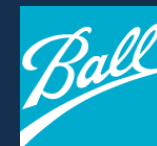
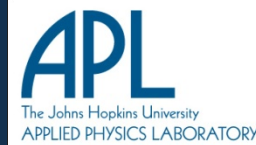
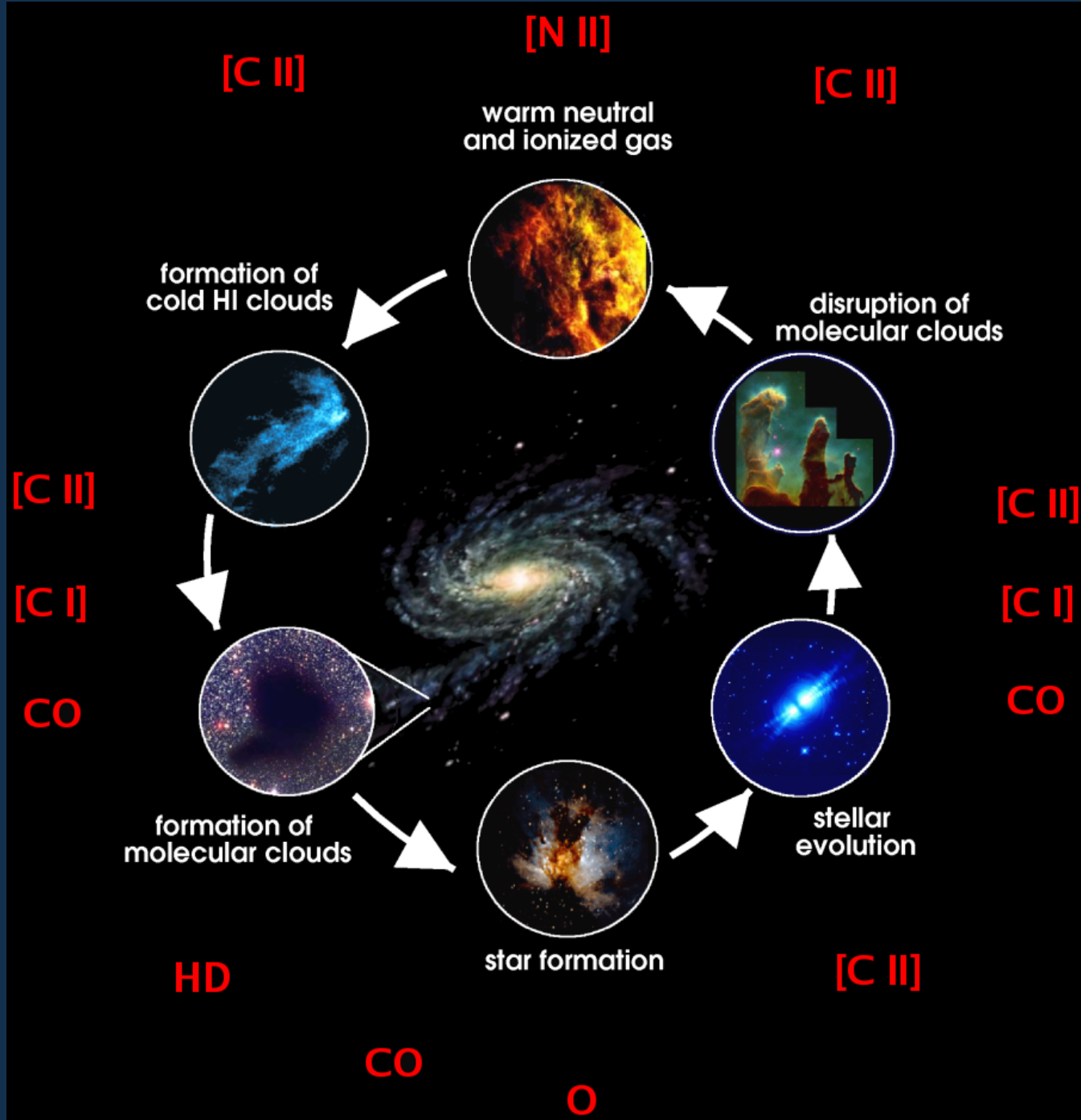


# GUSSTO!





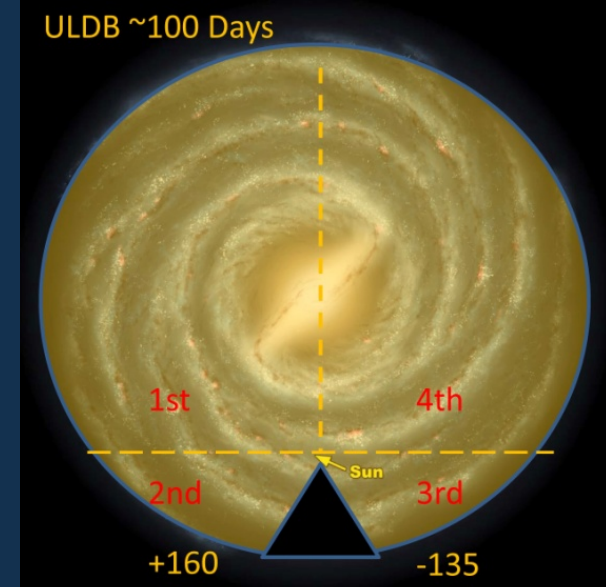
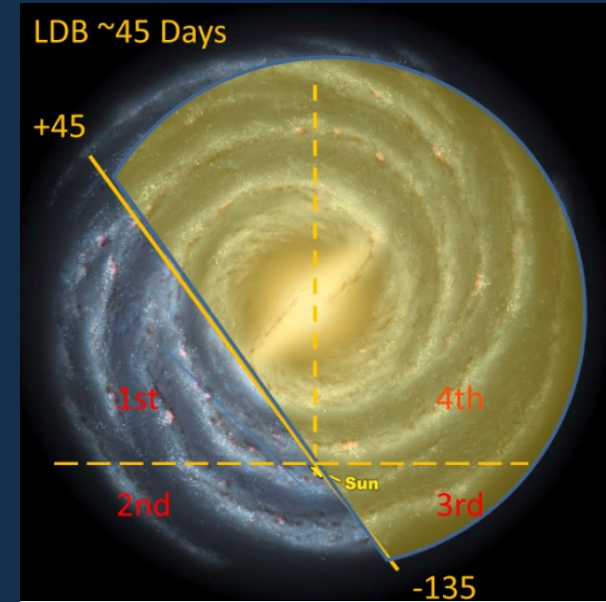
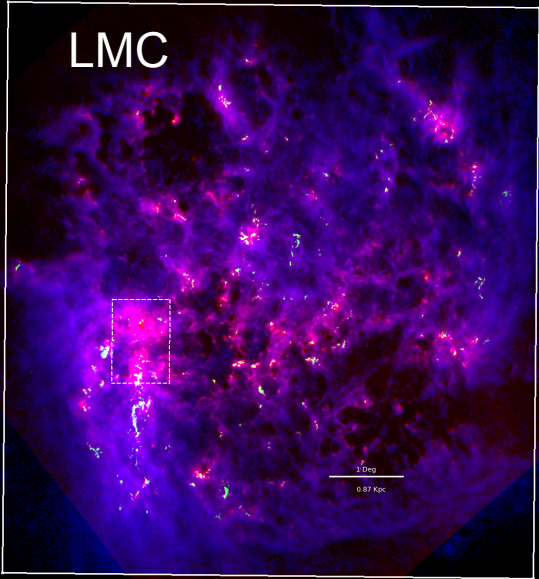
# MISSION GOAL

Better understand the nature of the far-infrared Universe by probing the topology and ecology of interstellar gas throughout the Milky Way and nearby galaxies:

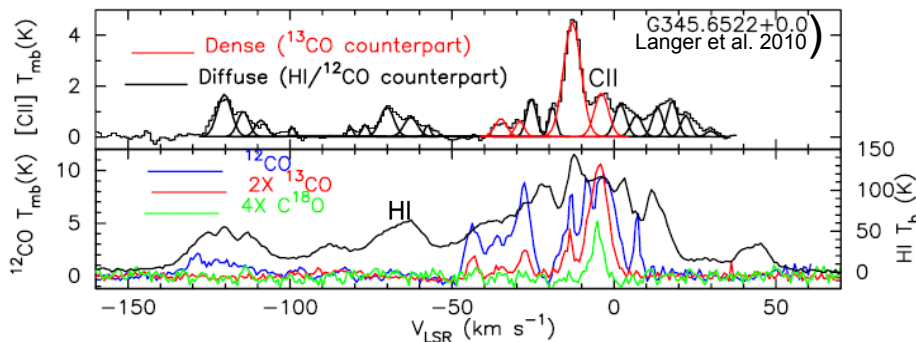
- Study the Life Cycle of star forming clouds in the Galaxy.
- Determine the parameters that affect the star formation rate throughout the Galaxy.
- Probe the physical conditions and dynamics of gas in the Galactic Center.
- Provide Milky Way and LMC templates for star formation in other galaxies.

# GUSSTO! Observations/Data Products

A high fidelity database of velocity and spatially resolved far infrared maps in  
[CII] ( $158 \mu\text{m}$ )  
[OI] ( $63 \mu\text{m}$ )  
[NII] ( $205 \mu\text{m}$ )  
fine structure line emission in the Milky Way and LMC.  
Spatial resolution: 50 arcsec  
Velocity resolution  $< 1 \text{ km/s}$



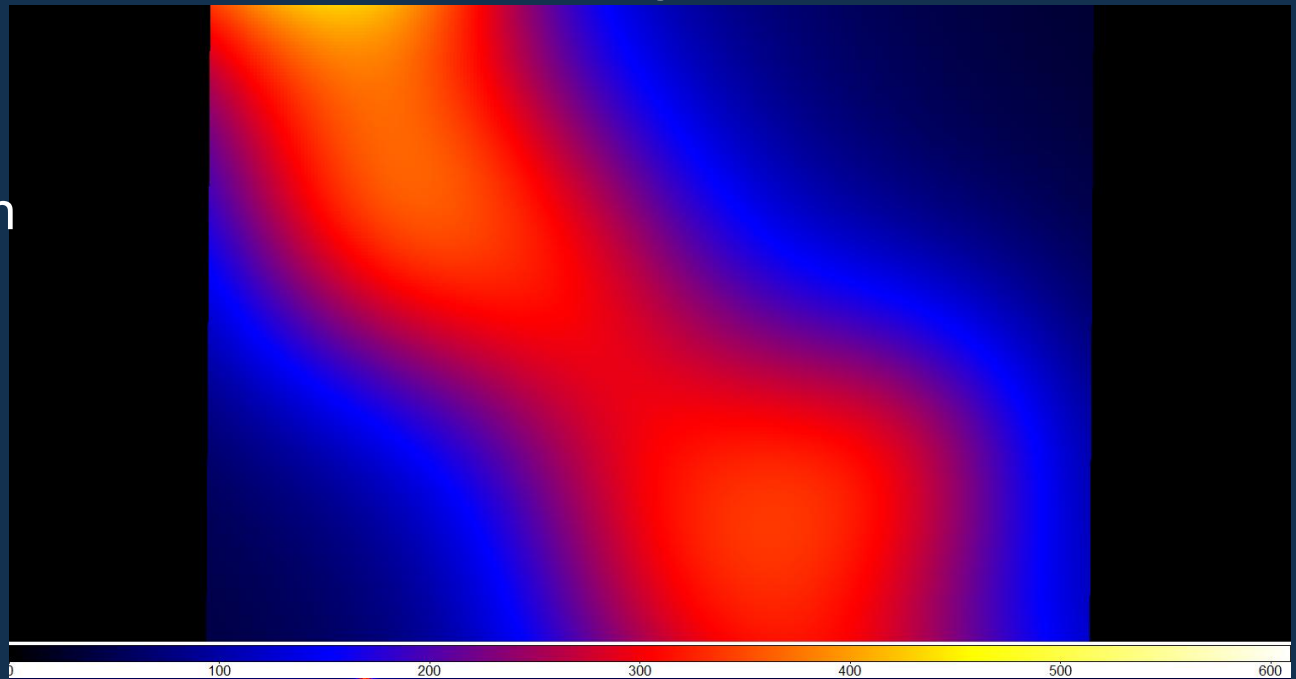
Langer et al.: C<sup>+</sup> Detection of Warm Dark Gas in Diffuse Clouds



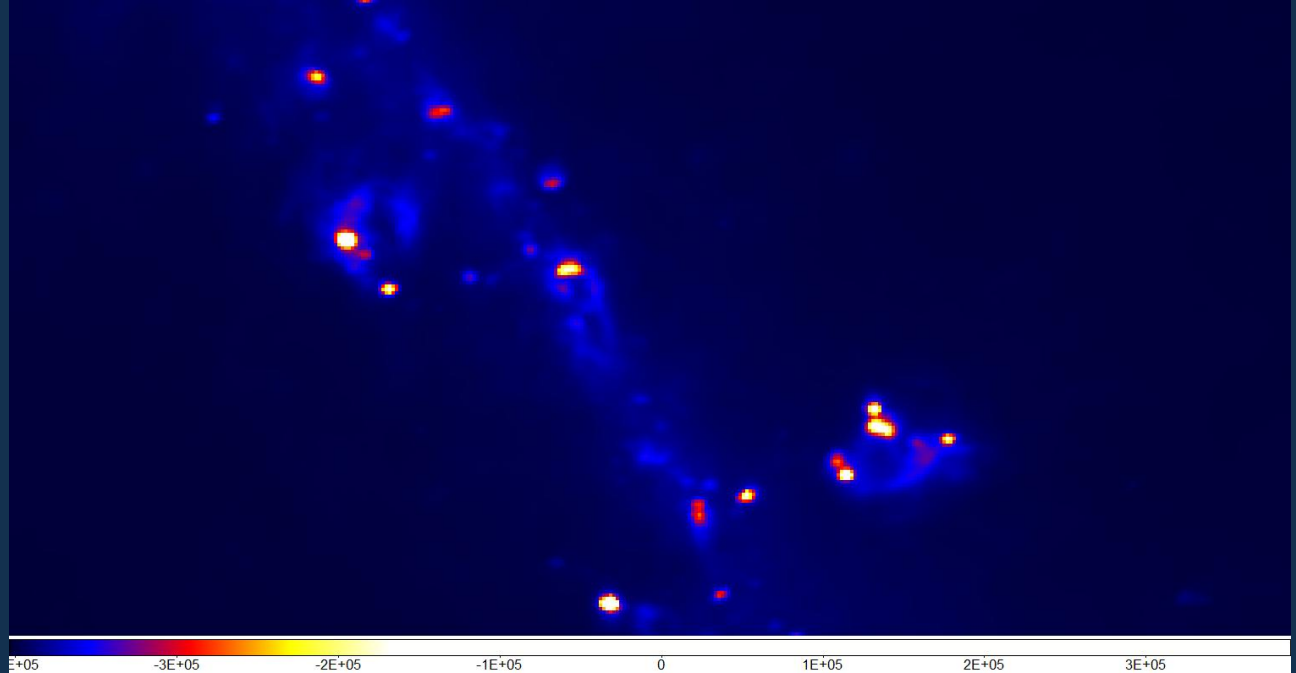
Above: Single line of sight (LOS) spectra of [CII] (*Herschel*) taken toward a Galactic sources.  
GUSSTO's surveys will observe  $\sim 100,000$  LOS.

# Galactic Plane Region Near $l = 340$

NOW :  
3 deg spatial resolution



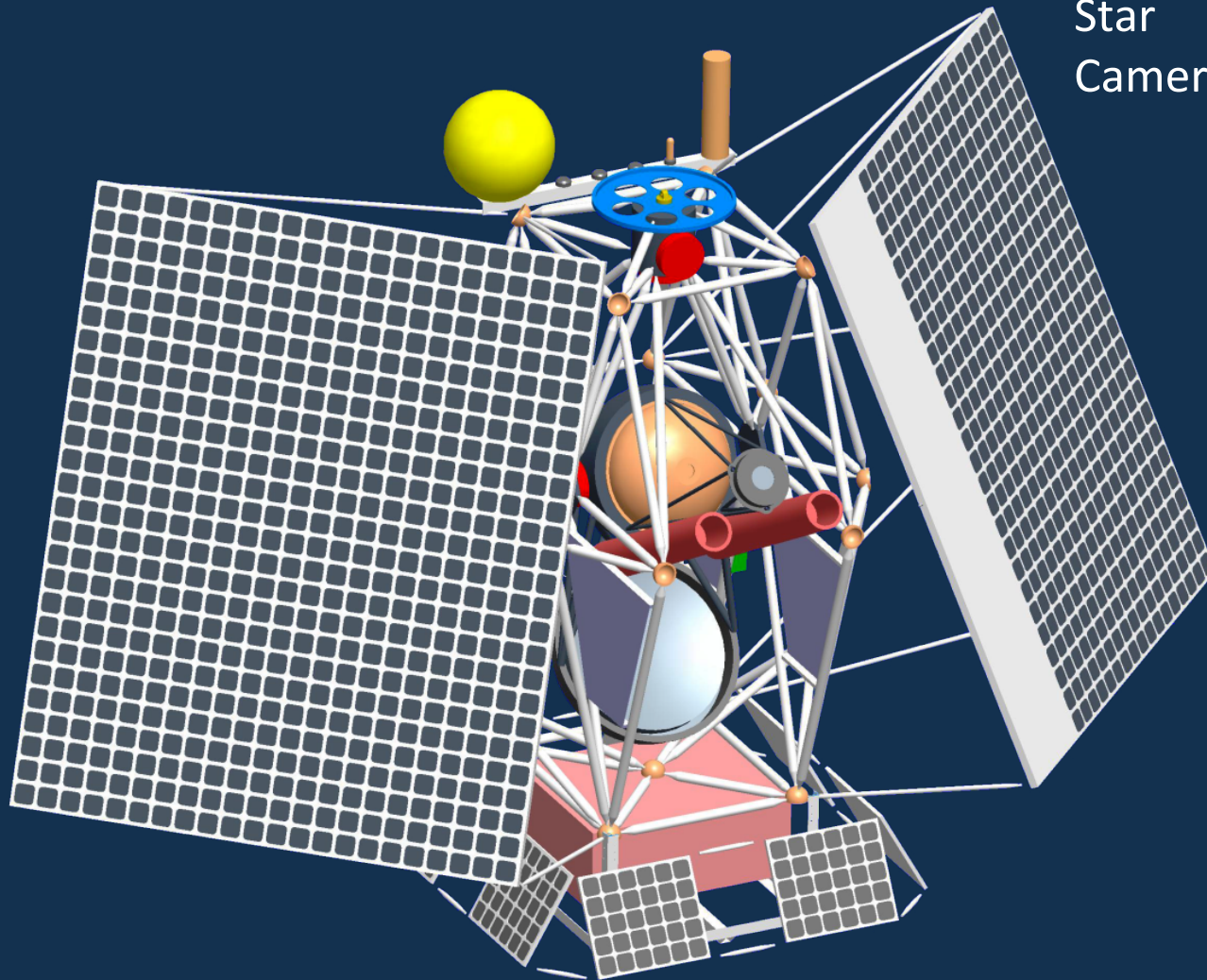
GUSSTO:  
50 arcsec



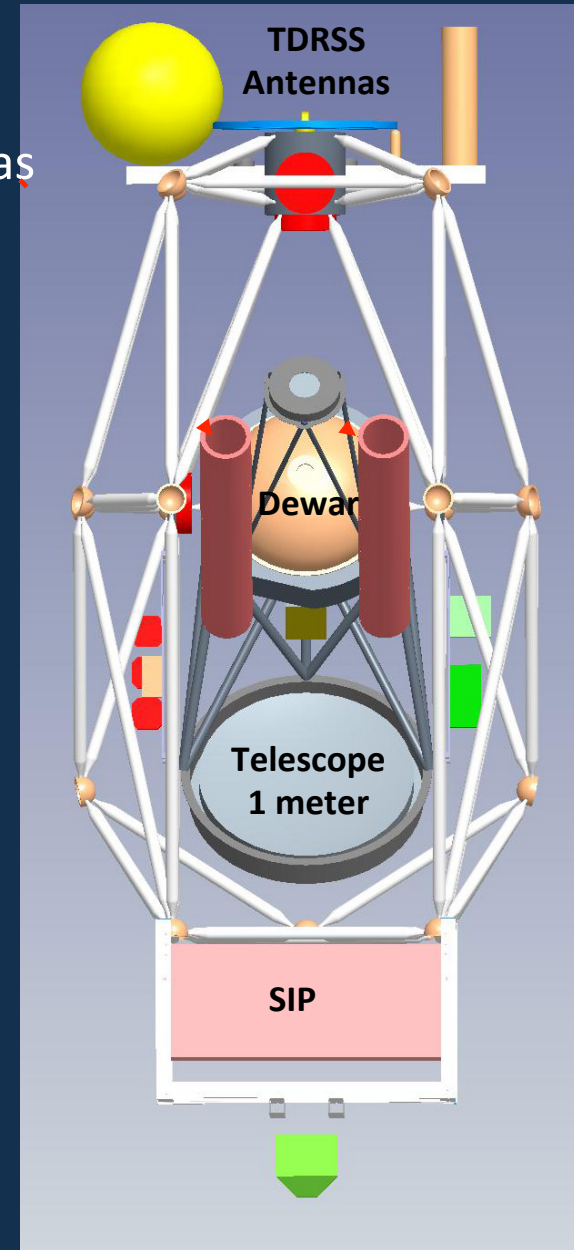
# GUSSTO Specifications

Item	Description
Telescope	1 meter off-axis Gregorian
Target Frequencies	[OI]: 4.7448 THz, [CII]: 1.9013 THz, [NII]: 1.4588 THz
Angular Resolution	50 arc seconds
Receiver Type	3x 16-Pixel HEB Mixer Array
System Noise Temp	~1500K (DSB)
Spectrometer	Digital Correlators
Spectrometer Bandwidths	2 , 4, and 5.5 GHz - Corresponds to 414, 632, 319 km/s for [NII], [CII], [OI]
Spectrometer Resolution	2.15, 5.37, and 6.45 MHz – Corresponds to 0.44, 0.85, 0.41 km/s for [NII], [CII], [OI]
Cryogenic System	Helium (~4K) Hybrid Cryostat
Platform	LDB or ULDB Gondola
Launch Vehicle	Zero or Super Pressure Balloon
Mission Lifetime	45 to 100 days

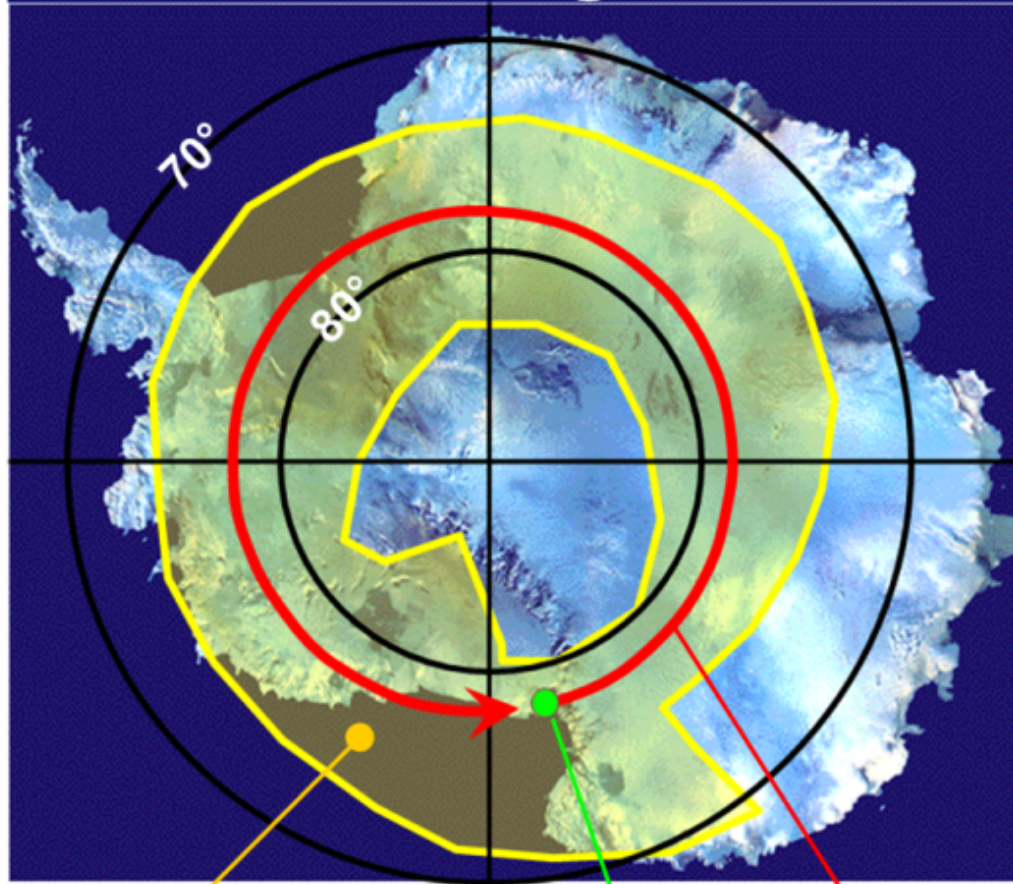
# GUSSTO Gondola & Telescope



Star  
Cameras



# GUSSTO Flight Path



Trajectories covered  
by all past LDB flights

Mc Murdo

GUSSTO  
Trajectory

Launch Site

McMurdo Antarctica

Altitude

~ 33 to 36 km

Orbit

Circumpolar 70°- 85° S

Mission Duration

45 to 100 days



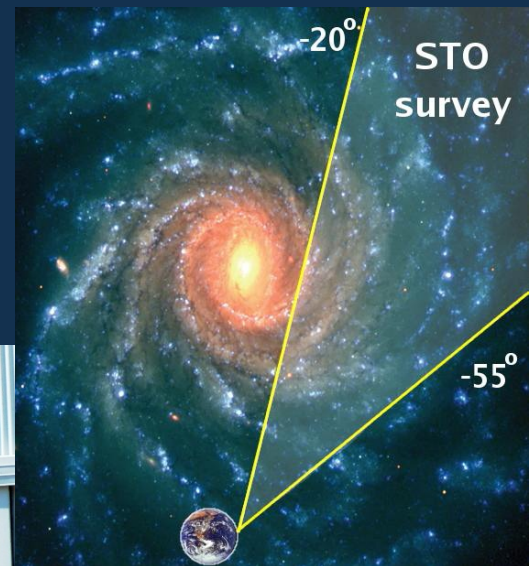
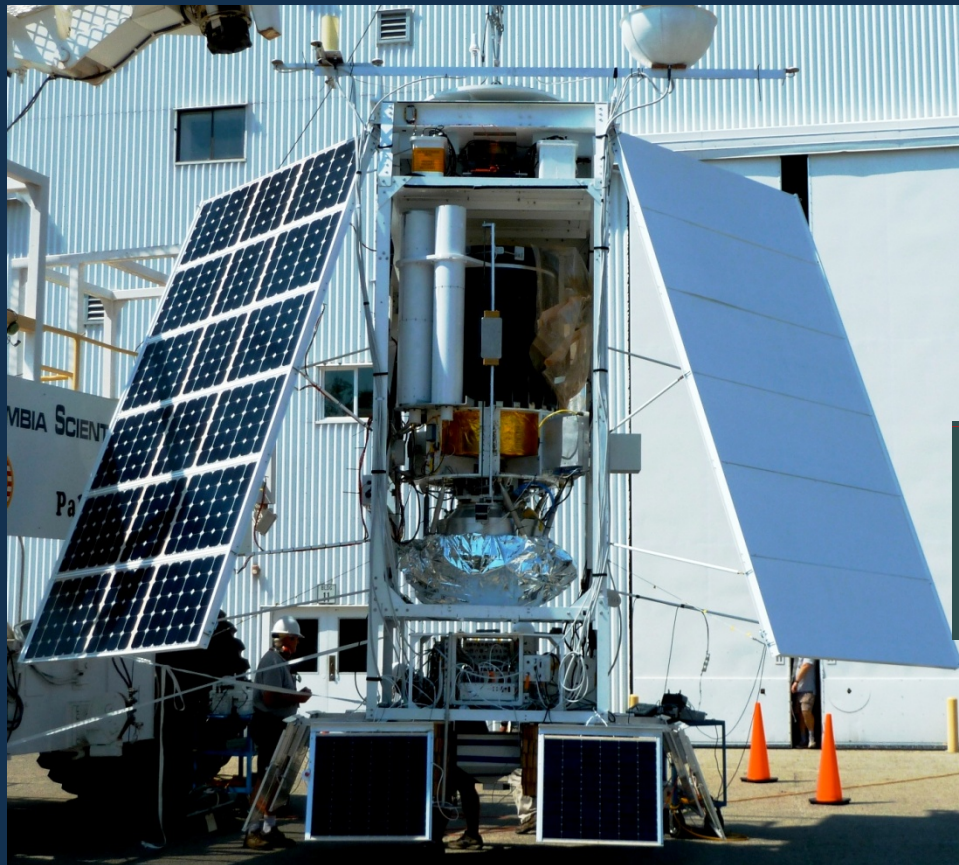
# Heritage: Stratospheric THz Observatory (STO)

UAz, JHU/APL, CIT/JPL, ASU, KOSMA, Ames, SAO, Oberlin, U.Maryland

Chris Walker (PI)



- 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

- LDB Platform
- ~20 day flights
- < 15" pointing knowledge/tracking
- STO maps will have ~ $10^3$ x angular & ~ $10^3$ x velocity resolution of COBE