

2004 5 14

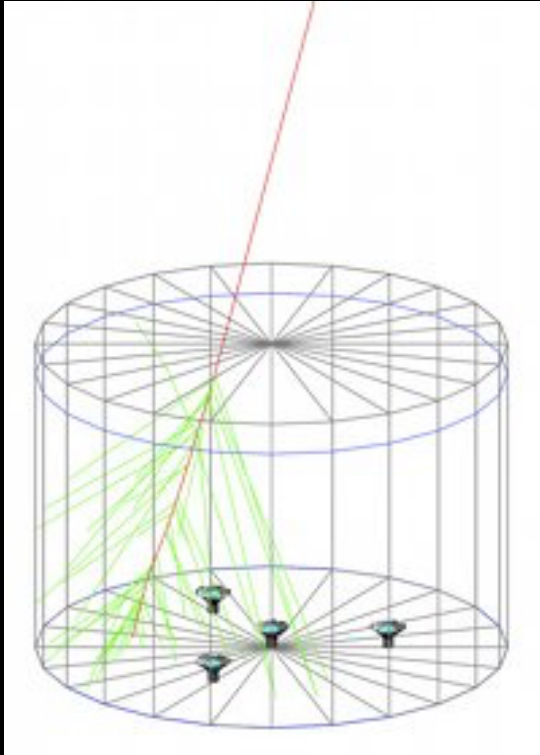


**GRAN**  
**TELESCOPIO**

# HAWC



# HAWC



# **Multiwavelength Astronomy**

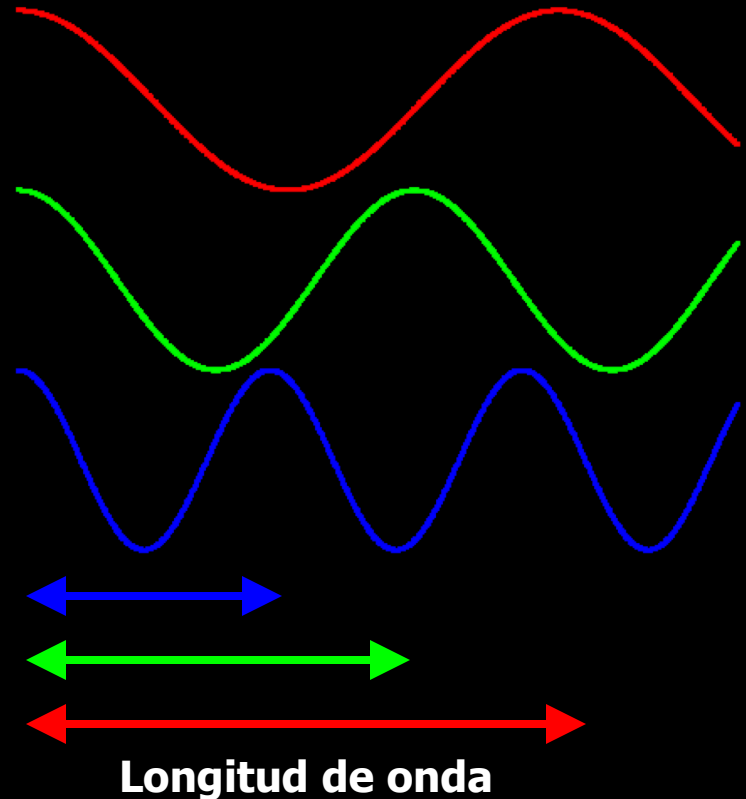
# Radiación Electromagnética

- Se describe la radiación EM por:

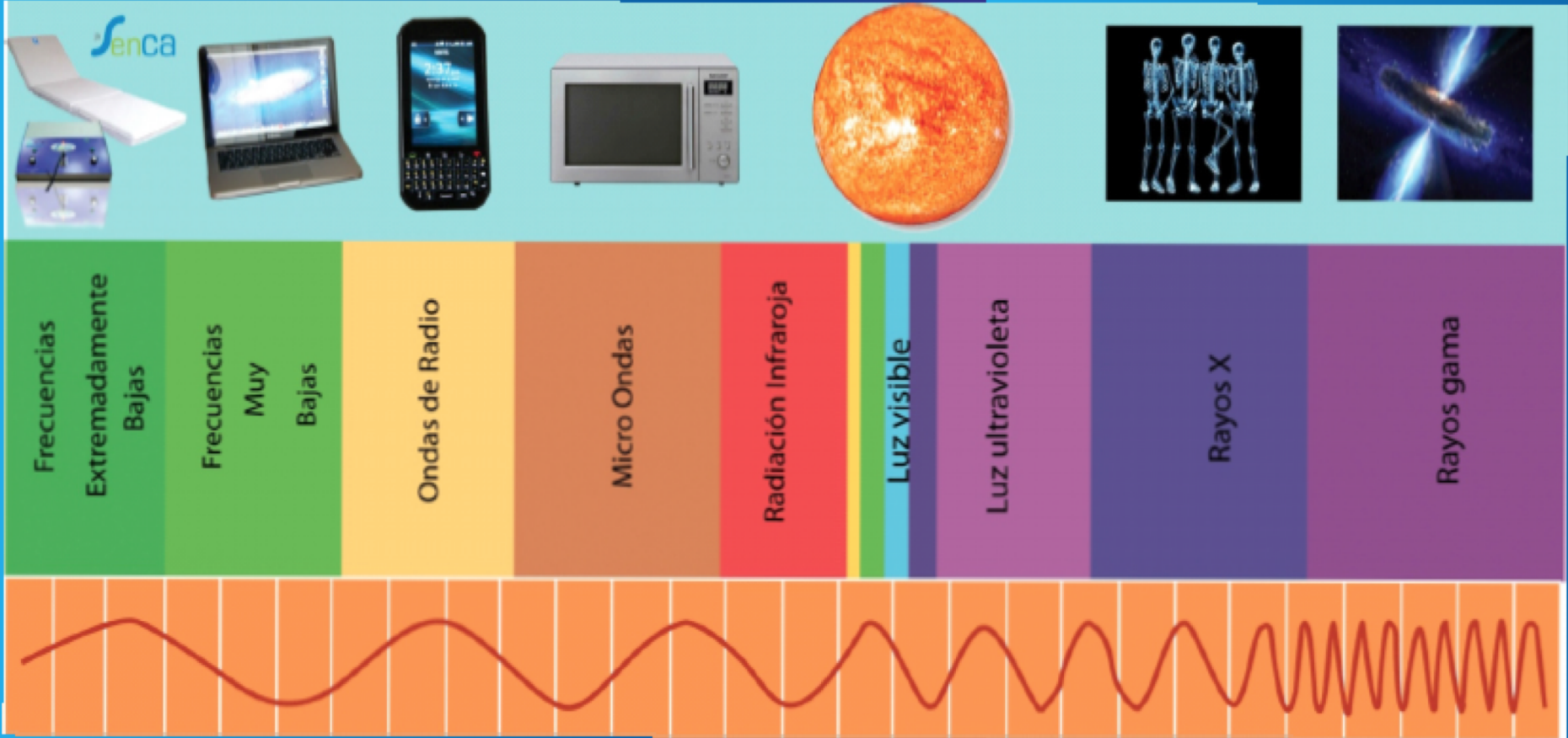
- Frecuencia
- Longitud de onda

- Luz:

- 300,000 km/s



# Espectro Electromagnético



¿Como vemos la luz que nos llega del Universo?



**Arecibo**



**GTM**



**Spitzer**



**Hubble**

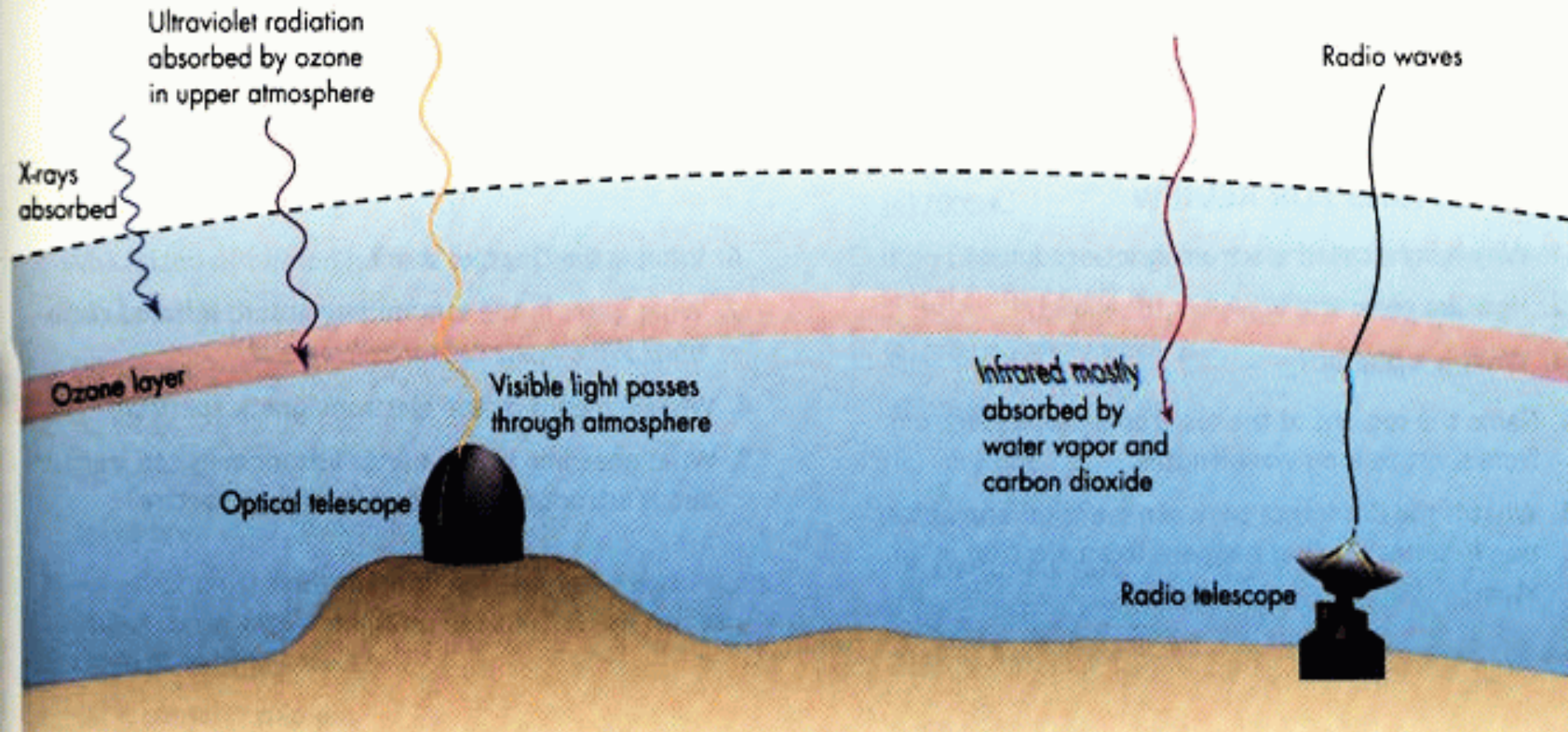
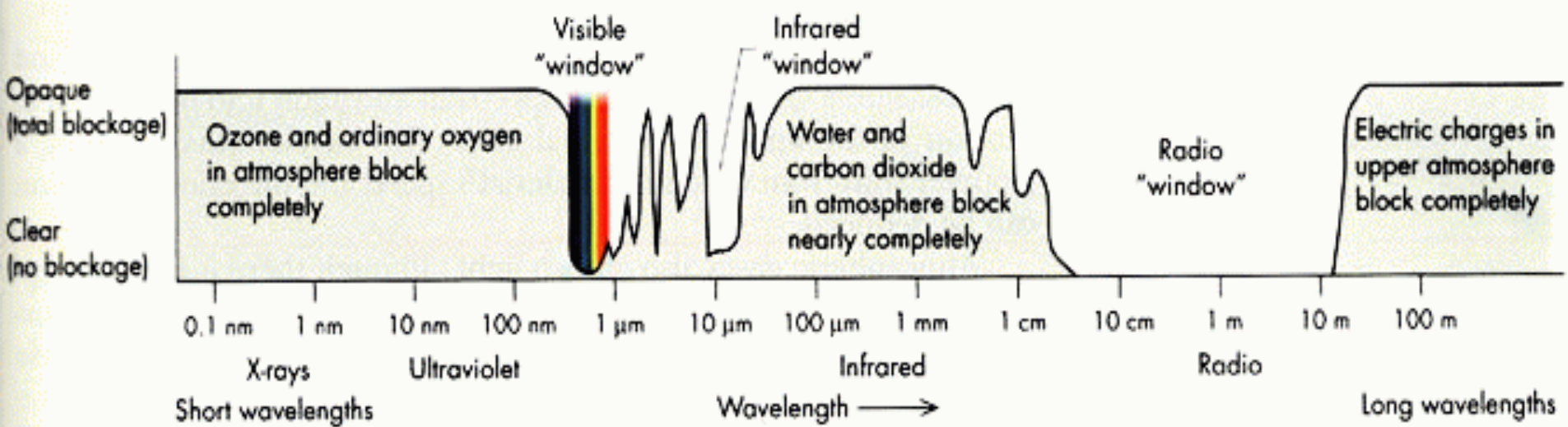


**Chandra**



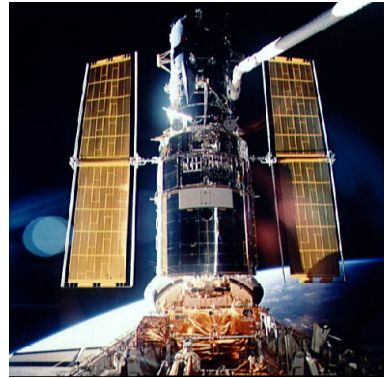
**HAWC**





# *El Espectro Electromagnético*

100MeV 100keV 0.1keV 1000A 5000A 1micra 1cm 100m



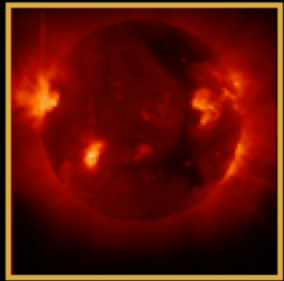
# Multi-wavelength Astronomy

Banda	Longitud de Onda /Energía	Temperatura	Qué se puede estudiar
Rayos Gamma	100keV-100MeV	$>10^8\text{K}$	Discos de acreción, gamma-ray bursts
Rayos X	$<1\text{-}100\text{keV}$	$10^6\text{-}10^8\text{K}$	Gas caliente en cúmulos de galaxias, coronas estelares, Discos de acreción,
Ultravioleta (UV)	900-3000Å	$10^4\text{-}10^6\text{K}$	Estrellas calientes enanas blancas, gas interestelar,
Óptico	3000-10,000Å	$10^3\text{-}10^4\text{K}$	Estrellas tipo solar
Infrarrojo	1-100 micras	$10\text{-}10^3\text{K}$	Polvo, planetas, enanas café
Microondas	1cm	$<10\text{K}$	Radiación de fondo del Universo.
Radio	$>1\text{m}$	$<10\text{K}$	Radiación de electrones moviéndose en un campo magnético: pulsars, AGNs

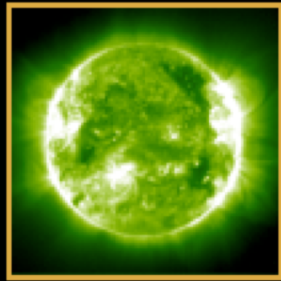
# Herschel



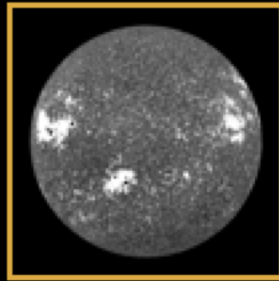
# El Sol



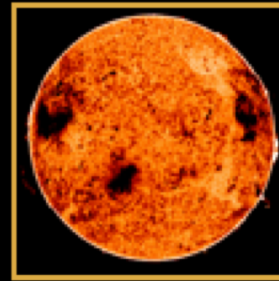
X-Ray: Yohkoh



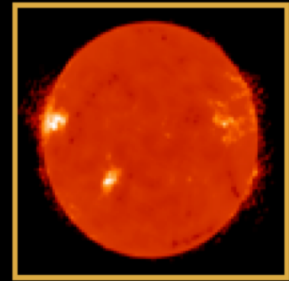
Ultraviolet: SOHO-EIT



Visible: BBSO

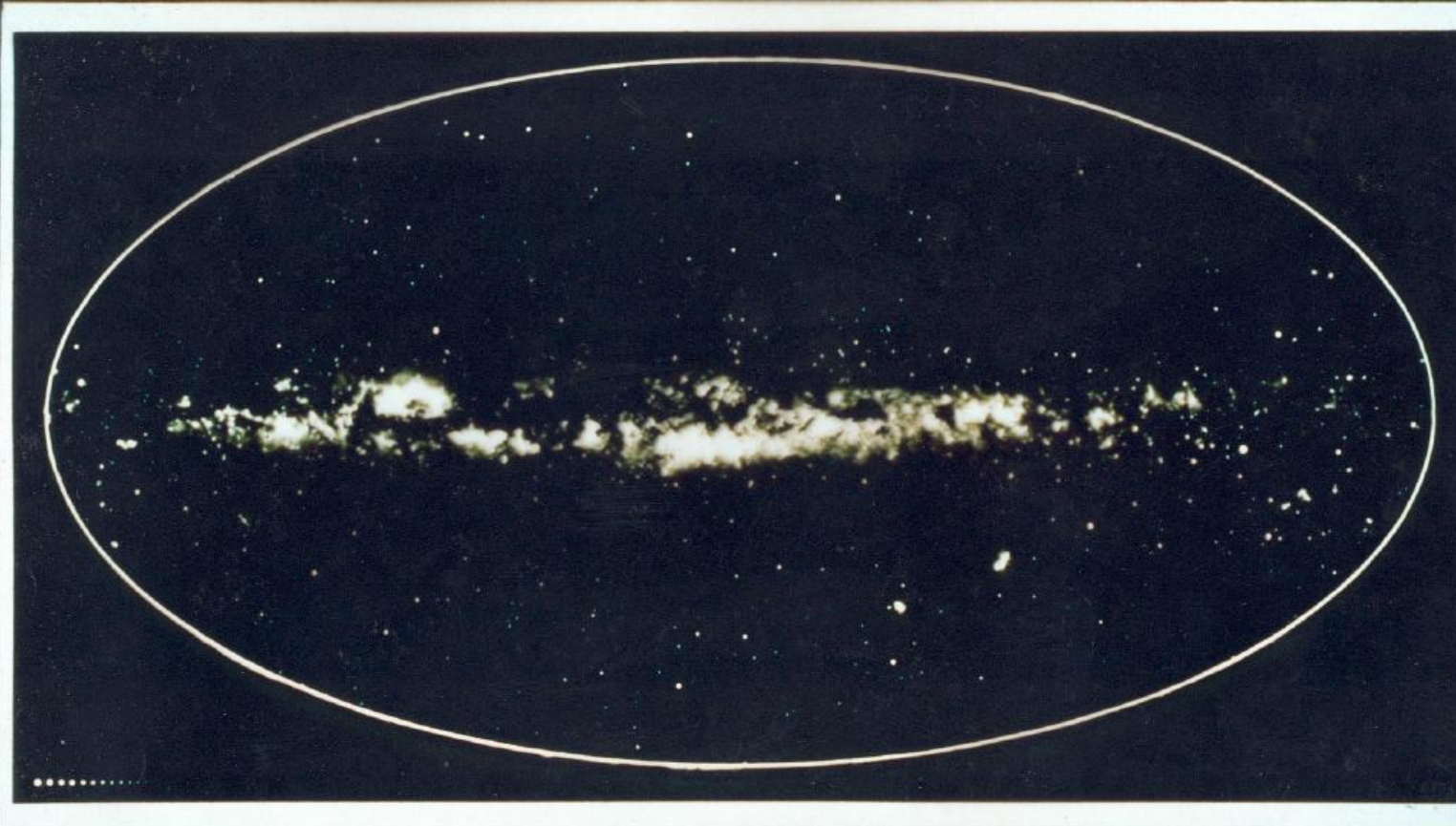


Infrared: NSO



Radio: Nobeyama

# La Vía Láctea: Óptico



estrellas,  
polvo

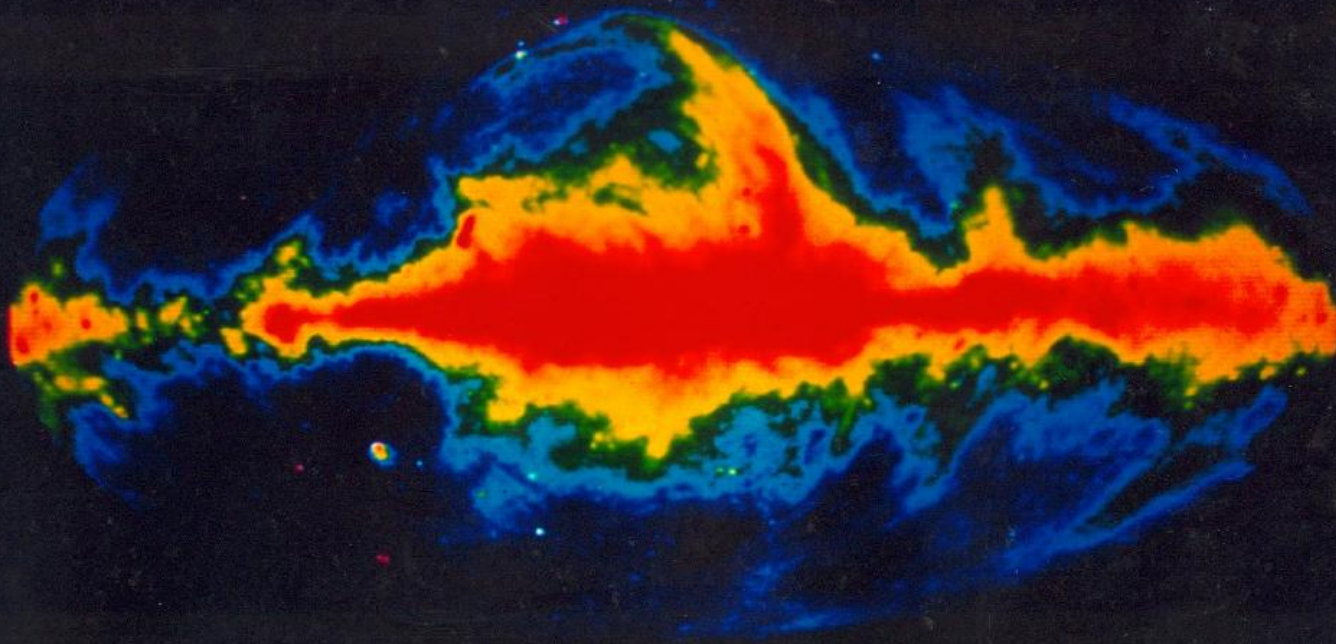
# La Vía Láctea: IR



*Near-infrared Image of the Milky Way obtained by the DIRBE on NASA's satellite COBE, NASA/Goddard Space Flight Center, April 17, 1990.*

A través  
del  
polvo

# La Vía Láctea: rayos X



Gas  
caliente



**Radio**

**Microondas**

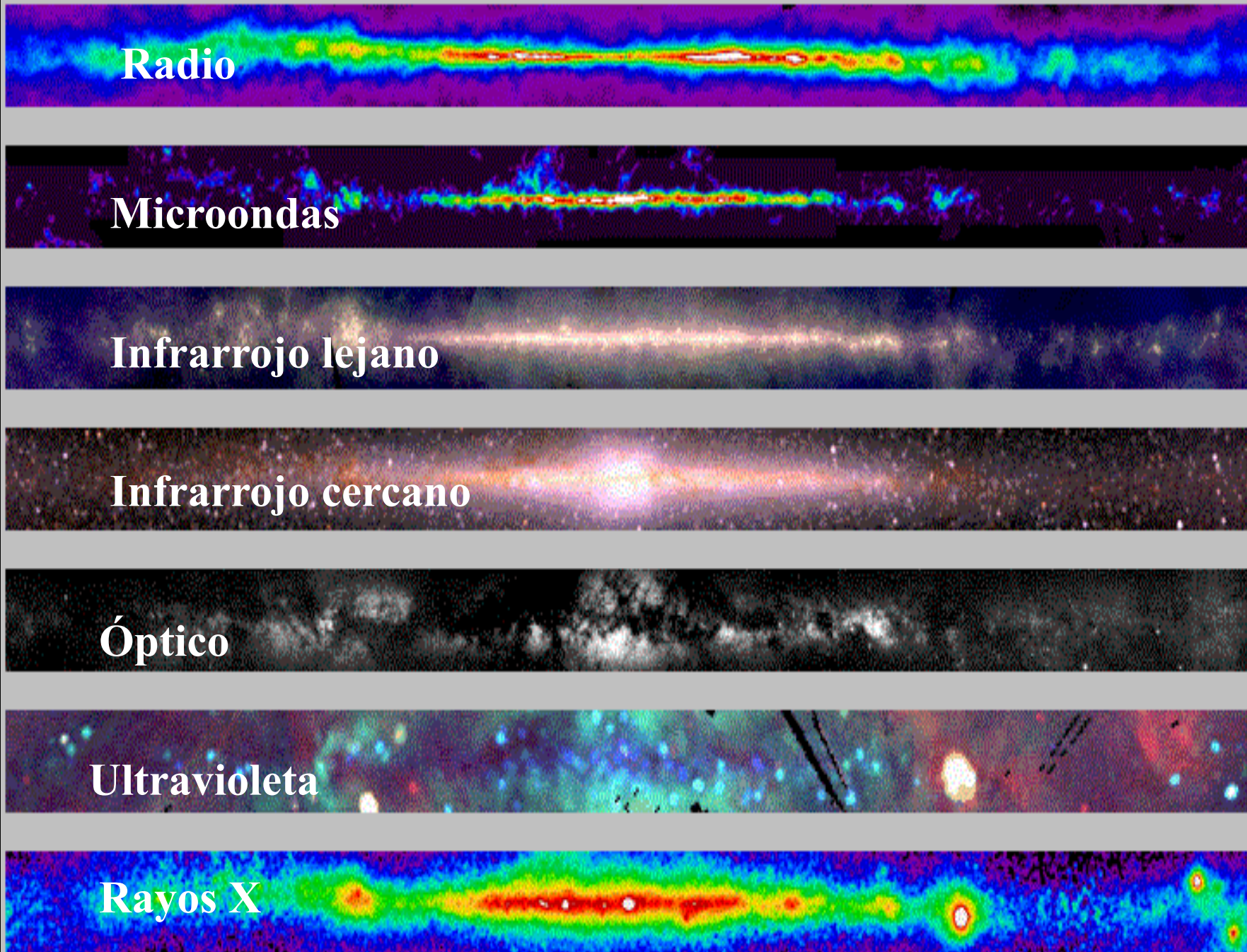
**Infrarrojo lejano**

**Infrarrojo cercano**

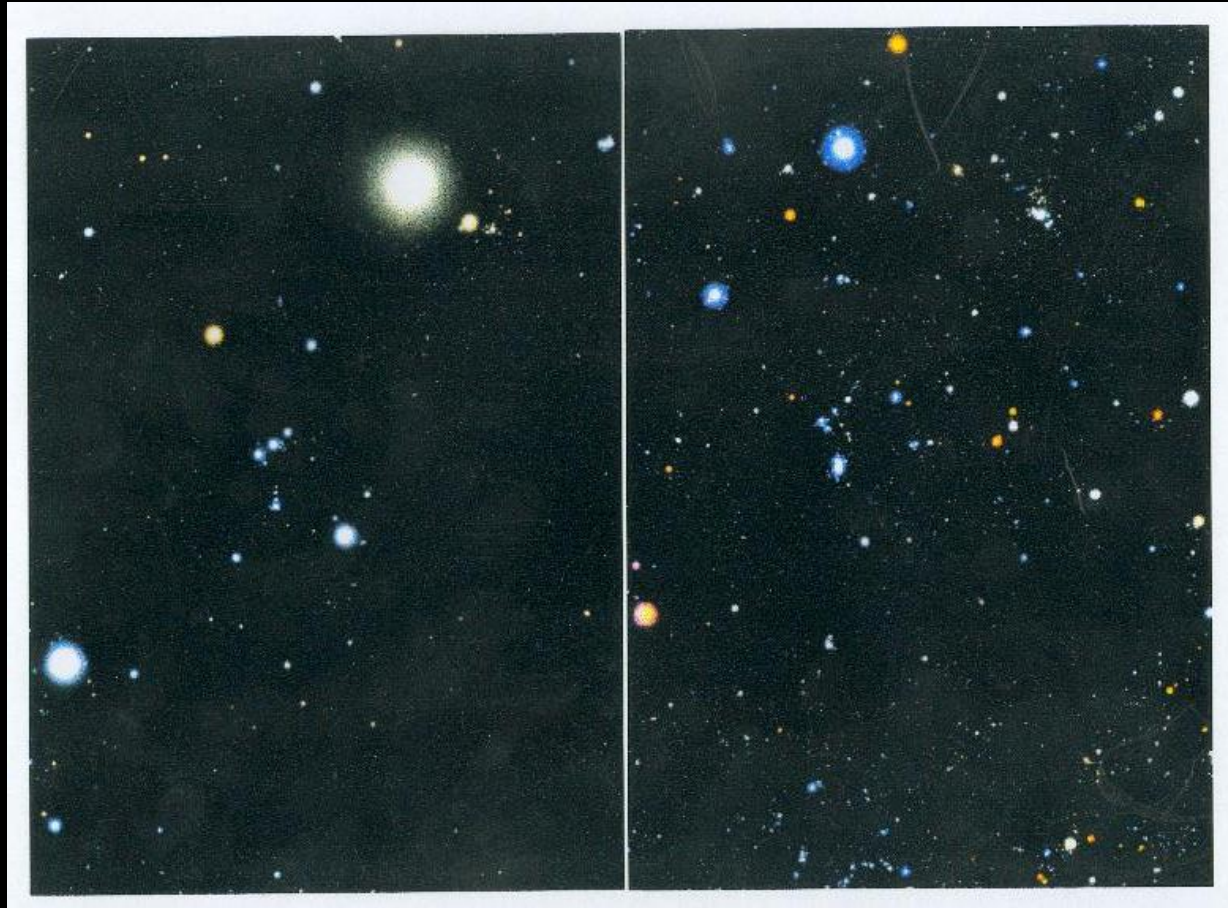
**Óptico**

**Ultravioleta**

**Rayos X**



# Orión en el óptico y rayos X



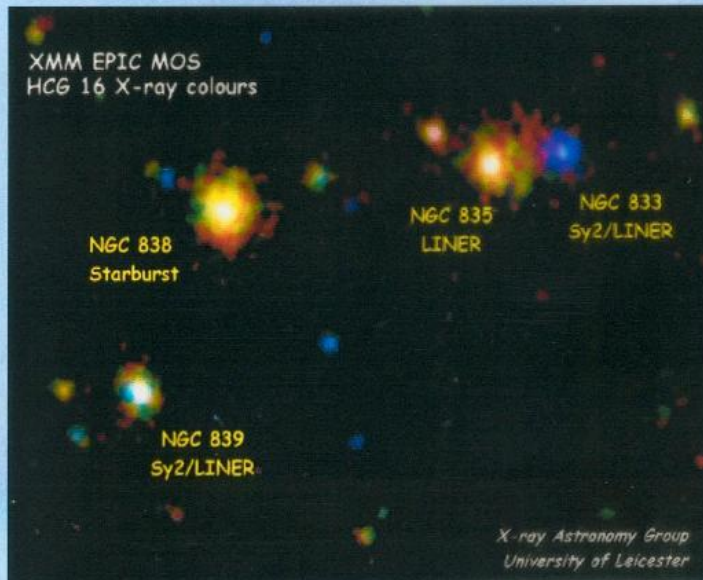
óptico

rayos X

# Estudio Multi-frecuencia

## Hickson 16 – a compact group of AGN/Starburst galaxies

XMM X-ray



Optical



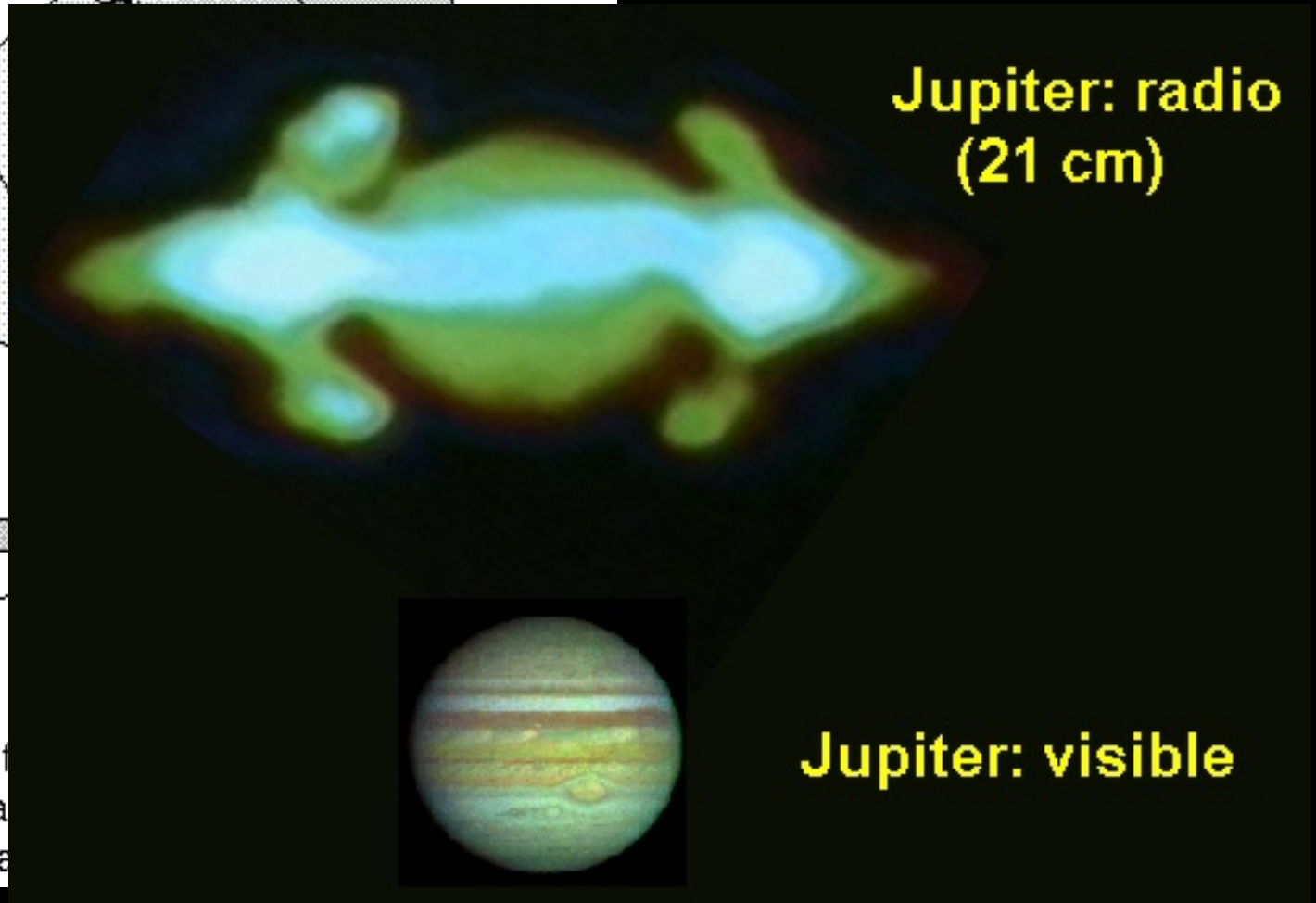
# Radiotelescopios

antenna

computer recorder

amplifier

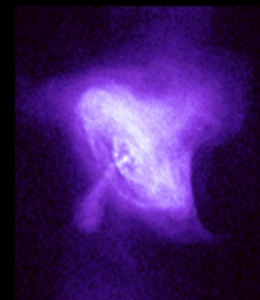
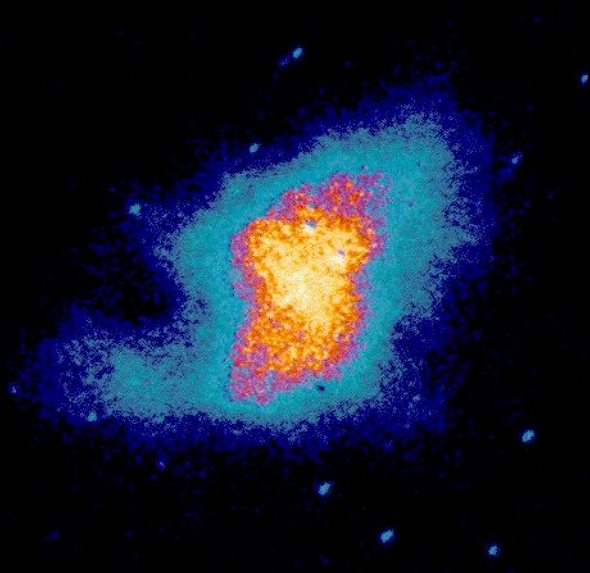
A radio telescope reflects radio waves to a focus at the antenna. Because radio waves have long wavelengths, the antennas are very large, the radio frequencies are very low, and the signals are very weak.



**Jupiter: radio  
(21 cm)**

**Jupiter: visible**

# Nebulosa del Cangrejo



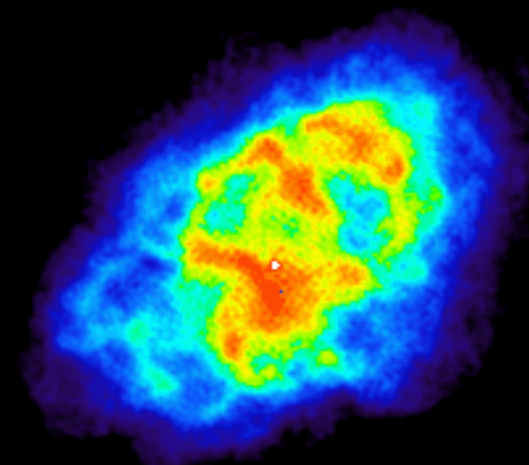
X4 (Chandra)



Crab (VLT)



F7 (Herschel)

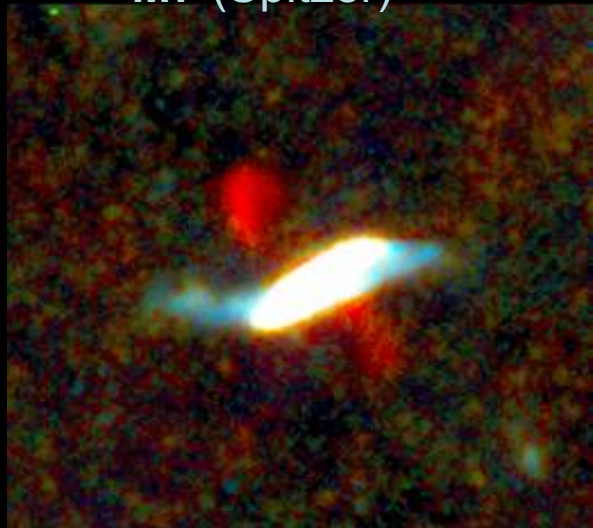


R9 (NRAO)

# Centaurus A



M7 (Spitzer)



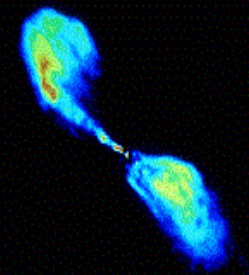
F8 (Herschel)



Centaurus A (NOAO)



X3 (Chandra)



R7 (NRAO)

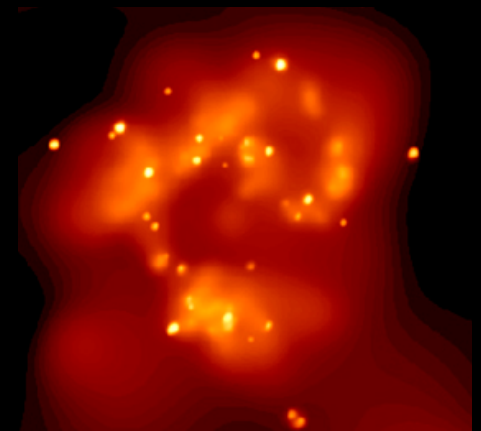
# Antennae



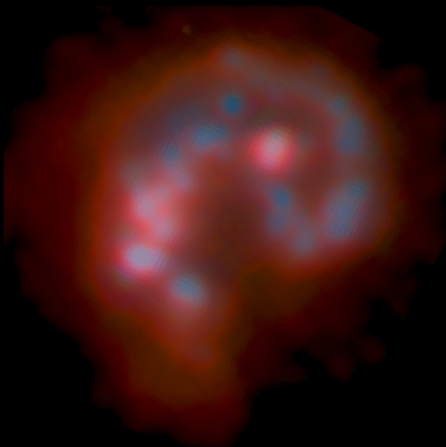
**M6** (Spitzer)



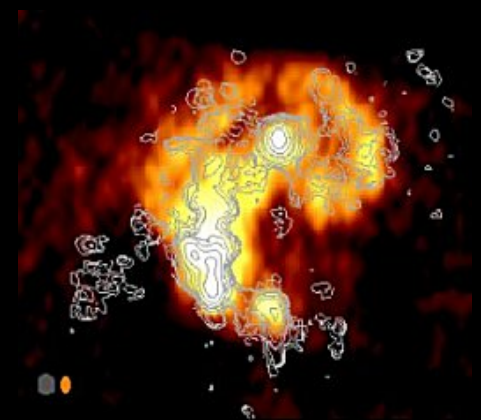
Antennae (Hubble)



**X5** (Chandra)



**F1** (Herschel)



**R8** (VLA)

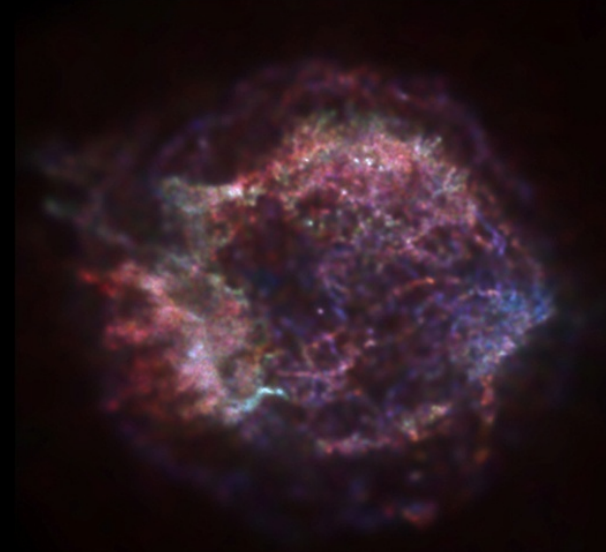
# Cassiopeia A



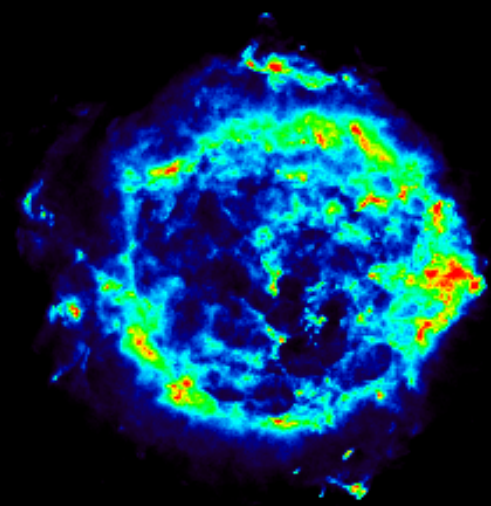
M2 (Spitzer)



Cassiopeia A (Hubble)



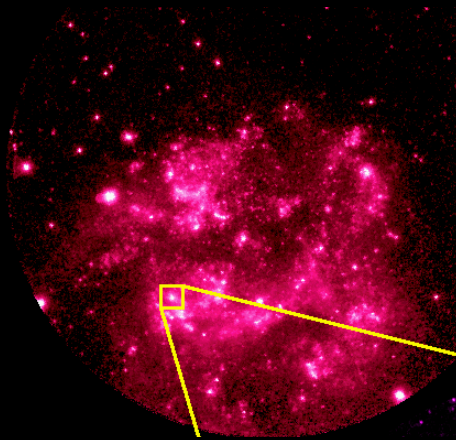
F2 (Herschel)



R11 (NRAO)



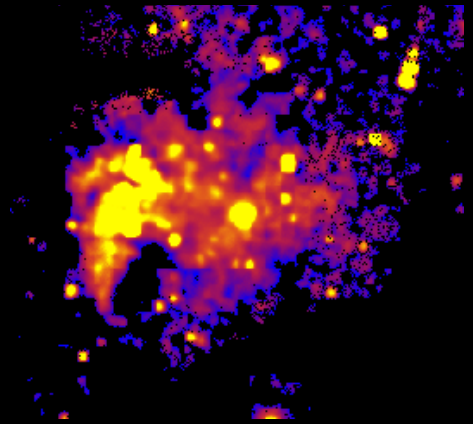
# Gran Nube de Magallanes



**U4** (Rocket)



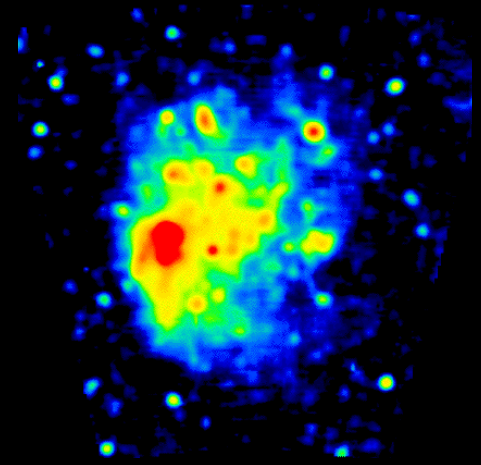
**LMC** (AAO)



**X1** (ROSAT)

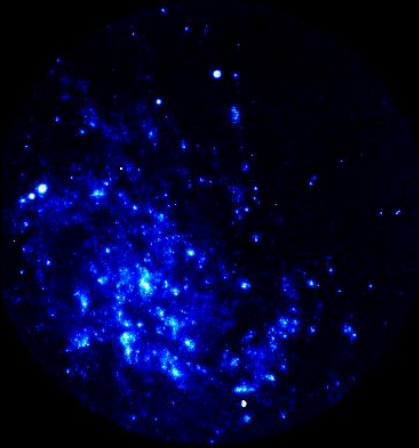


**F3** (Herschel)



**R10** (RAIUB)

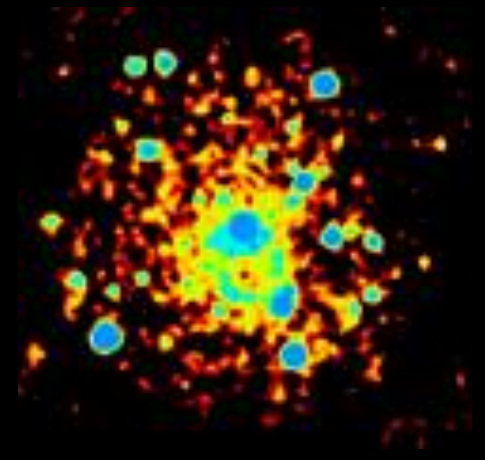
# Triangulum



**U1** (UIT)



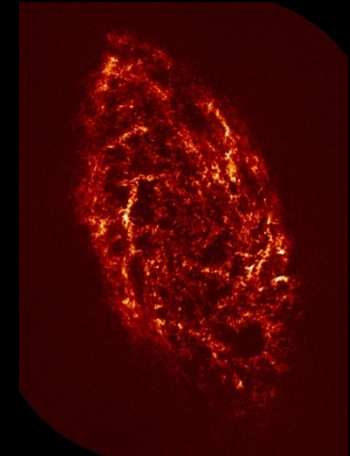
Triangulum (INT)



**X8** (ROSAT)



**M4** (Spitzer)



**R2** (NRAO)

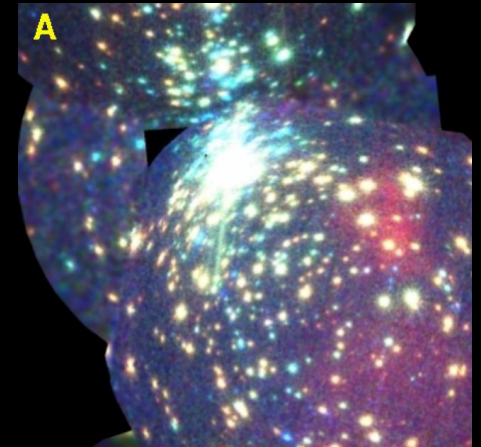
# Orión



**N1** (VISTA)



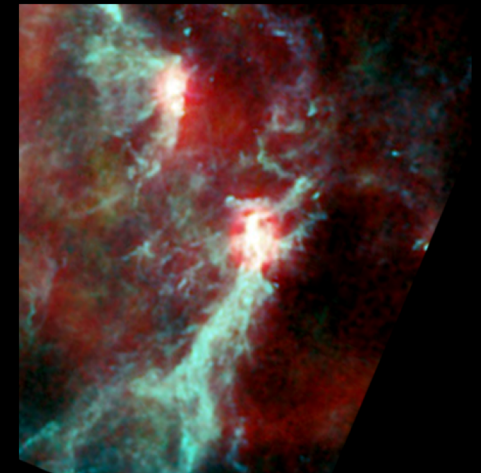
Orion (Hubble)



**X2** (XMM)

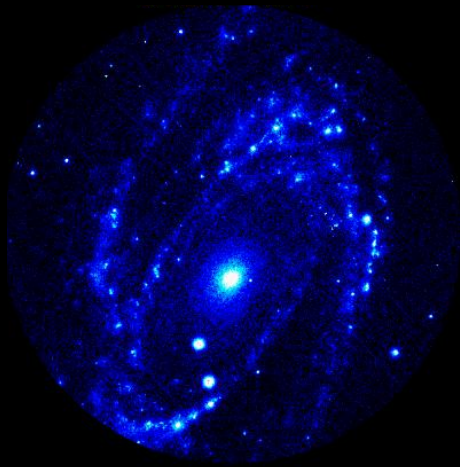


**M3** (Spitzer)



**F9** (Planck)

# M81



**U2 (UIT)**



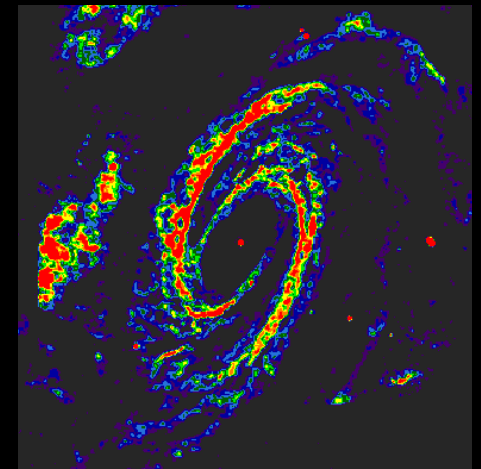
**M81 (Gendler)**



**X12 (Chandra)**

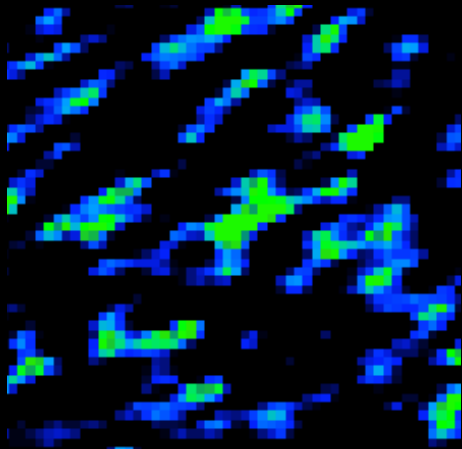


**F5 (Herschel)**



**R1 (VLA)**

# M87



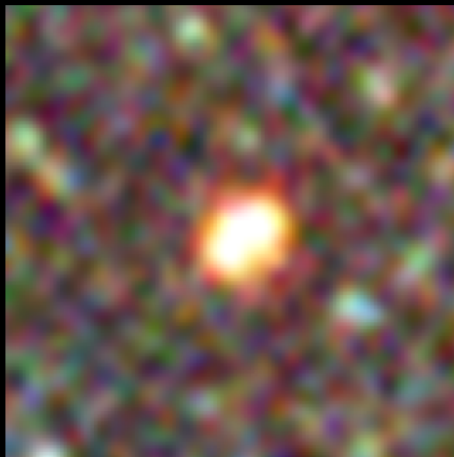
M5 (IRAS)



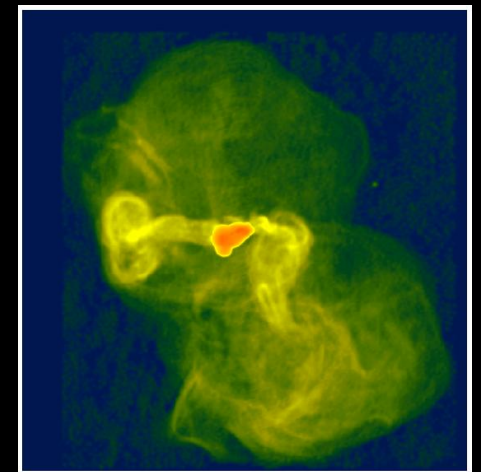
M87 (AAT)



X9 (Chandra)



F4 (Herschel)



R4 (NRAO)

# Sombrero



**N2** (2MASS)



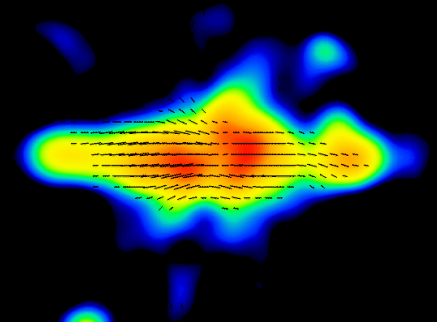
Sombrero (Hubble)



**X10** (Chandra)



**M1** (Spitzer)



**R3** (VLA)

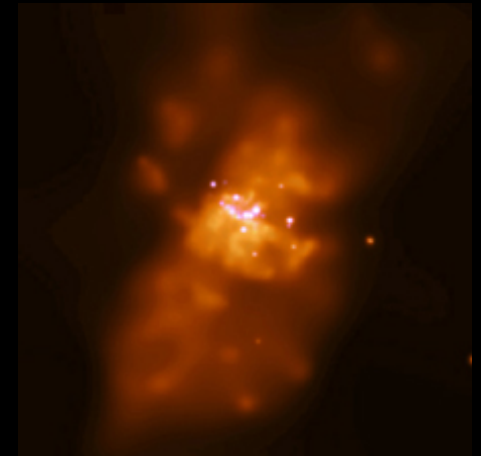
# M82



**M8** (Spitzer)



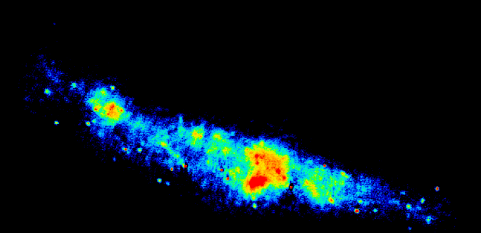
**M82** (Gendler)



**X11** (Chandra)

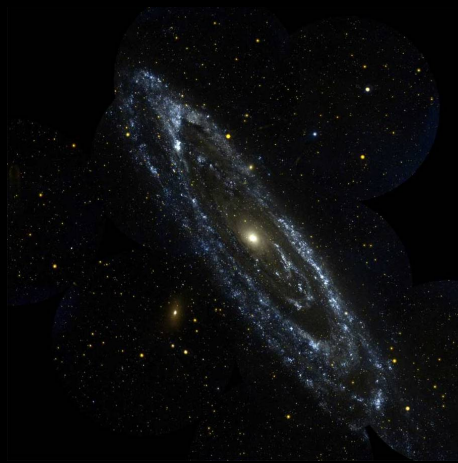


**F6** (Herschel)



**R5** (VLA/Merlin)

# Andrómeda



**U3 (GALEX)**



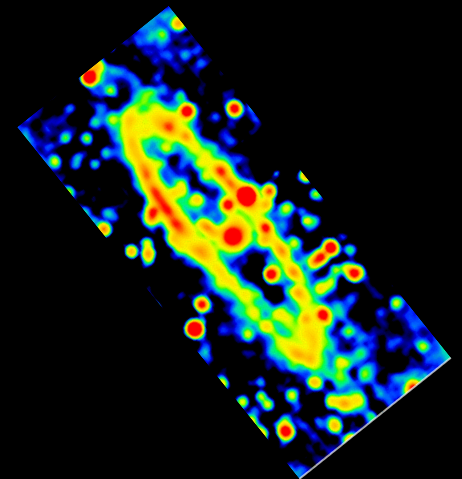
Andrómeda (Gendler)



**X7 (XMM-Newton)**



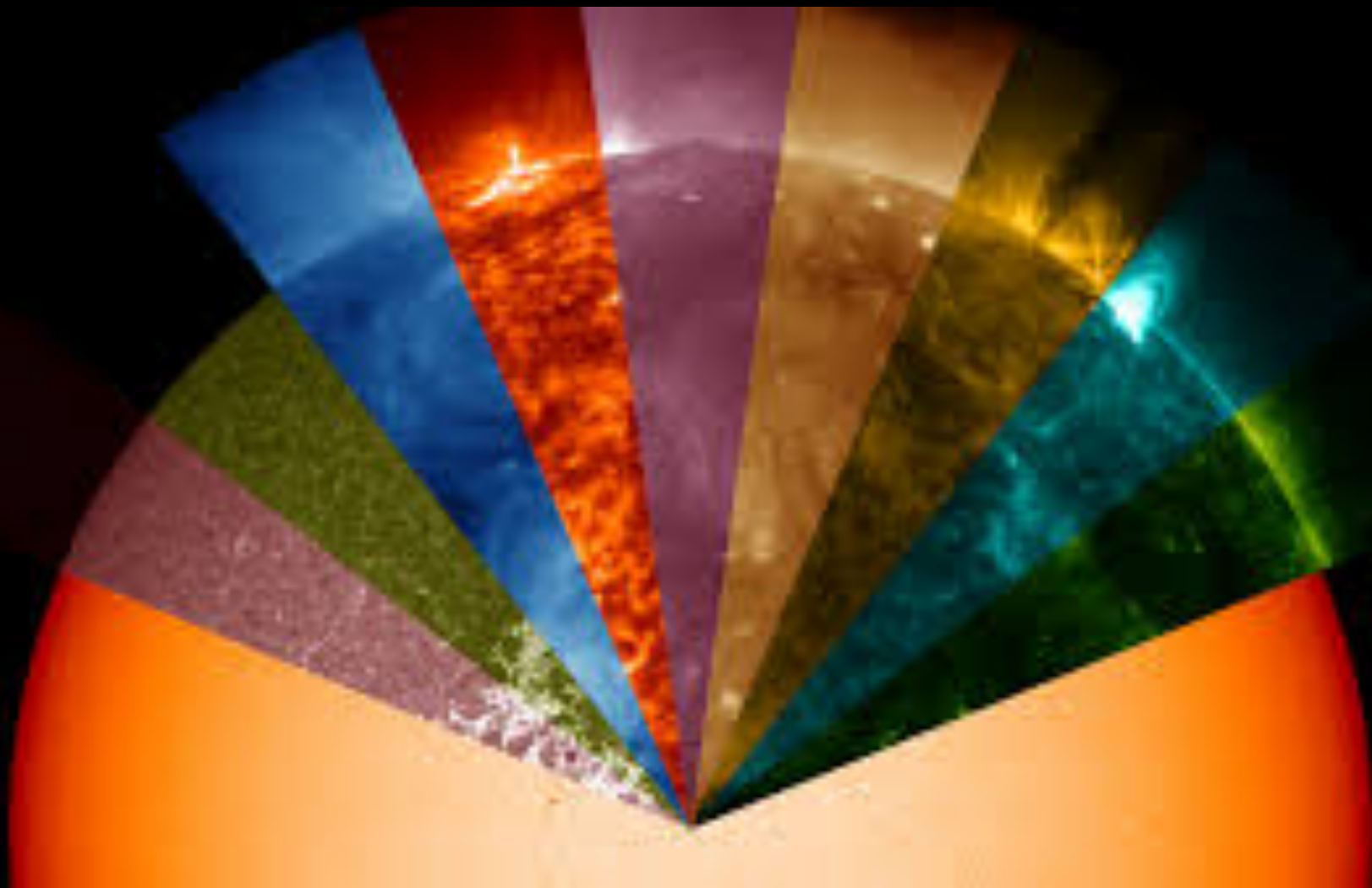
**F10 (Herschel)**



**R6 (Effelsberg)**



# Rebanadas



<http://www.chromosome.net>