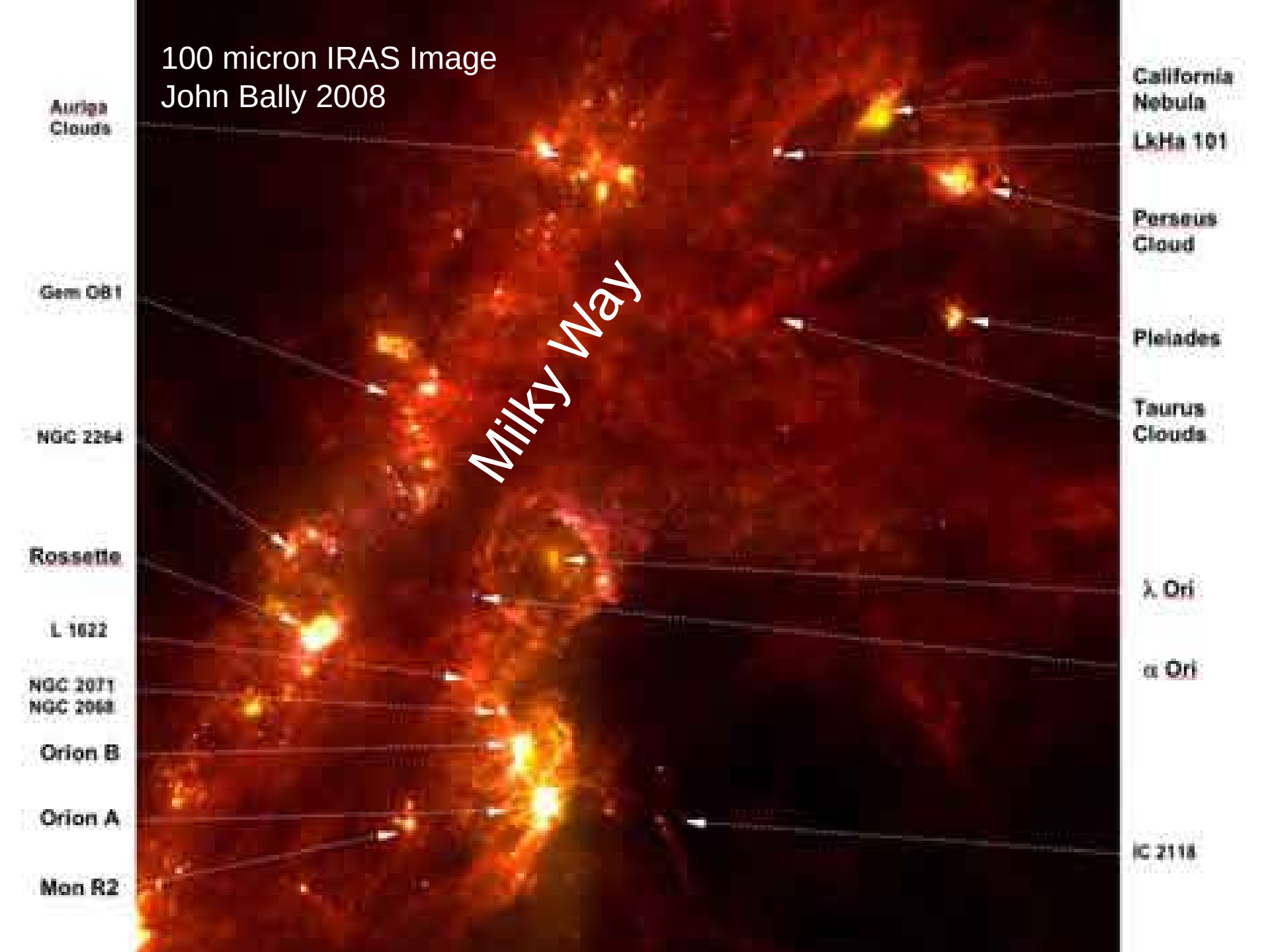
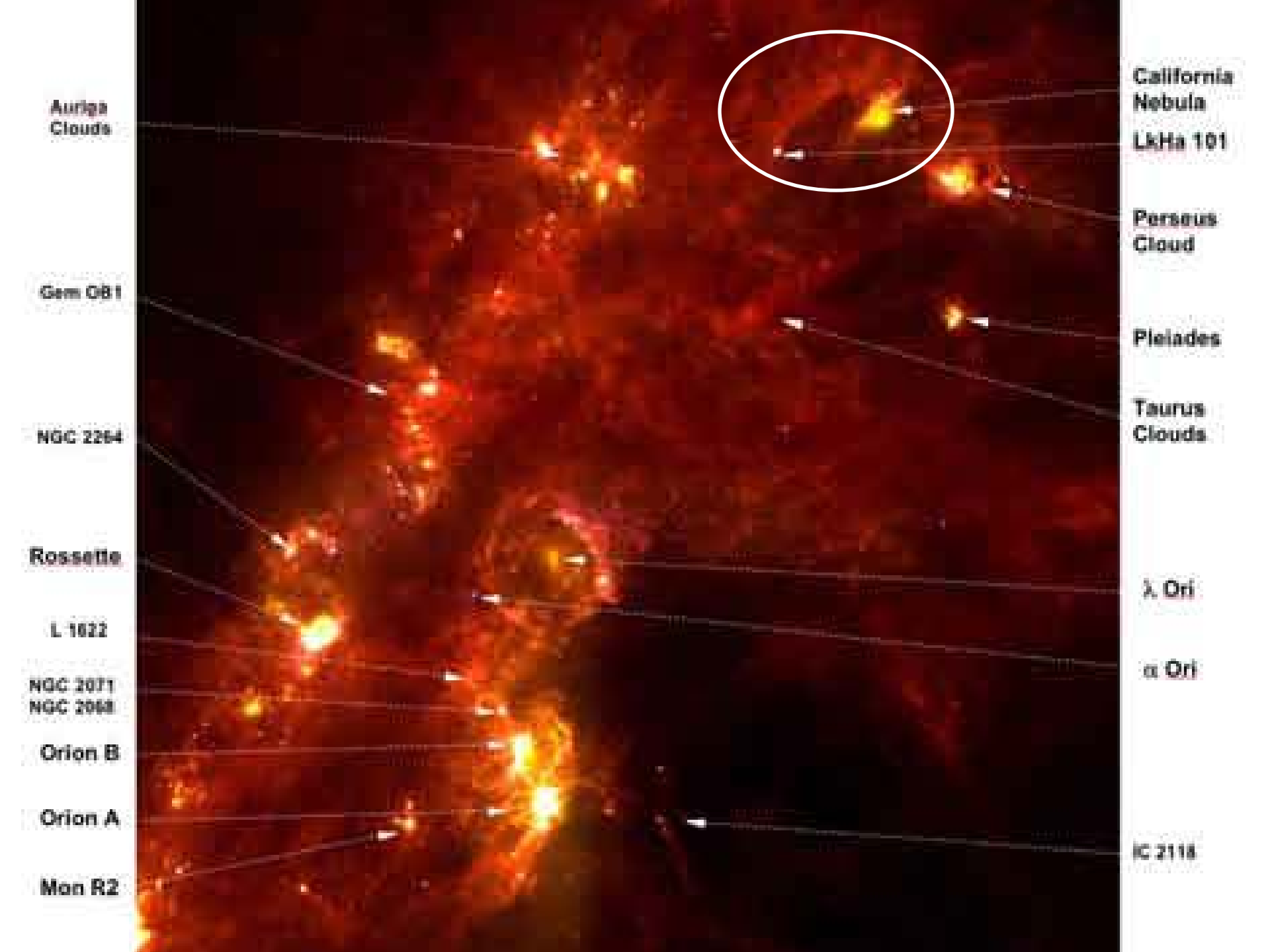
Giant Molecular Clouds

We live in a Galaxy comprised of stars, dust, gas, planets, and people.

Where did it all come from?


100 micron IRAS Image
John Bally 2008
Milky Way
Auriga Clouds
Gem OB1
NGC 2264
Rossette
L 1622
NGC 2071
NGC 2068
Orion B
Orion A
Mon R2
California Nebula
LkHa 101
Perseus Cloud
Pleiades
Taurus Clouds
λ Ori
α Ori
IC 2118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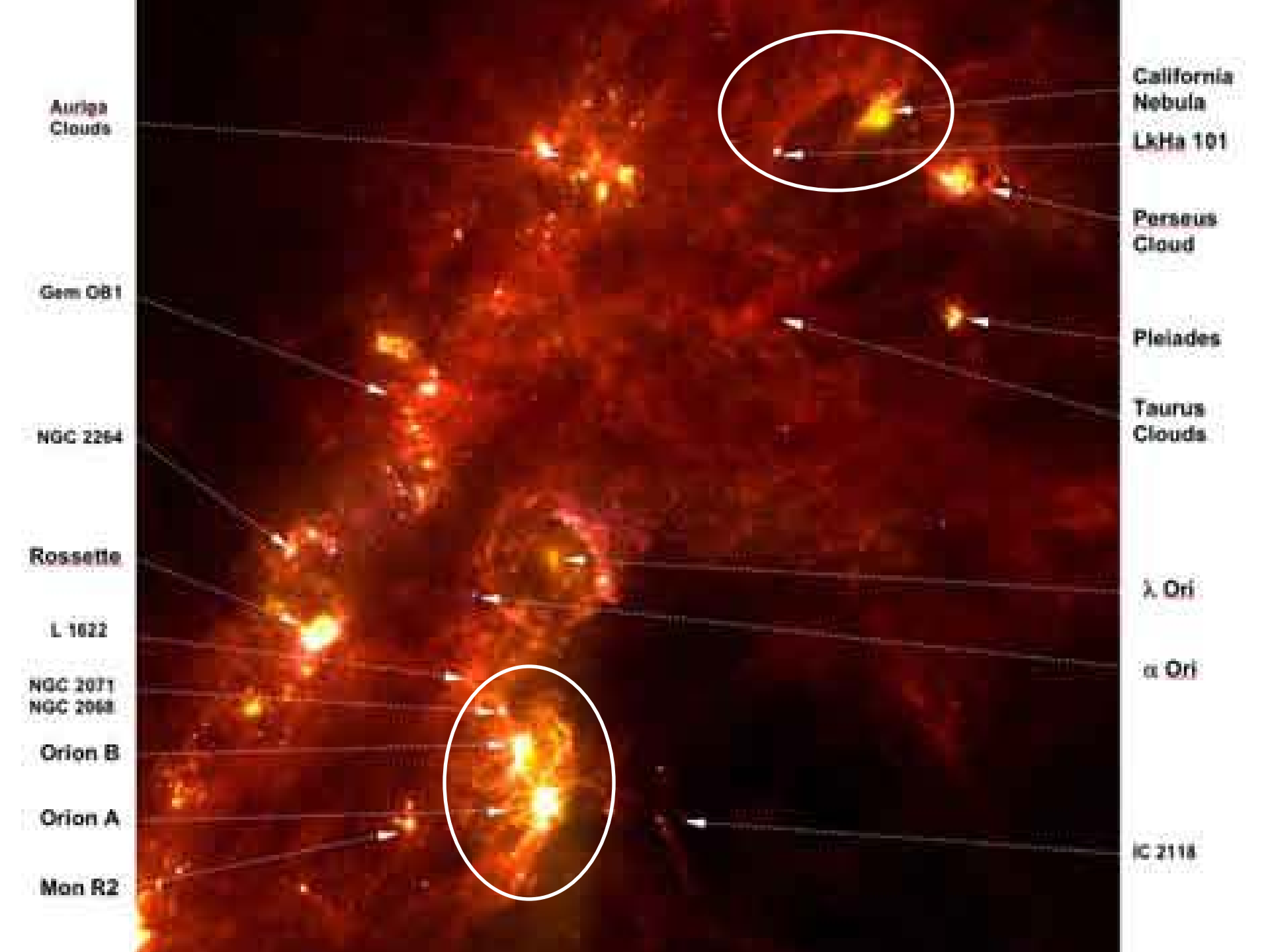
California Nebula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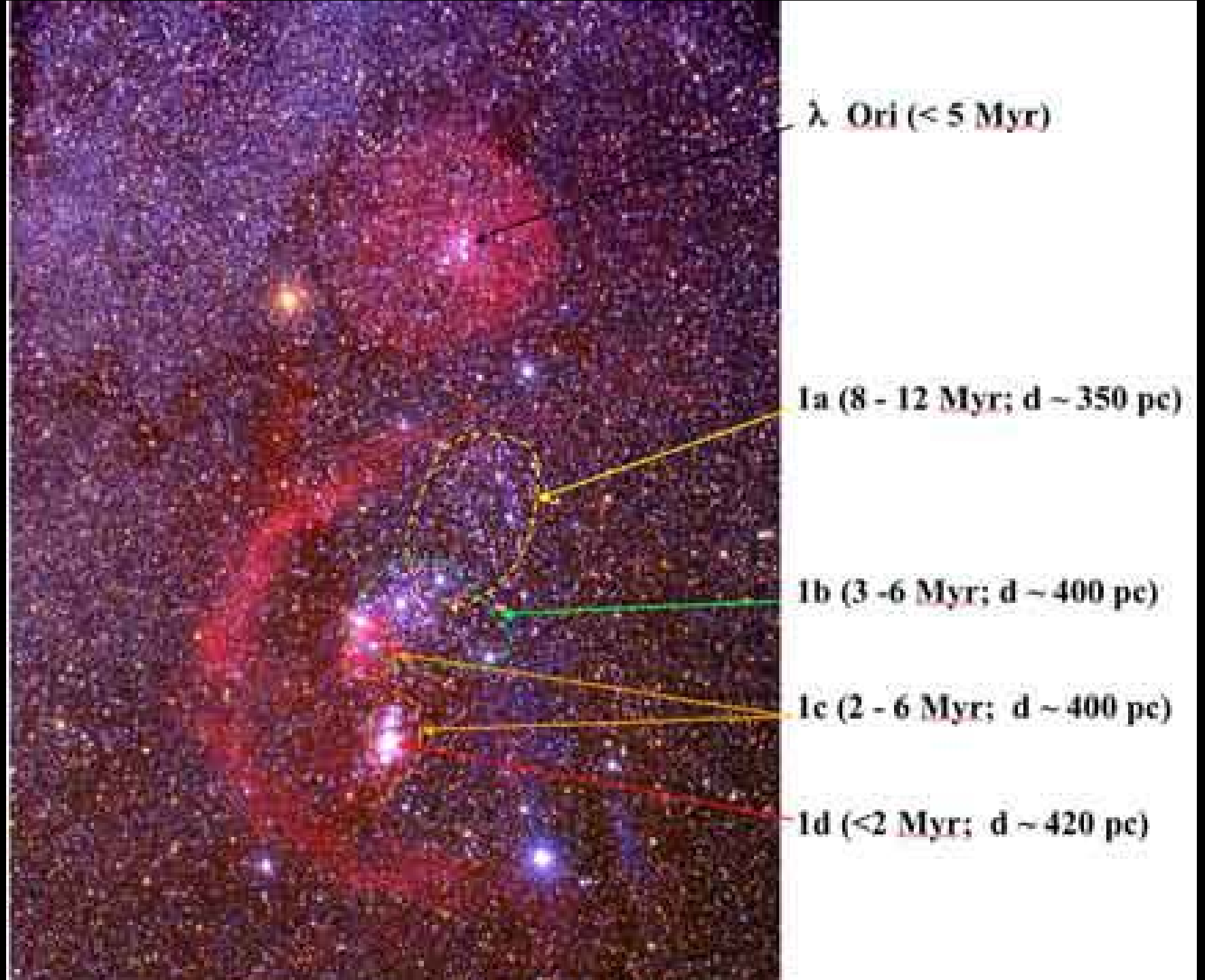
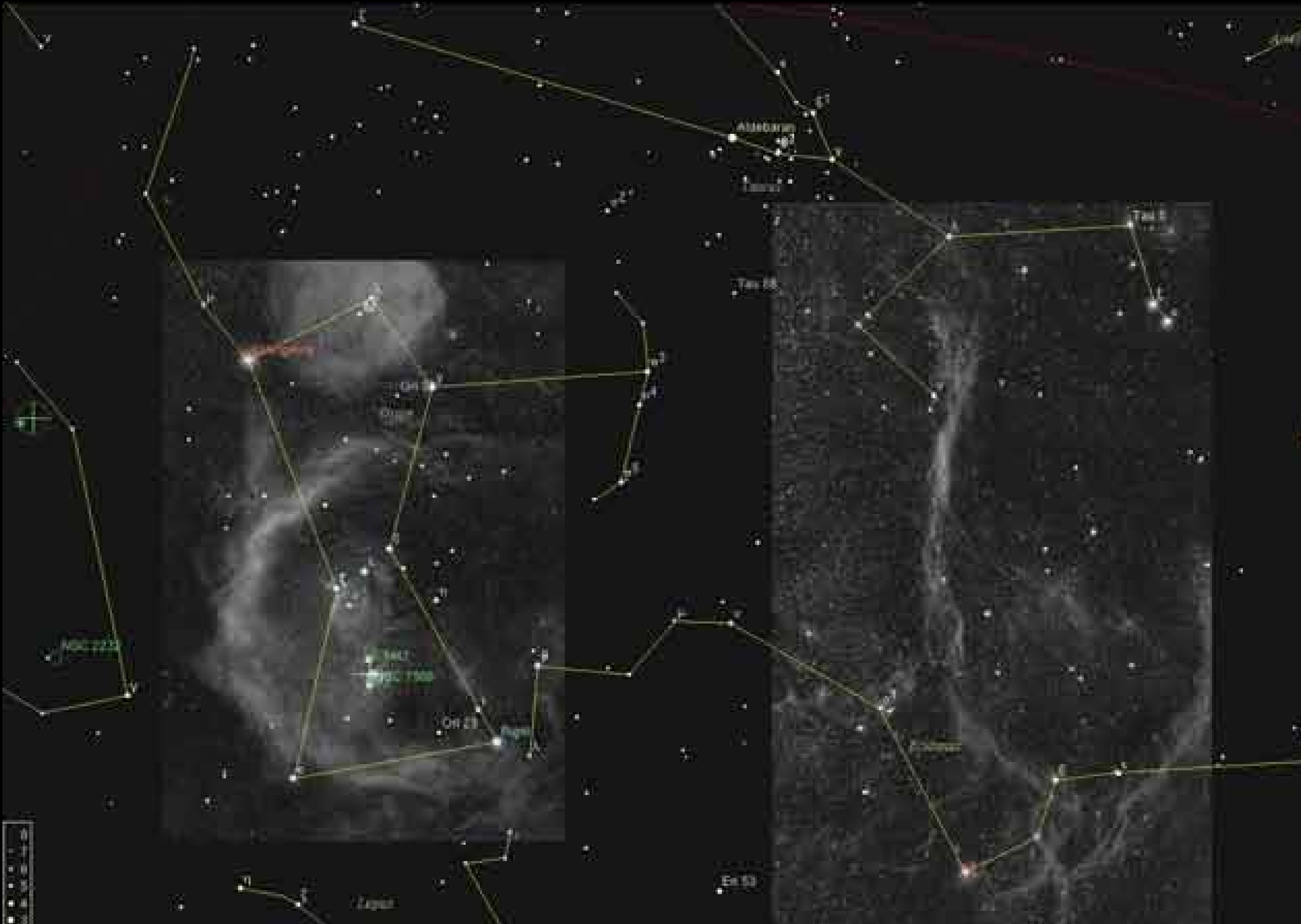
Orion
cluster ~ 1700 members

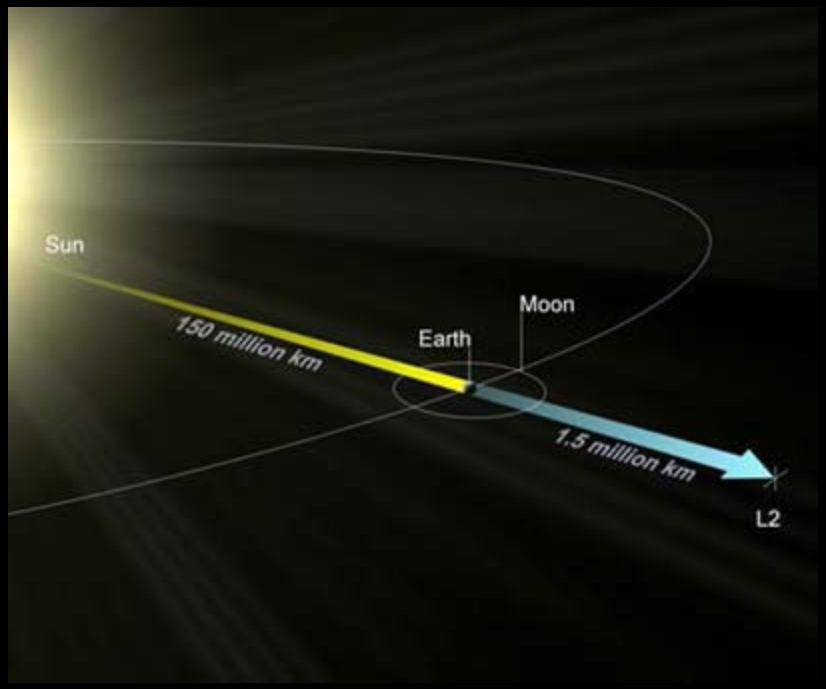

λ Ori (< 5 Myr)
1a (8 - 12 Myr; d ~ 350 pc)
1b (3 -6 Myr; d ~ 400 pc)
1c (2 - 6 Myr; d ~ 400 pc)
1d (<2 Myr; d ~ 420 pc)

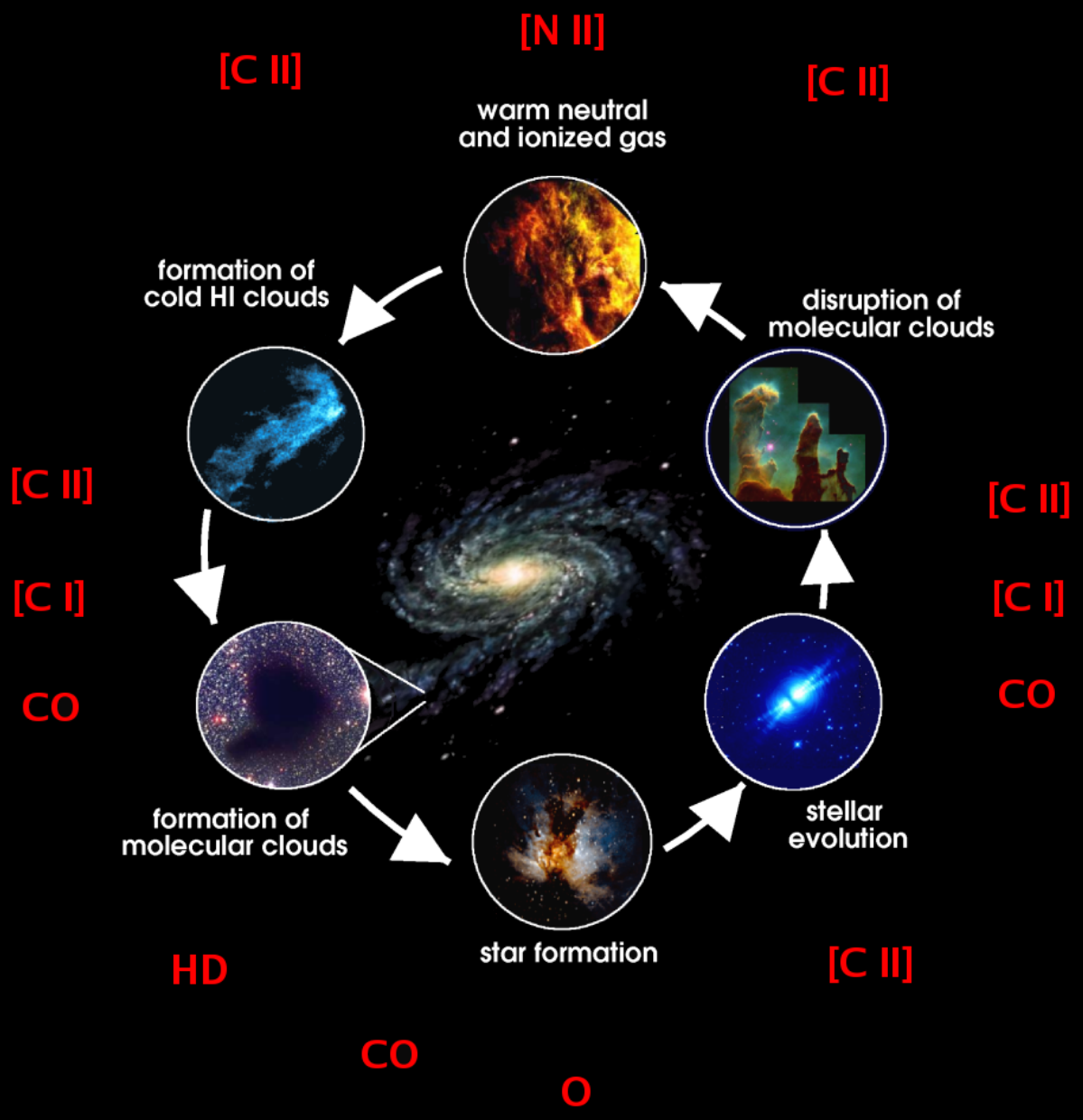

Aldebaran
Lepus

Galactic Bubble RCW 120

Galactic Bubble RCW 120

Herschel Space Observatory

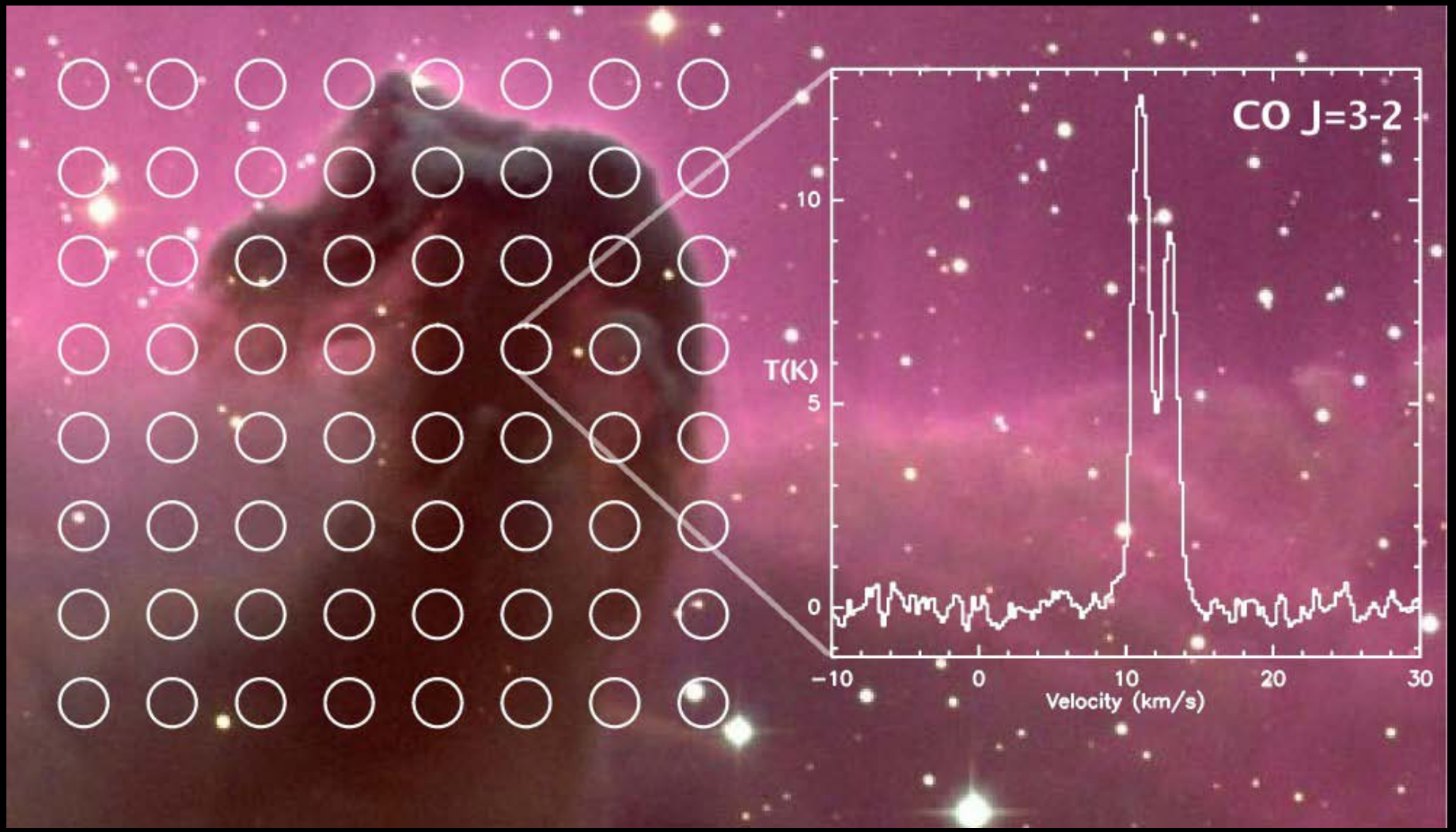




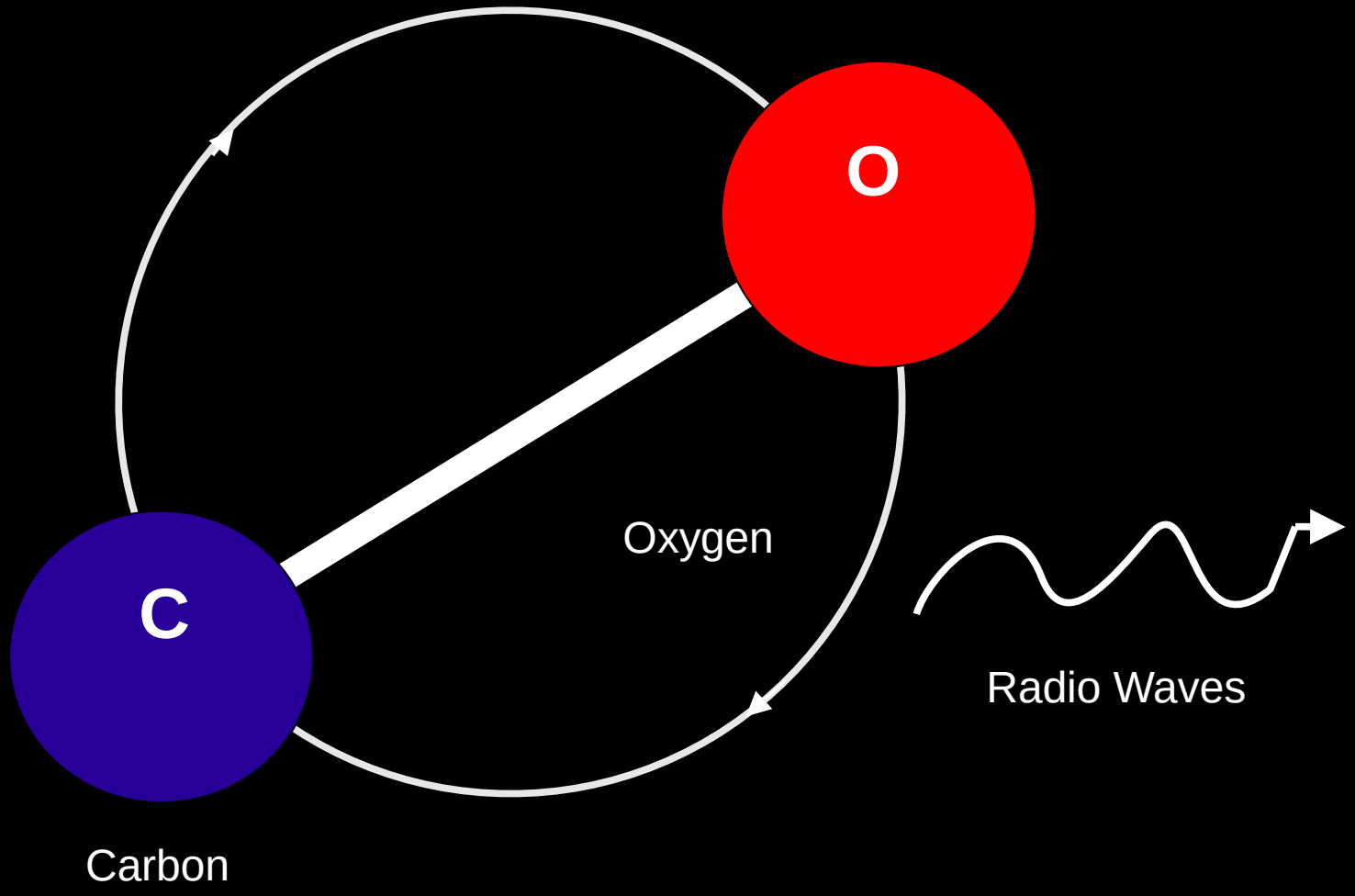
Spectral diagnostics of the interstellar life cycle define a new, pressing need for large-scale, high resolution, ***THz*** spectroscopic surveys!

SMT: Mt. Graham, AZ

SuperCam on SMT

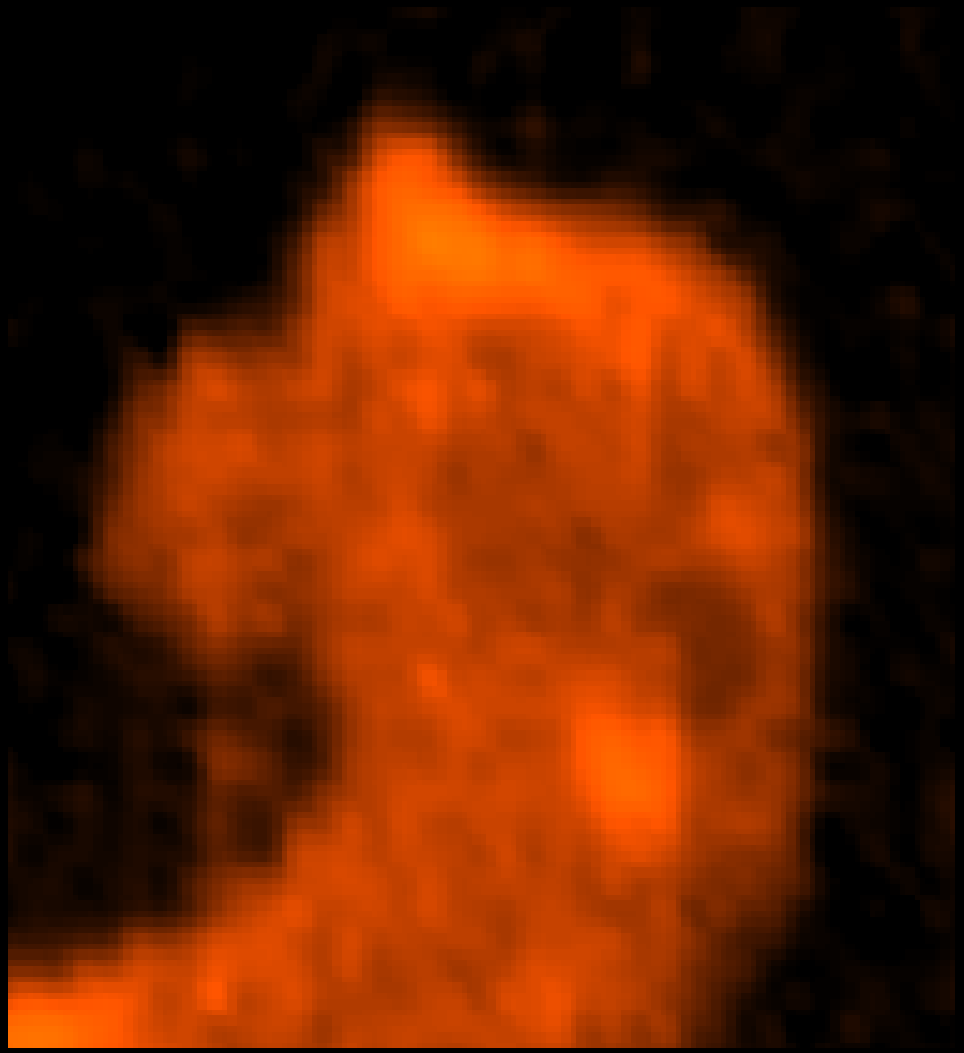


The Carbon Monoxide (CO) Molecule



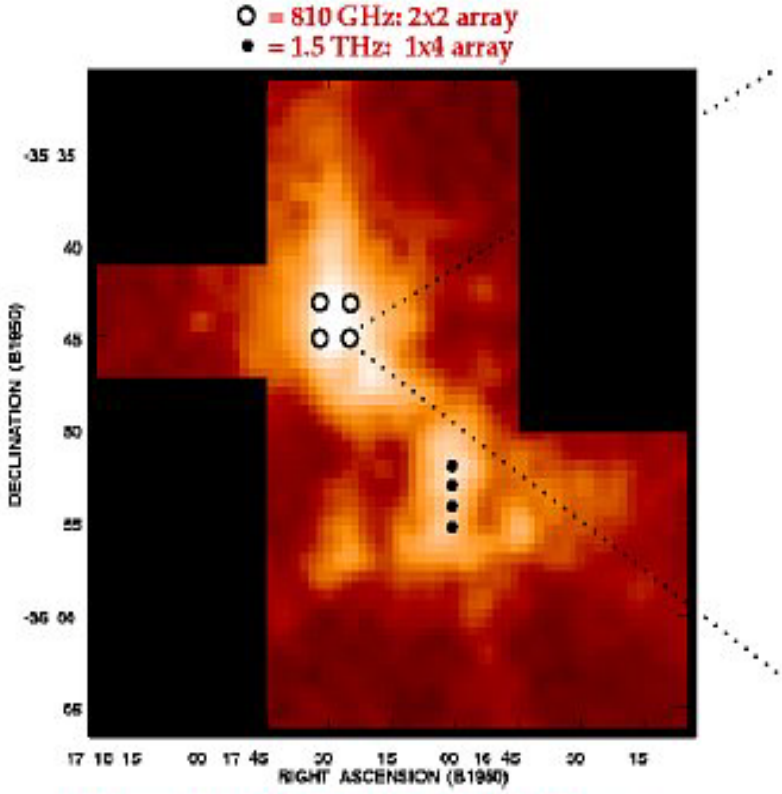
The Horsehead Nebula

Visible light



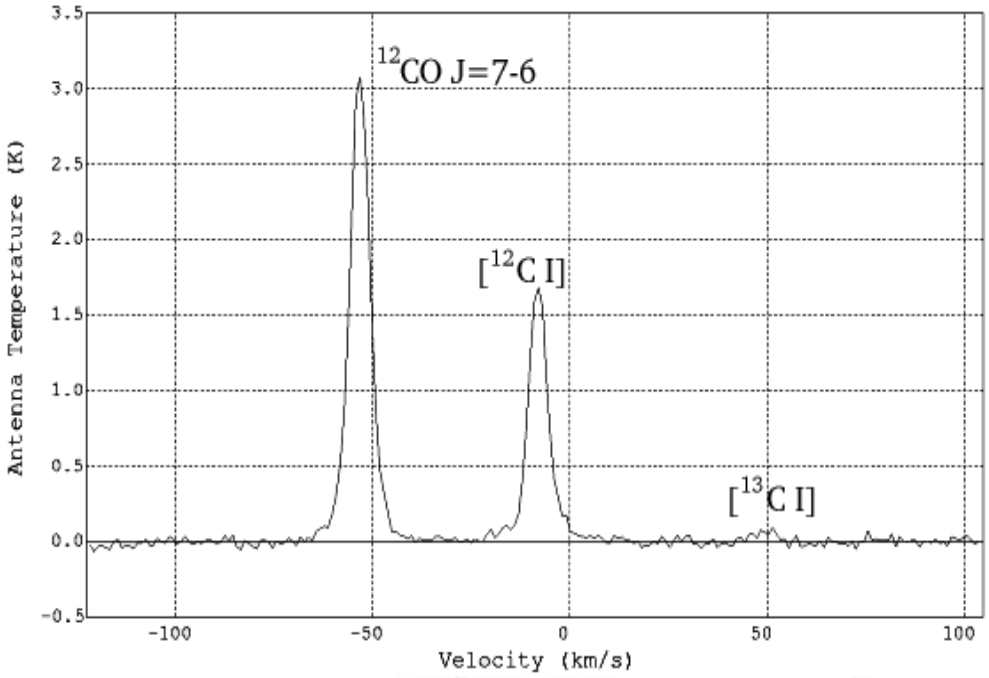
In the "submillimeter light" of the CO molecule

^{12}CO J=4-3 map of NGC 6334



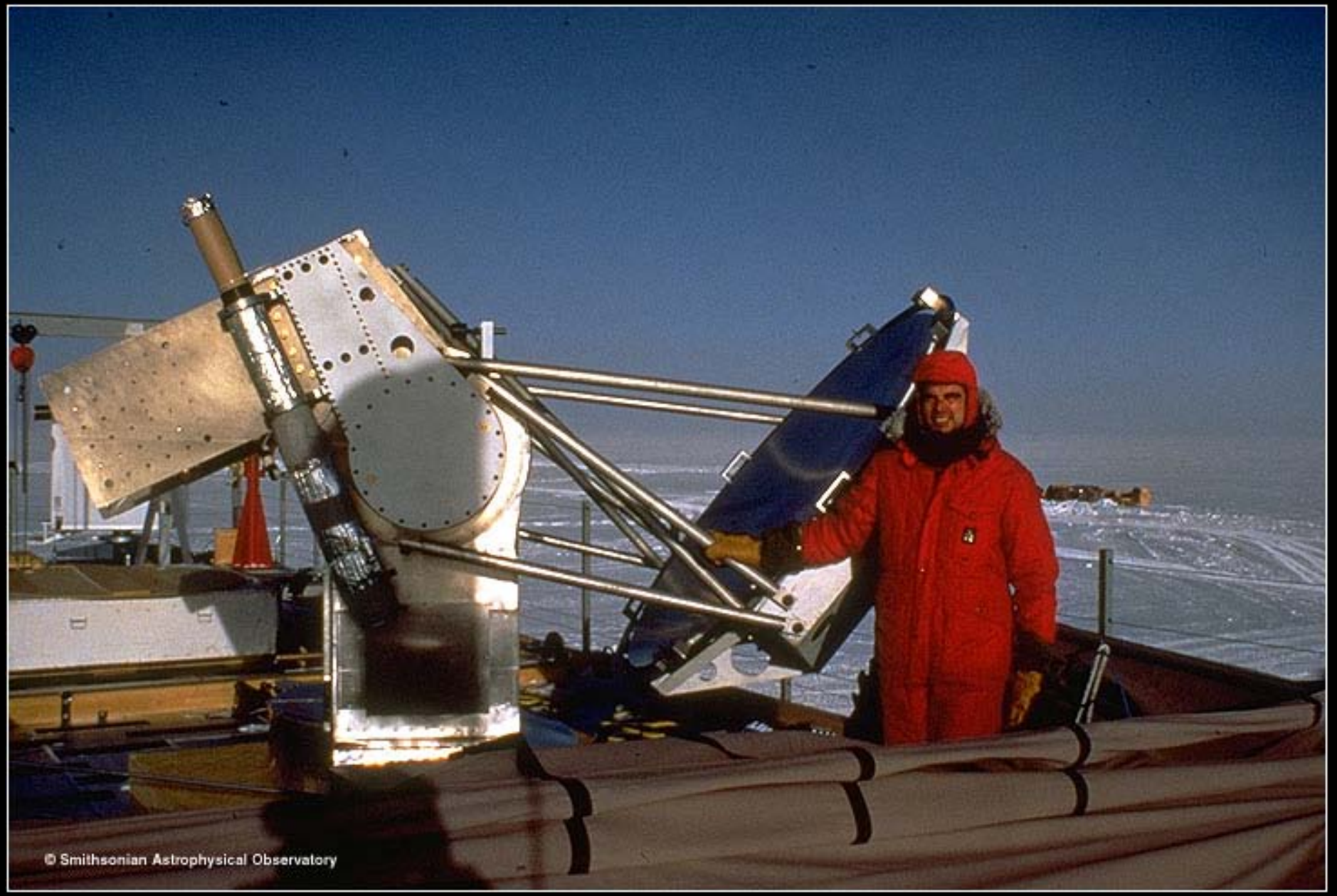
Mapped with the 1.7-m AST/RO telescope at the South Pole with the Arizona/Caltech 460/492 GHz receiver

Simultaneous C I and ^{12}CO J=7-6 in NGC 6334



Observed at the South Pole with AST/RO and the Arizona/KOSMA 810 GHz receiver

The AST/RO Telescope at the South Pole



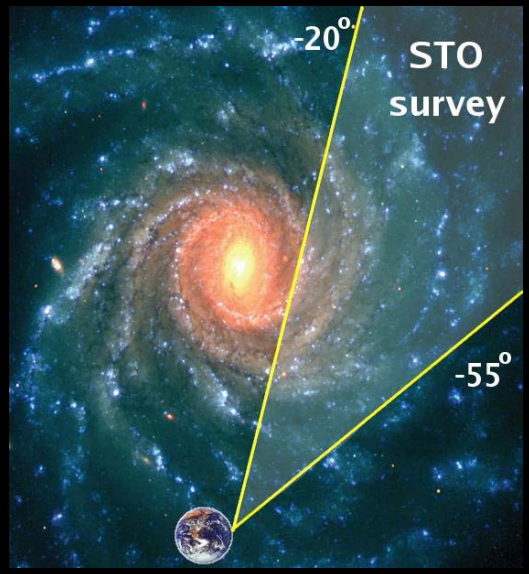
AST/RO

Stratospheric THz Observatory (STO)

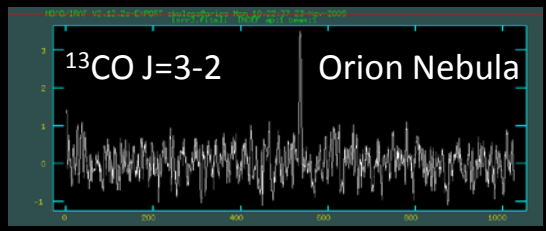
UAz, JHU/APL, CIT/JPL, ASU, KOSMA, Ames, SAO, Oberlin , U.Maryland
Chris Walker (PI)

LDB Platform
- ~30 day flights
- < 15” pointing knowledge/tracking
- STO maps will have ~10^3x angular & ~10^3x velocity resolution of COBE

- 0.8-meter telescope with two cryogenic 4-pixel THz arrays
- platform for THz surveys to probe the Life Cycle of the Interstellar Medium



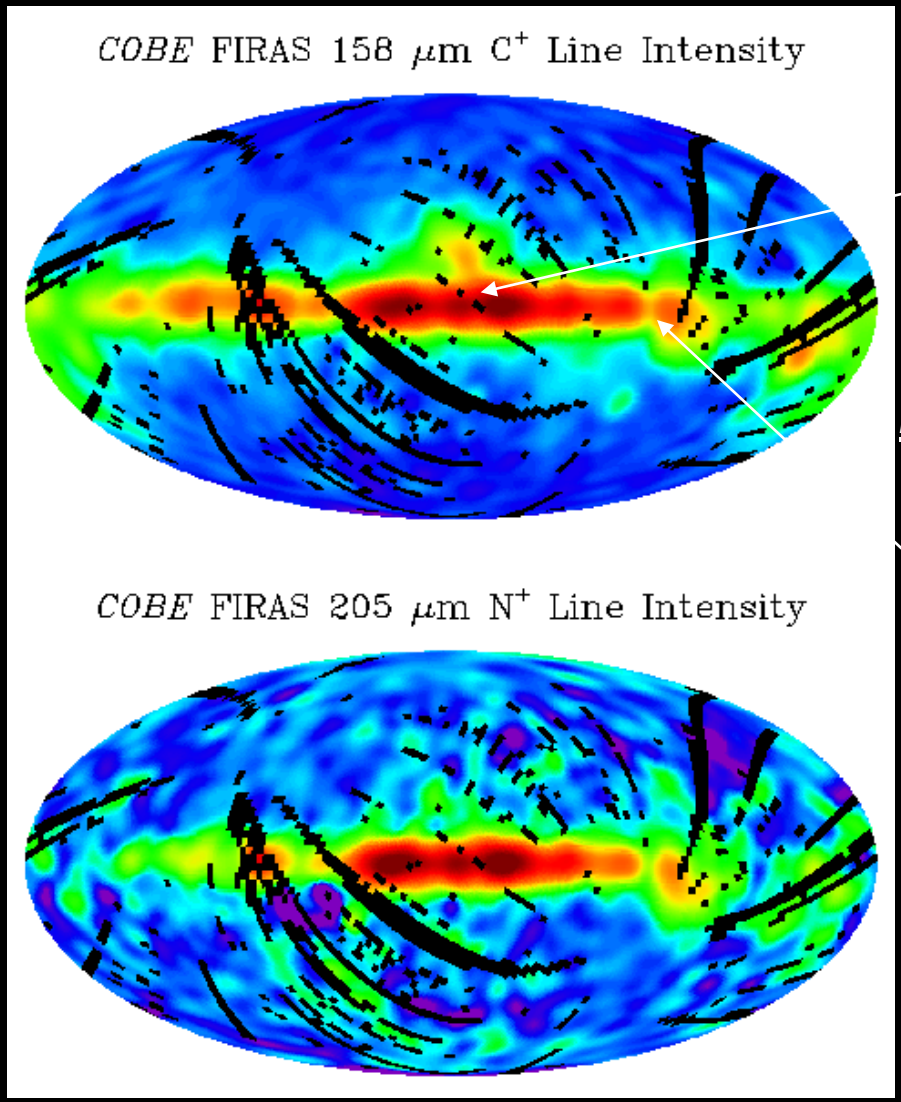
Engineering Flight-
Oct. 15, 2009
First Light Spectrum:

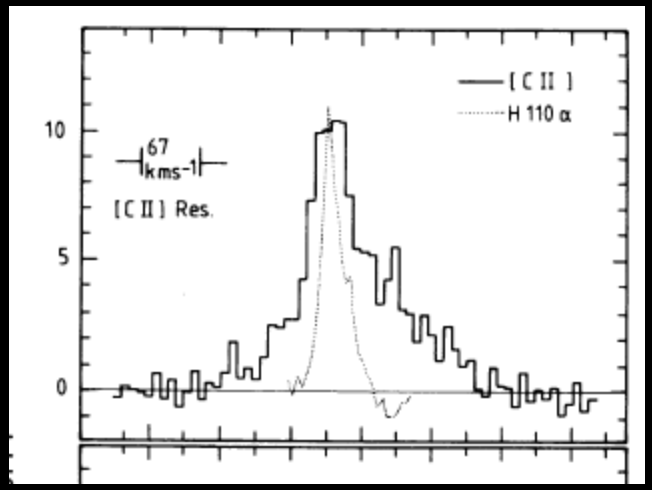


2011-12 - First Science Flight : C+, N+ Galactic Plane Survey

[CII]/[NII] Emission is Widespread

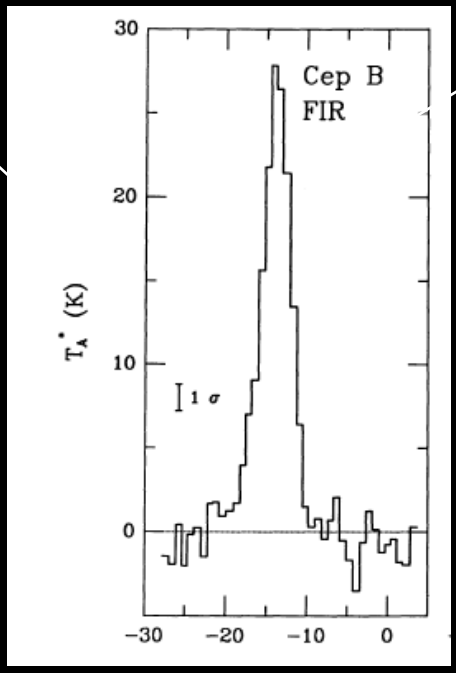
Bulge-KAO:





(Genzel, et al. 1990)

Disk-KAO:



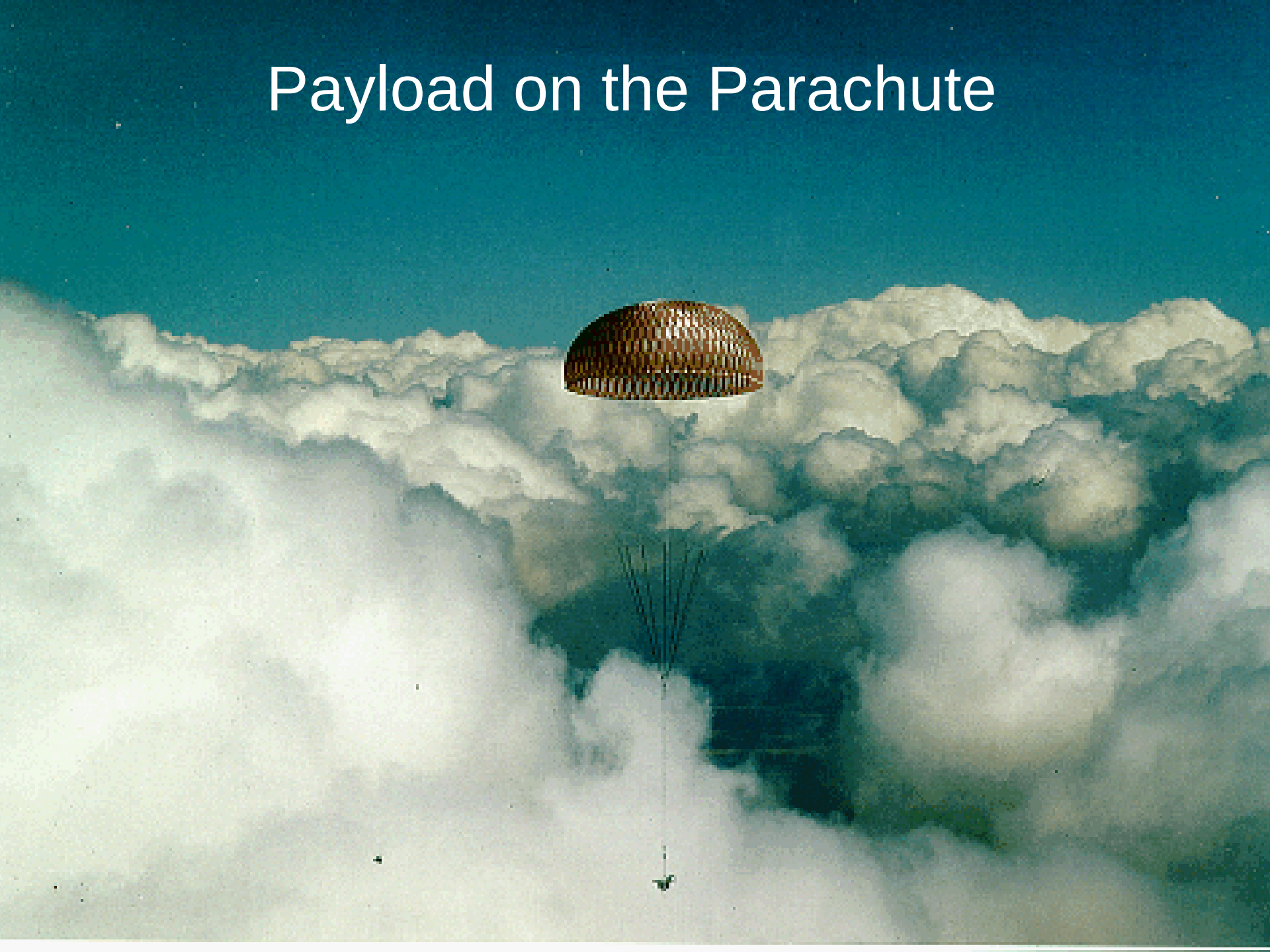
(Borieko, et al. 1990)

High Velocity (Heterodyne) Resolution is essential!

STO maps ~420x angular ~10^6 x velocity resolution of COBE.

Balloon at ~130,000 ft

Payload on the Parachute



Textbook Landing in Antarctica