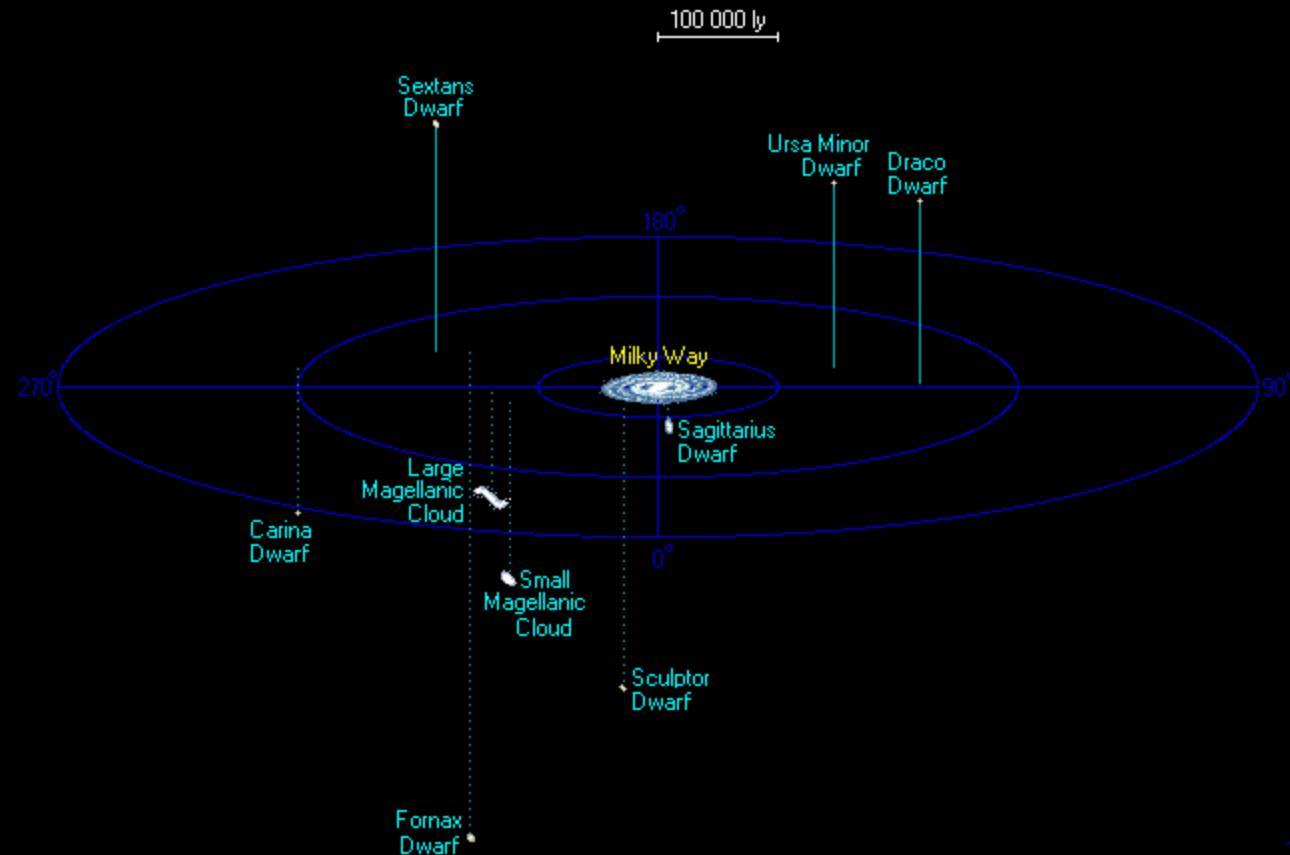
$d = 55\text{-}60 \text{ kpc}$

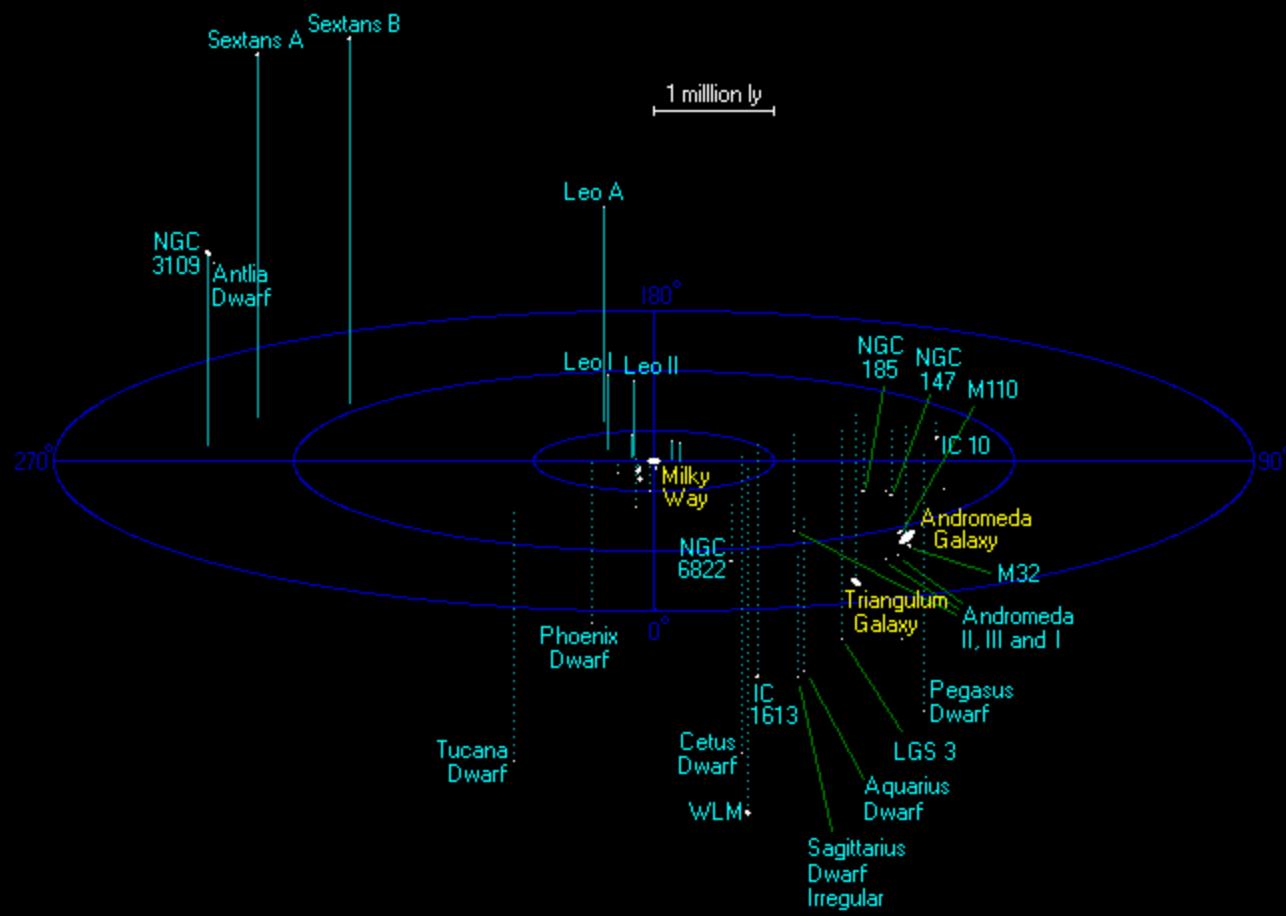
$180.000 - 200.000 \text{ anos luz}$

$1.700.000.000.000.000.000 - 1.850.000.000.000.000.000 \text{ km}$

$1.7 \times 10^{18} - 1.85 \times 10^{18} \text{ km}$

O Grupo Local de galáxias







AGLOMERADOS DE GALÁXIAS

Aglomerado de galáxias
Hydra

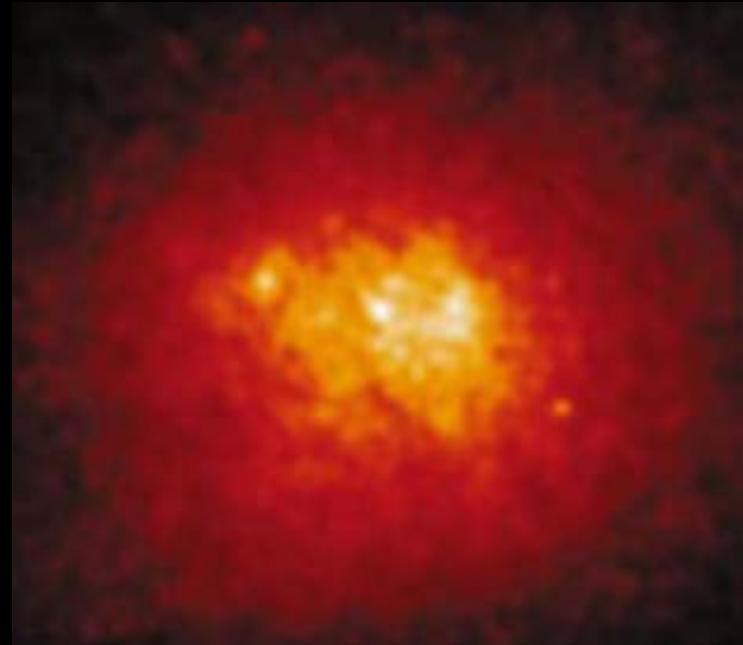


Aglomerado de galáxias

Coma

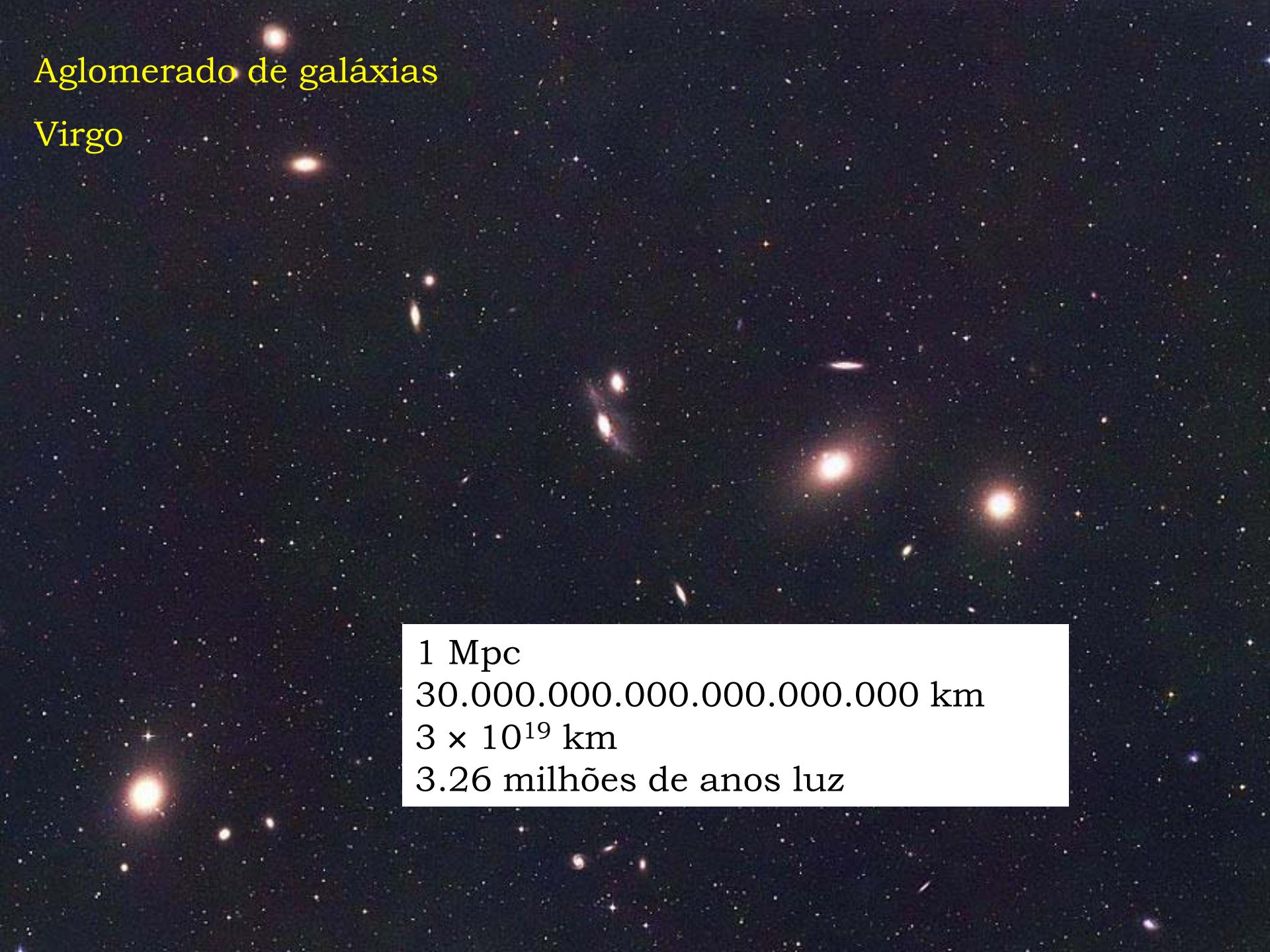


Luz visivel



Raios X

Aglomerado de galáxias Virgo



1 Mpc
30.000.000.000.000.000 km
 3×10^{19} km
3.26 milhões de anos luz

“Tamanho” do universo:

c: velocidade da luz = 300.000 km/s

t: idade do universo ~ 15 bilhões de anos

$$R \sim c t$$

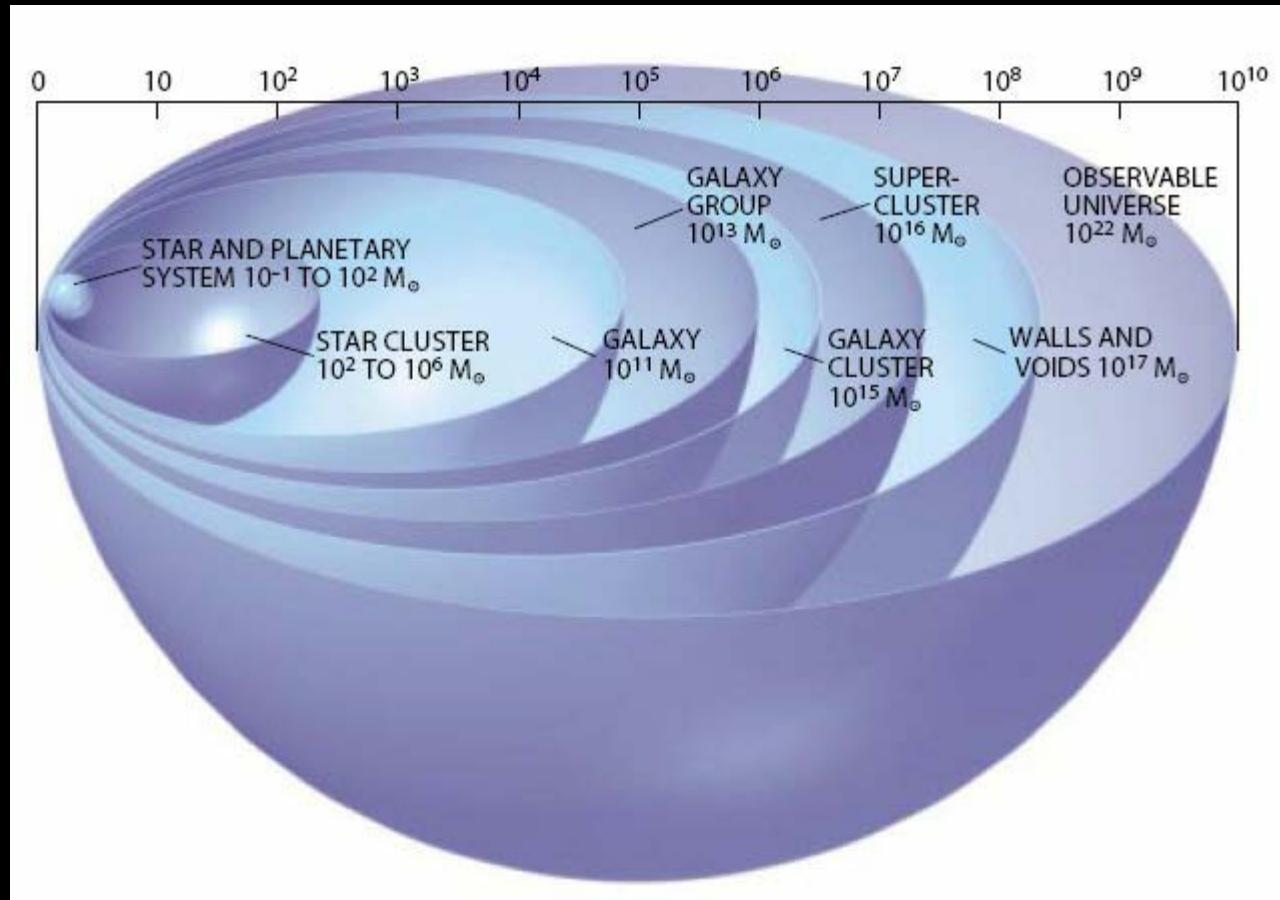
$$R \sim 140.000.000.000.000.000.000.000 \text{ km}$$

$$= 1.4 \times 10^{23} \text{ km}$$

$$= 4500 \text{ Mpc}$$

$$= 15 \text{ bilhões de anos luz}$$

Diâmetro aproximado em anos-luz



HIERARQUIA COSMICA

Murucio



FIM