Stratospheric Balloons

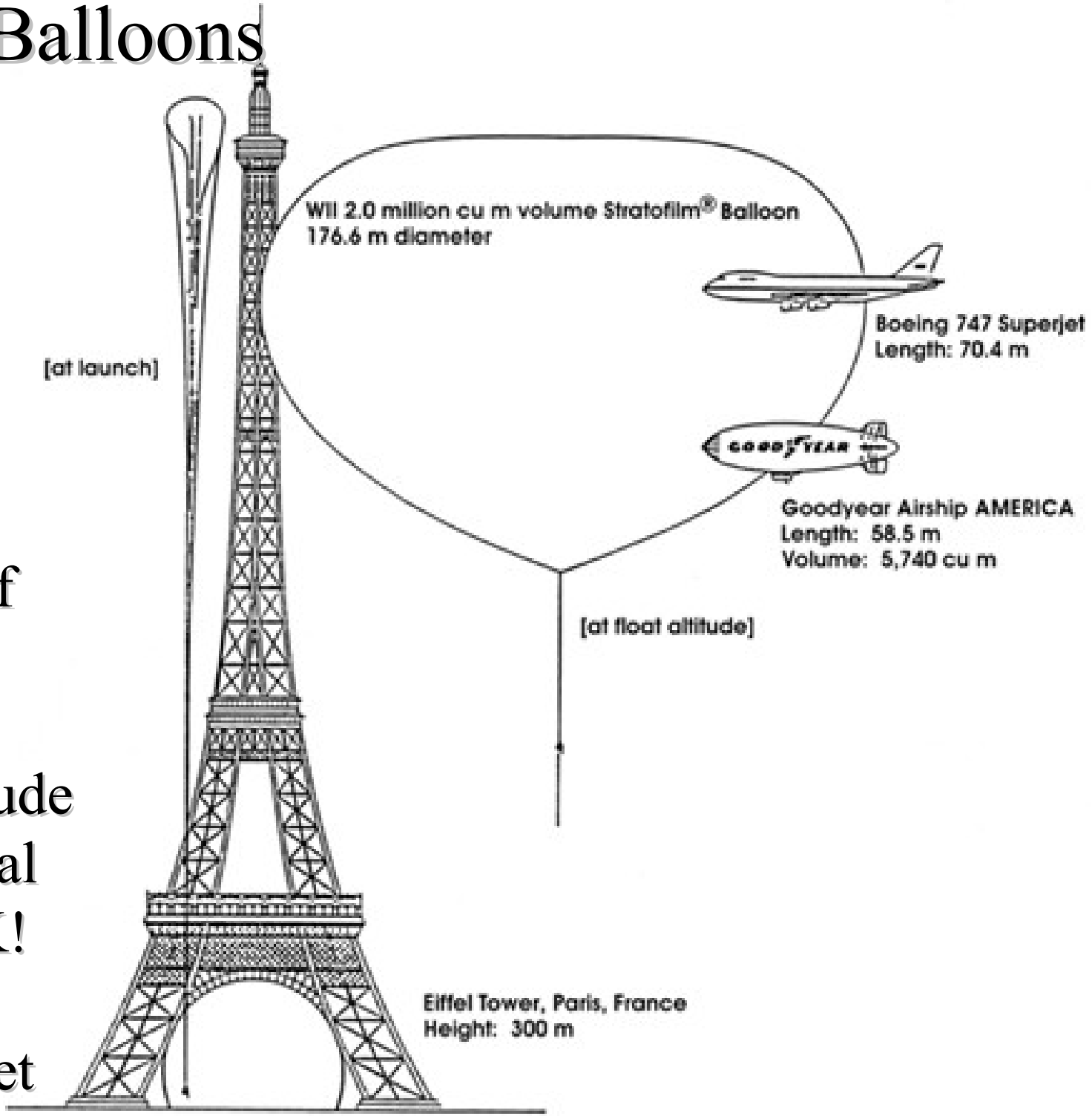
35km altitude
(3.5 mBar)

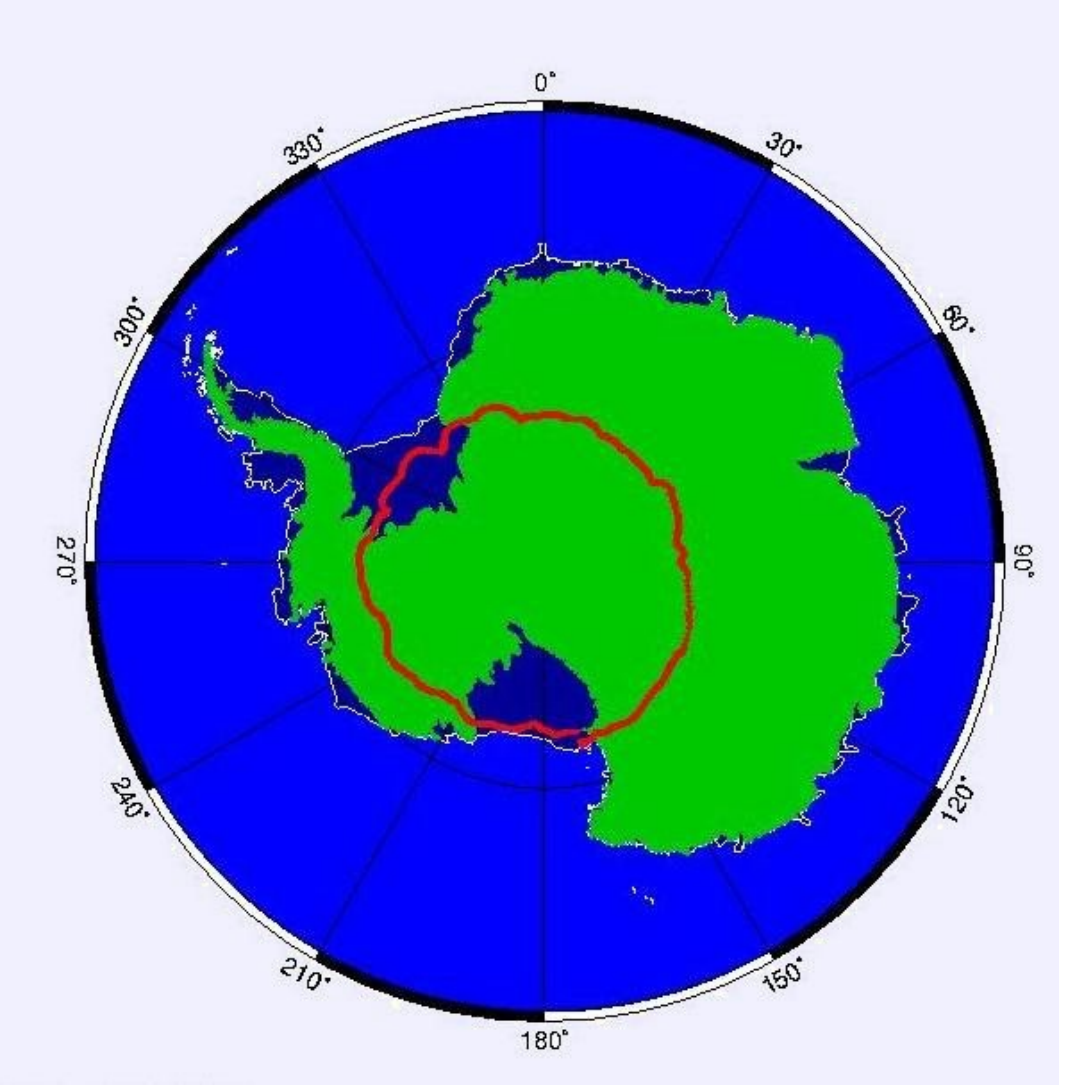
3500kg payloads

Flights duration of
over a month

Below ITAR altitude
limits: international
collaborations OK!

<$5 Million budget





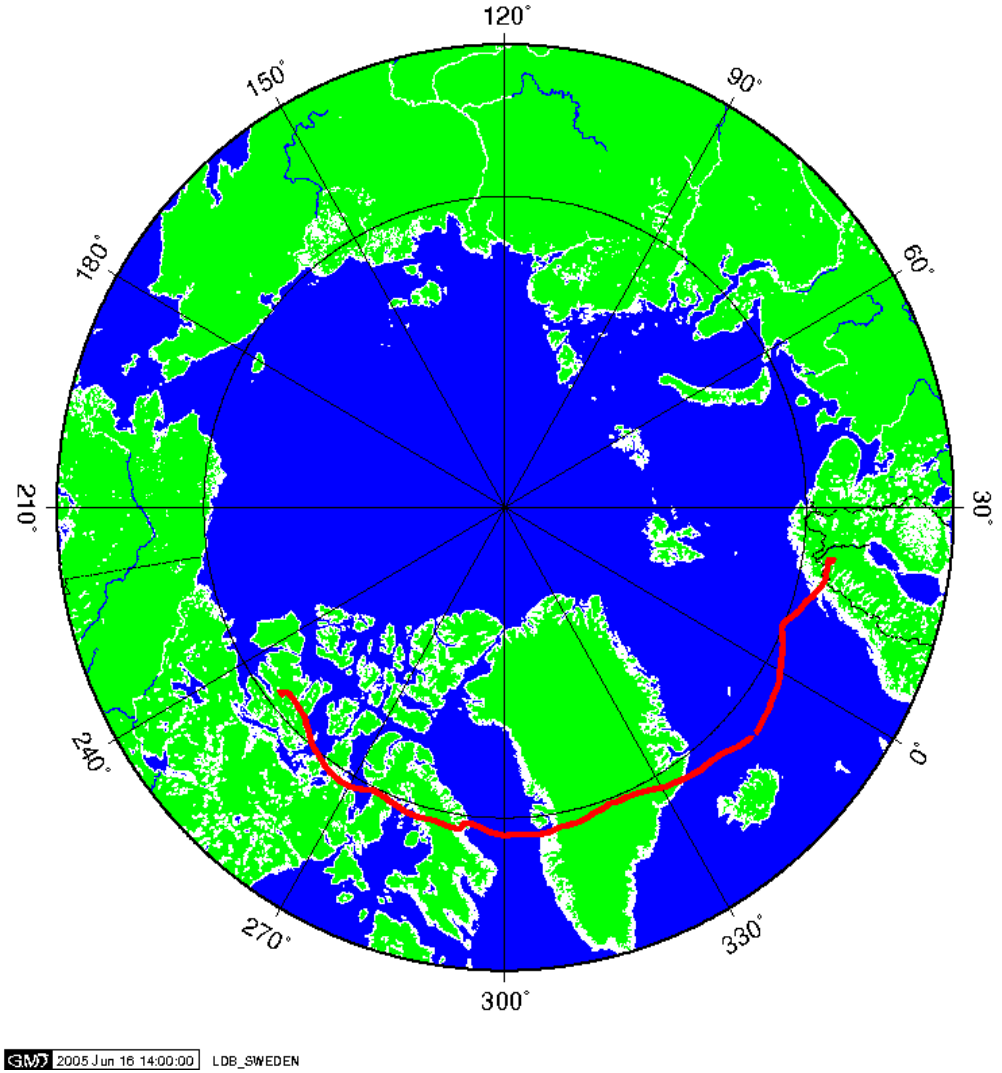
Antarctic flights

Continuous solar illumination
Minimizes diurnal variations

Flights over 30 days now routine

Launch window: Dec 10 – Jan 10

Kiruna flights

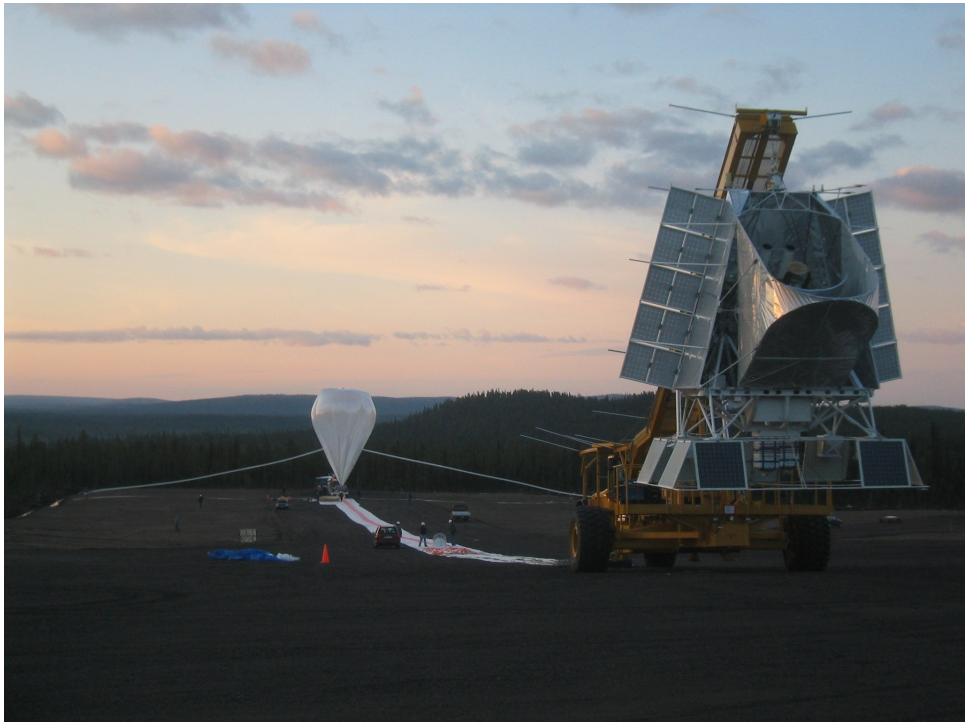


Continuous solar illumination

~100 hour flight times

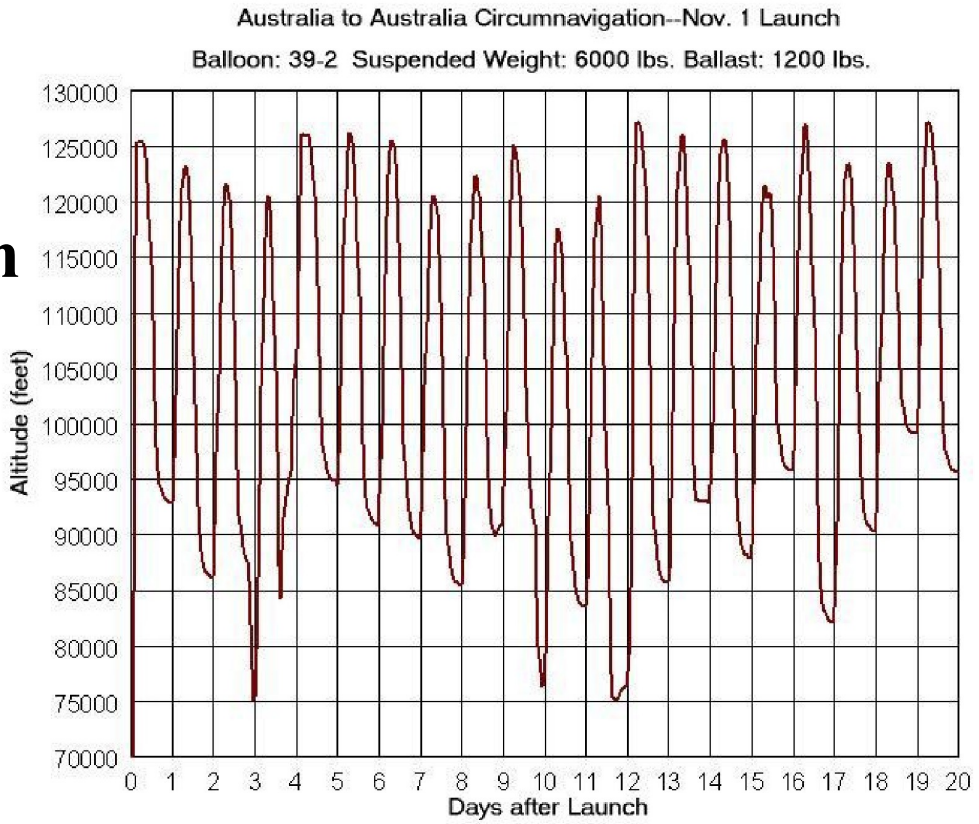
Longer w/ Russian overflight

Launch window: June/July



Alice Springs flights

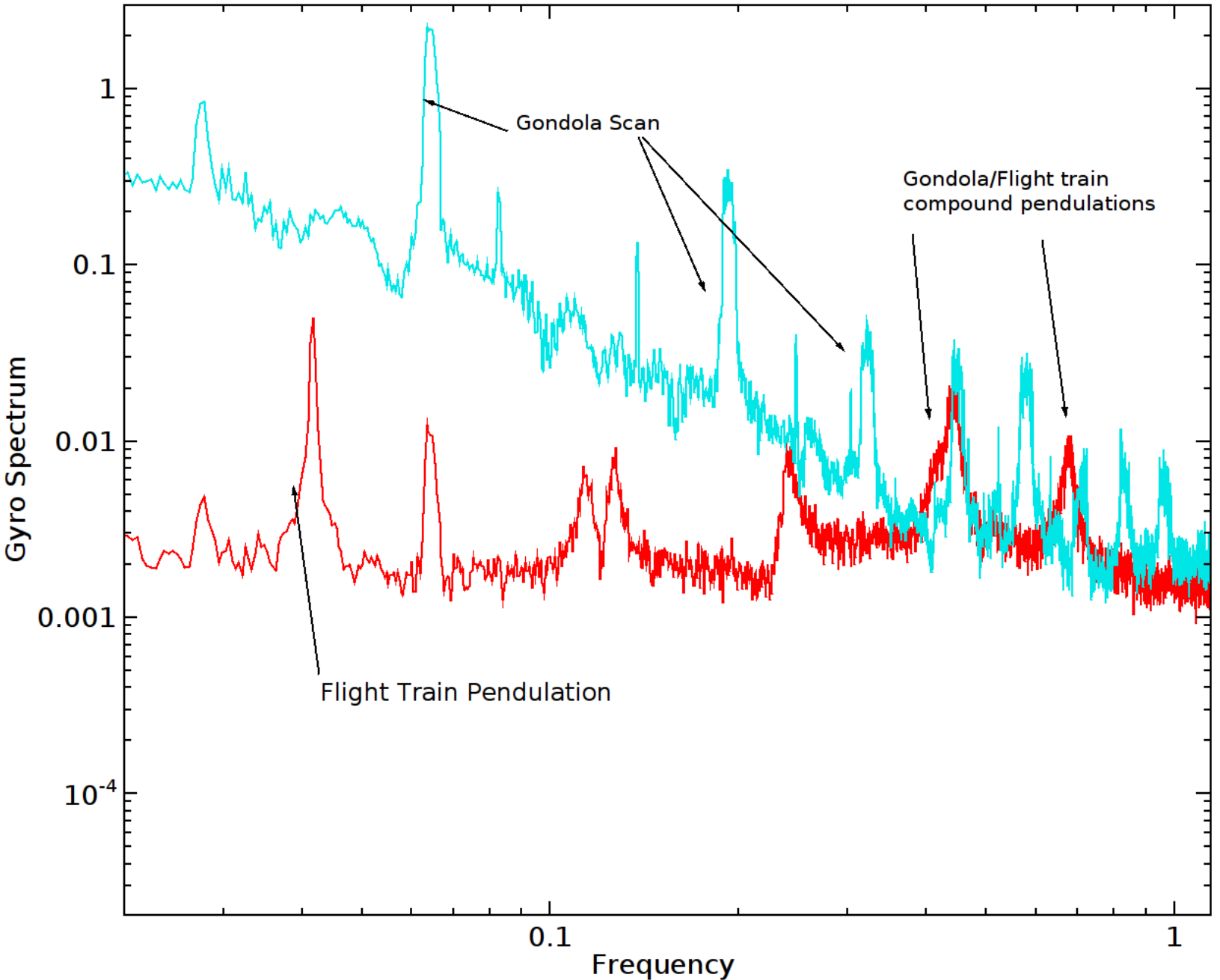
Option 1:
Zero Pressure Circumnavigation
20 day flight, ~12h nights
Night altitude drops to 90,000 ft
Historic success rate: ~50% (simulations predict better than this)



Option 2:
Zero Pressure Turn around
4 day flights, ~12h nights
Night altitude drops to 90,000 ft
Routine

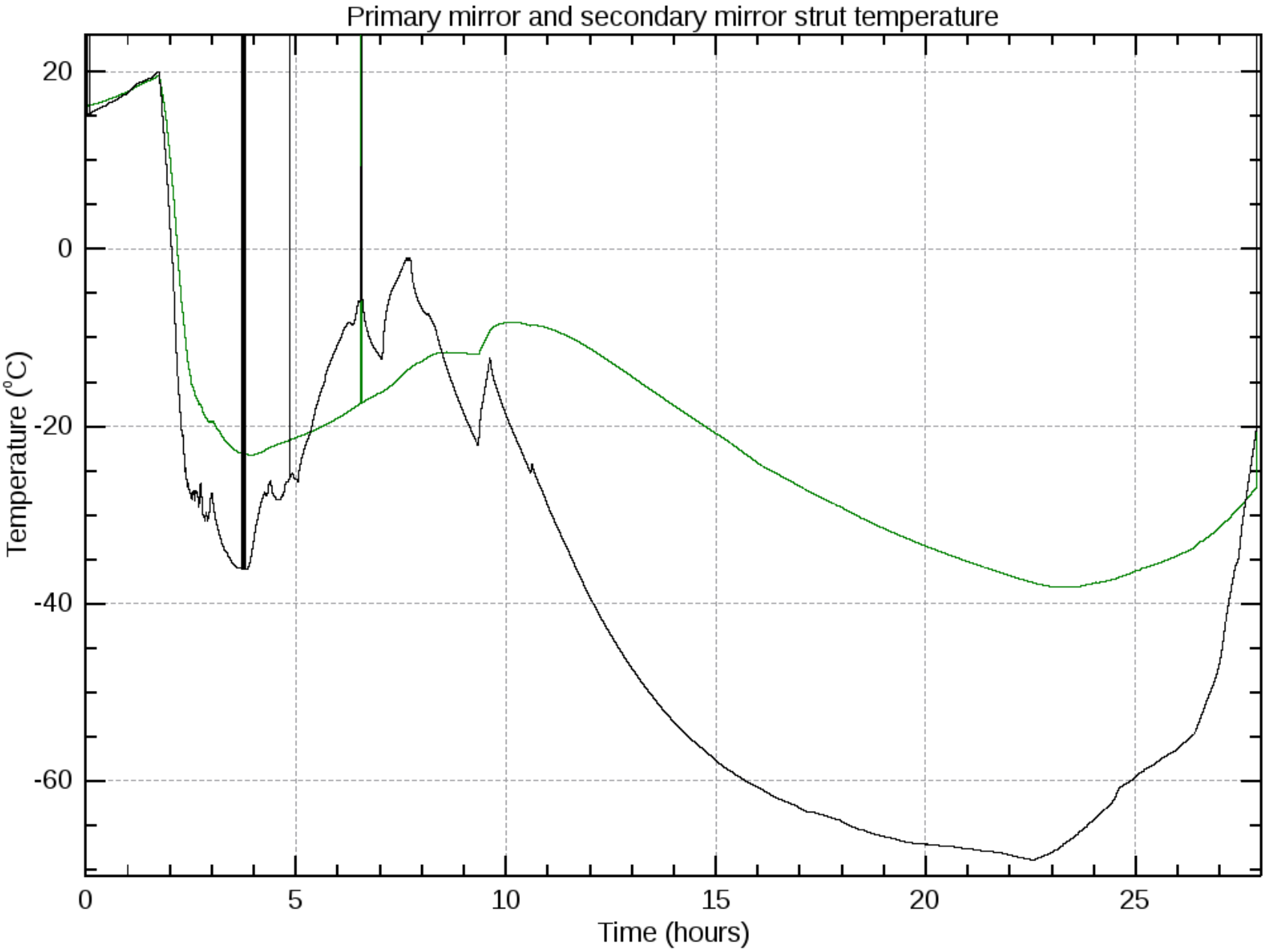
Option 3:
Super Pressure Circumnavigation
Few to many week flights, ~12h nights
Excellent altitude stability
2000 lb maximum payload
Lower altitude
Not fully demonstrated (yet)

Outer Frame Stability:

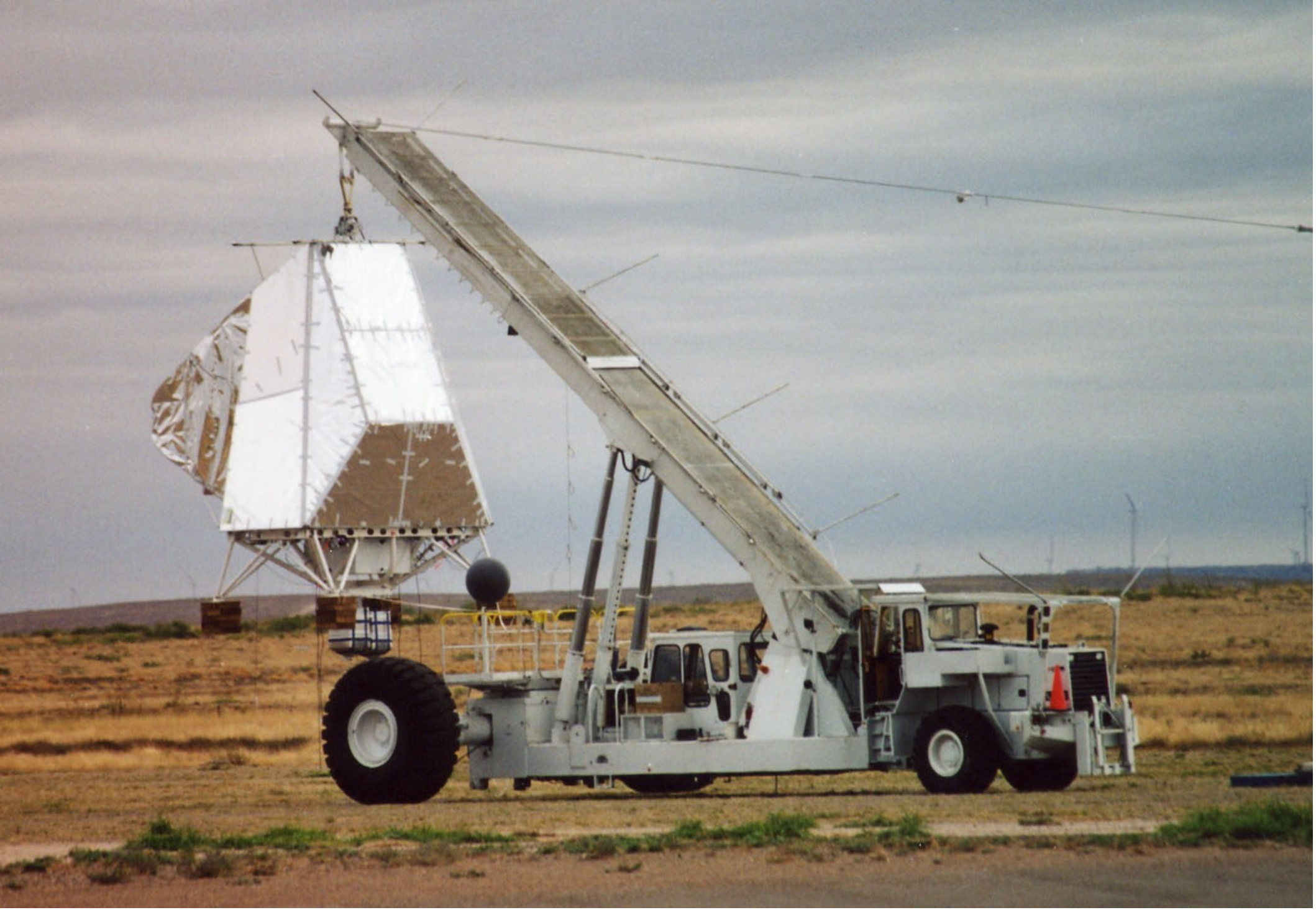


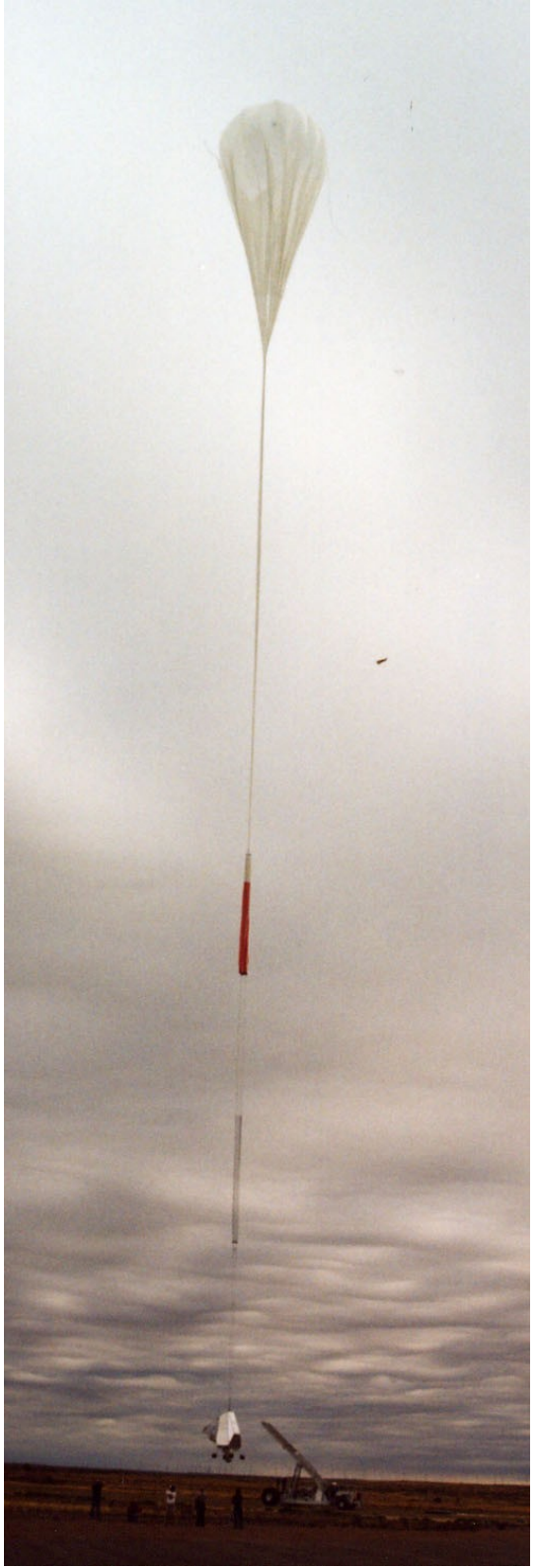
Red: outer Frame Roll ~6' motions

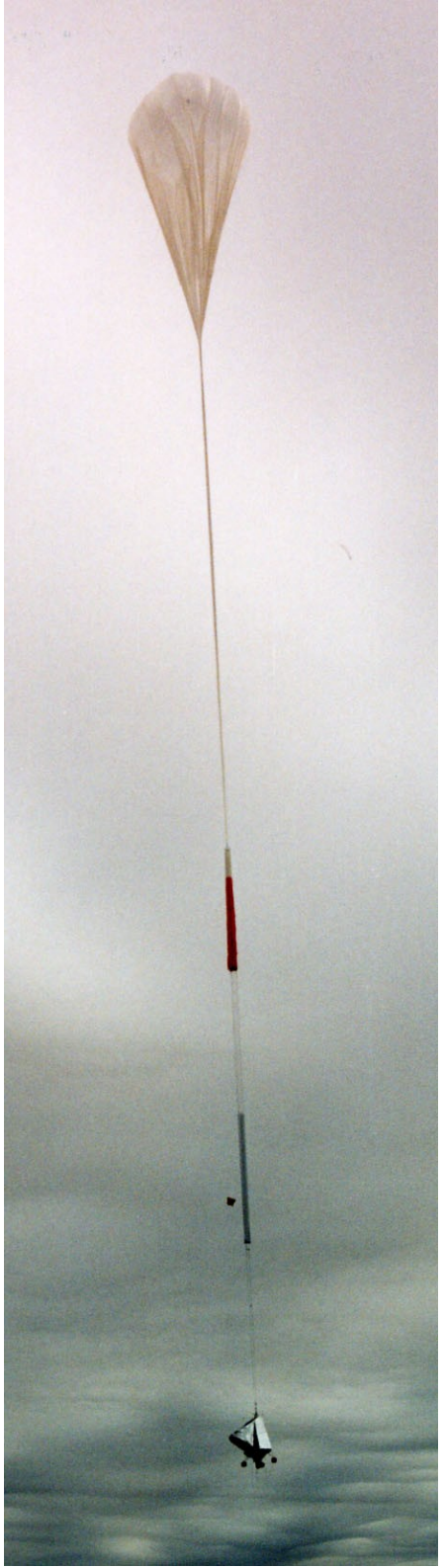
Cyan: Az, For reference

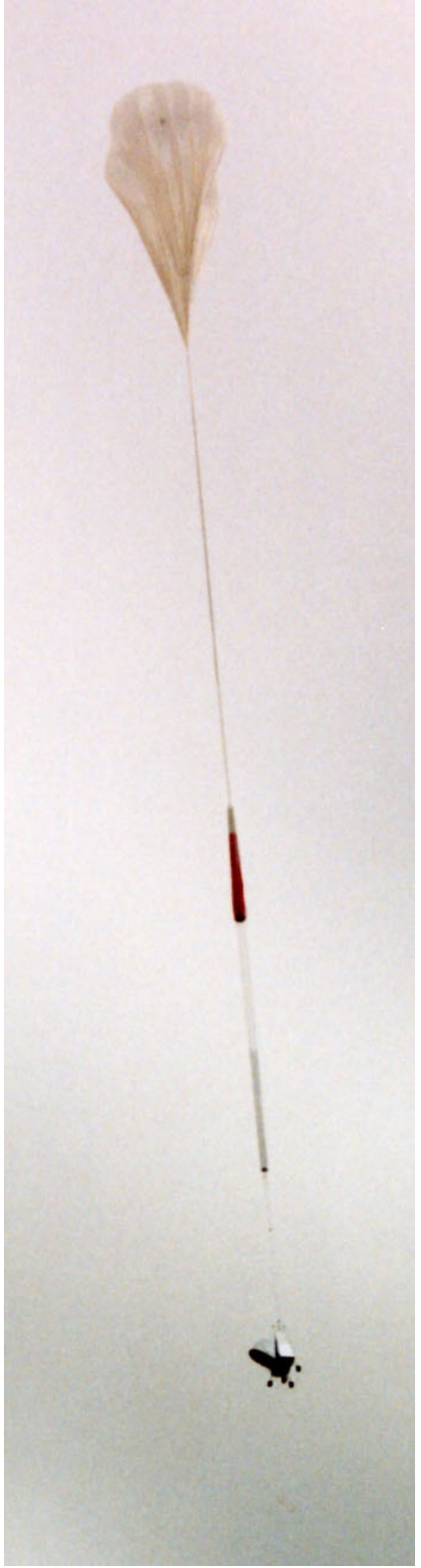

Primary mirror and secondary mirror strut temperature
20
0
-20
-40
-60
Temperature (°C)
0
5
10
15
20
25
Time (hours)

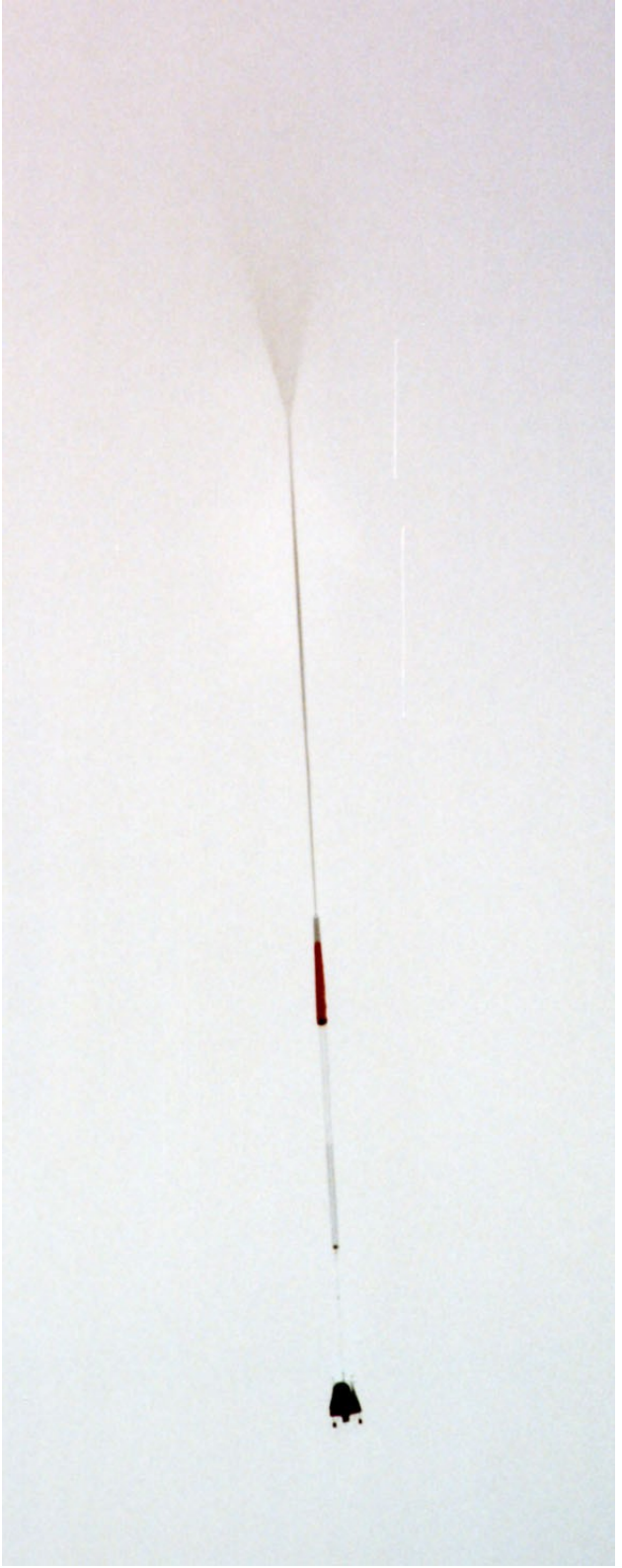
BLAST Test Flight (Ft. Sumner, September, 2003)
(Photos by Marsden)

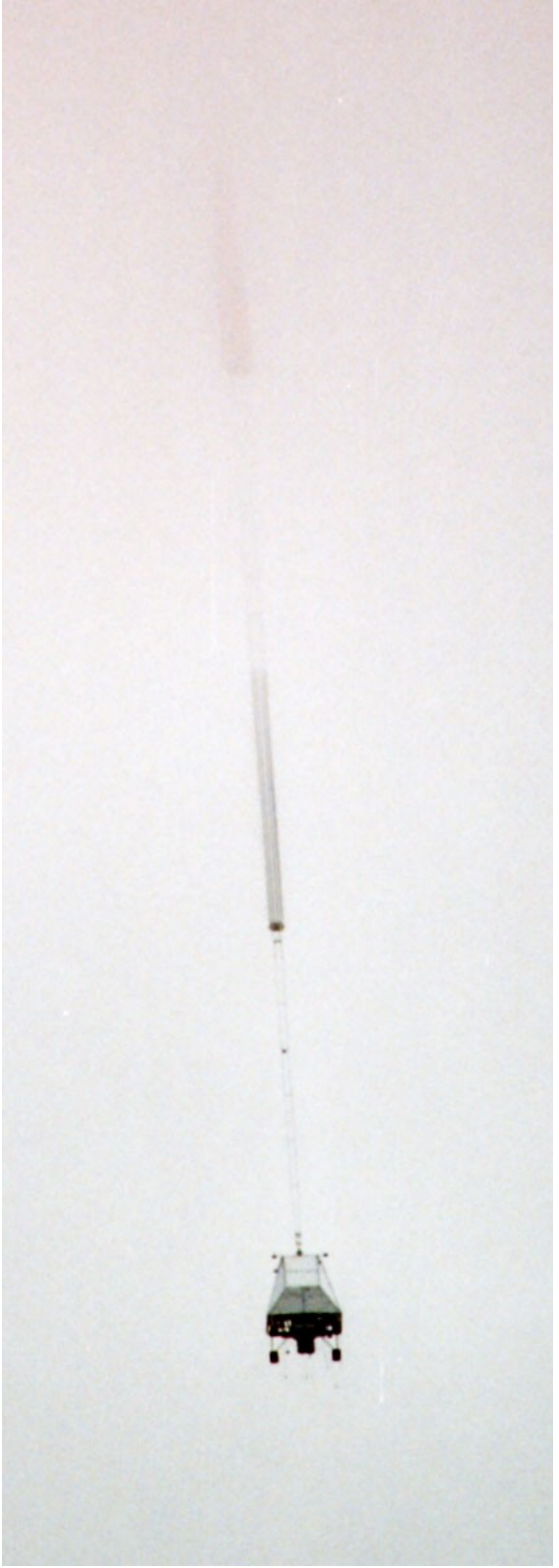


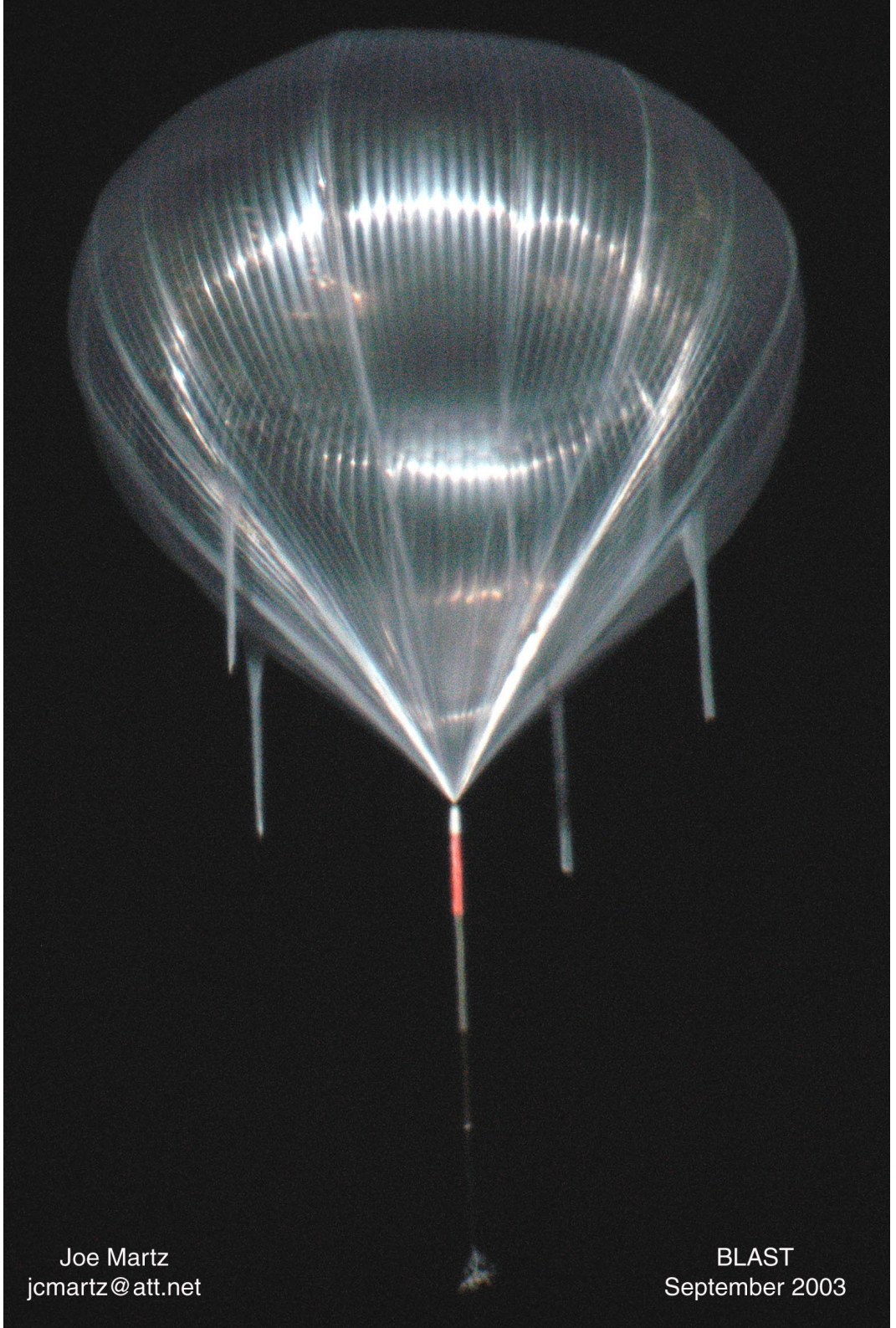






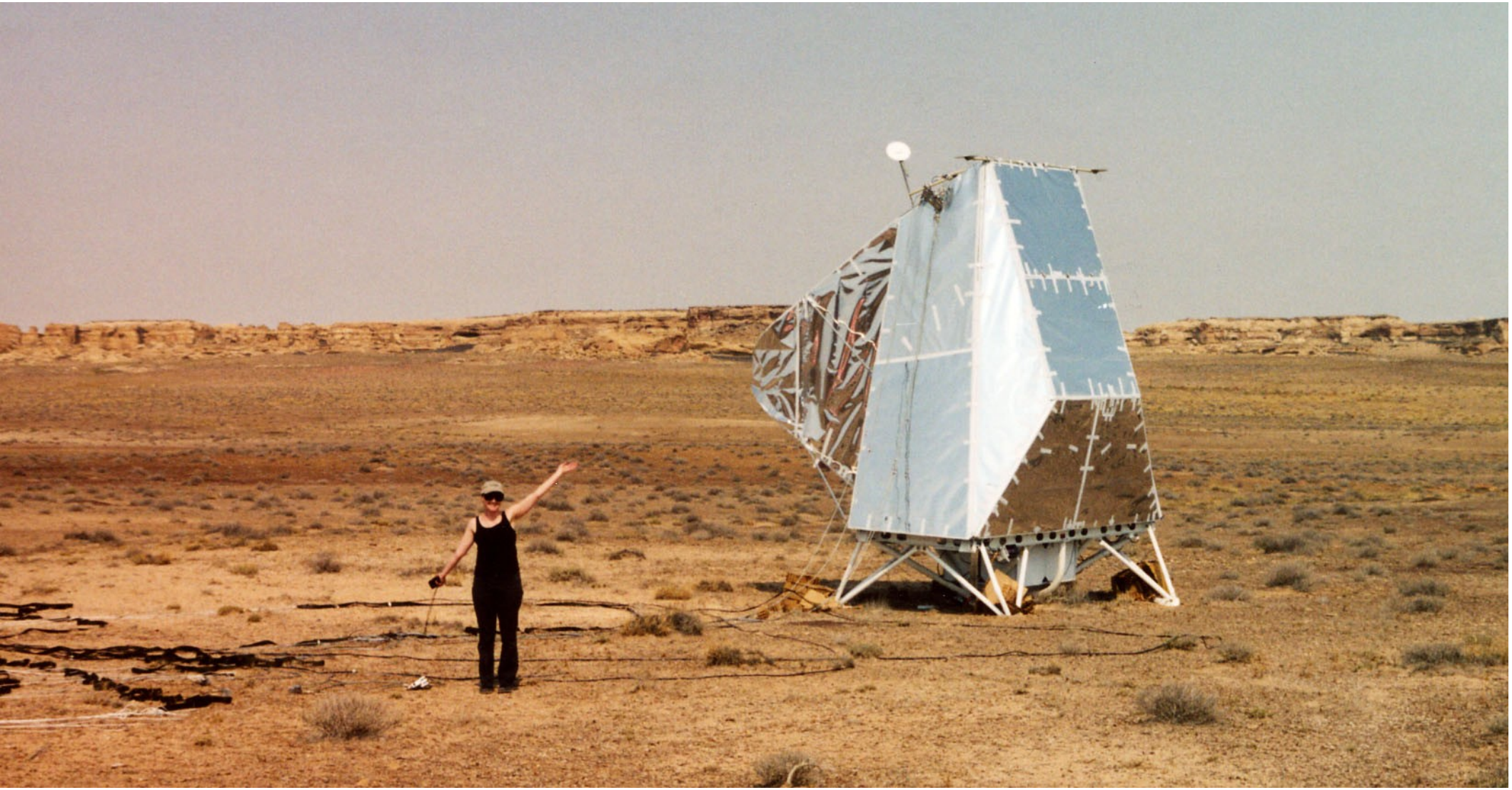




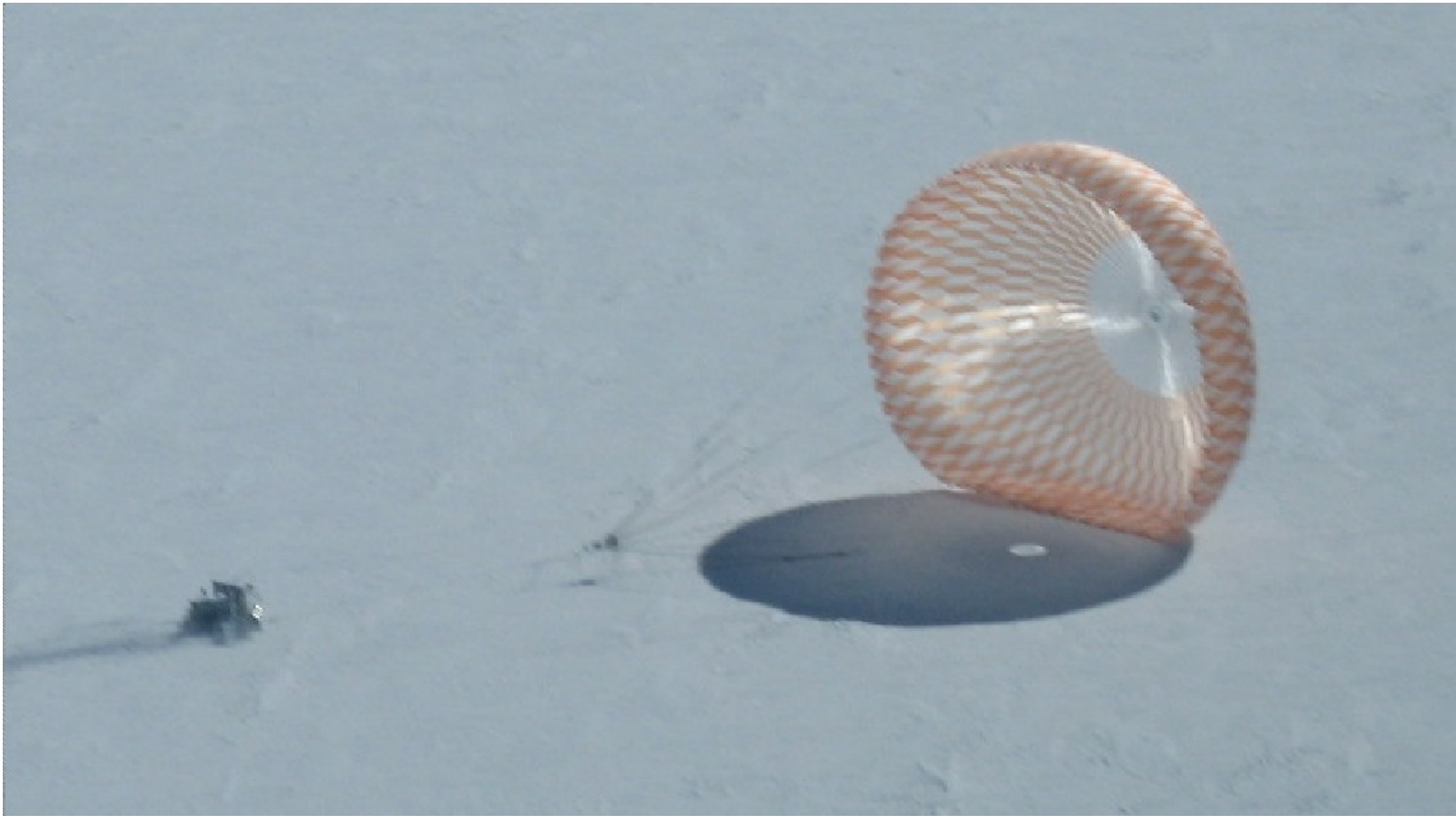


Joe Martz
jcmartz@att.net

BLAST
September 2003



BOOMERANG at Float



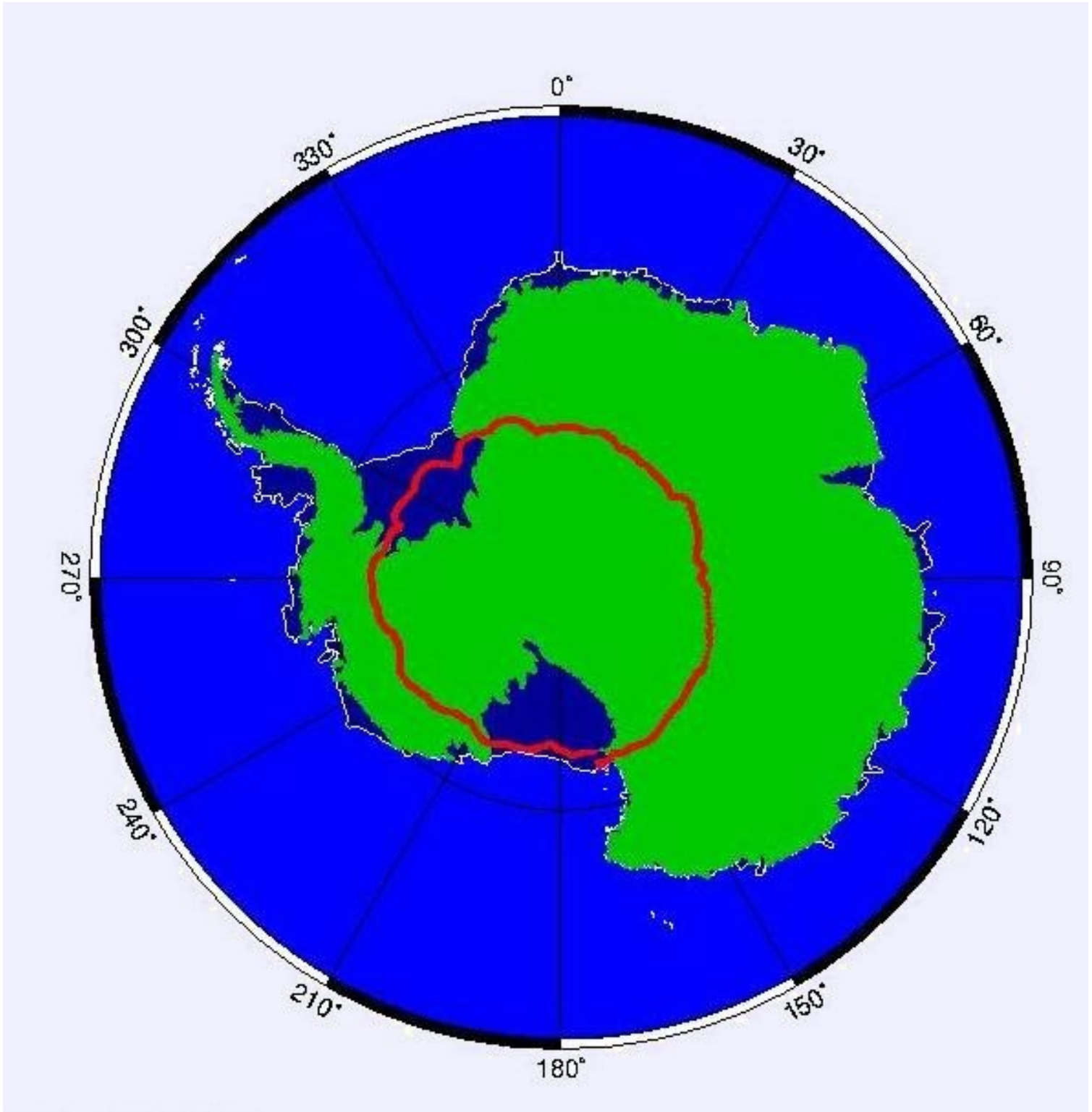
BOOMERANG: 1998 and 2003

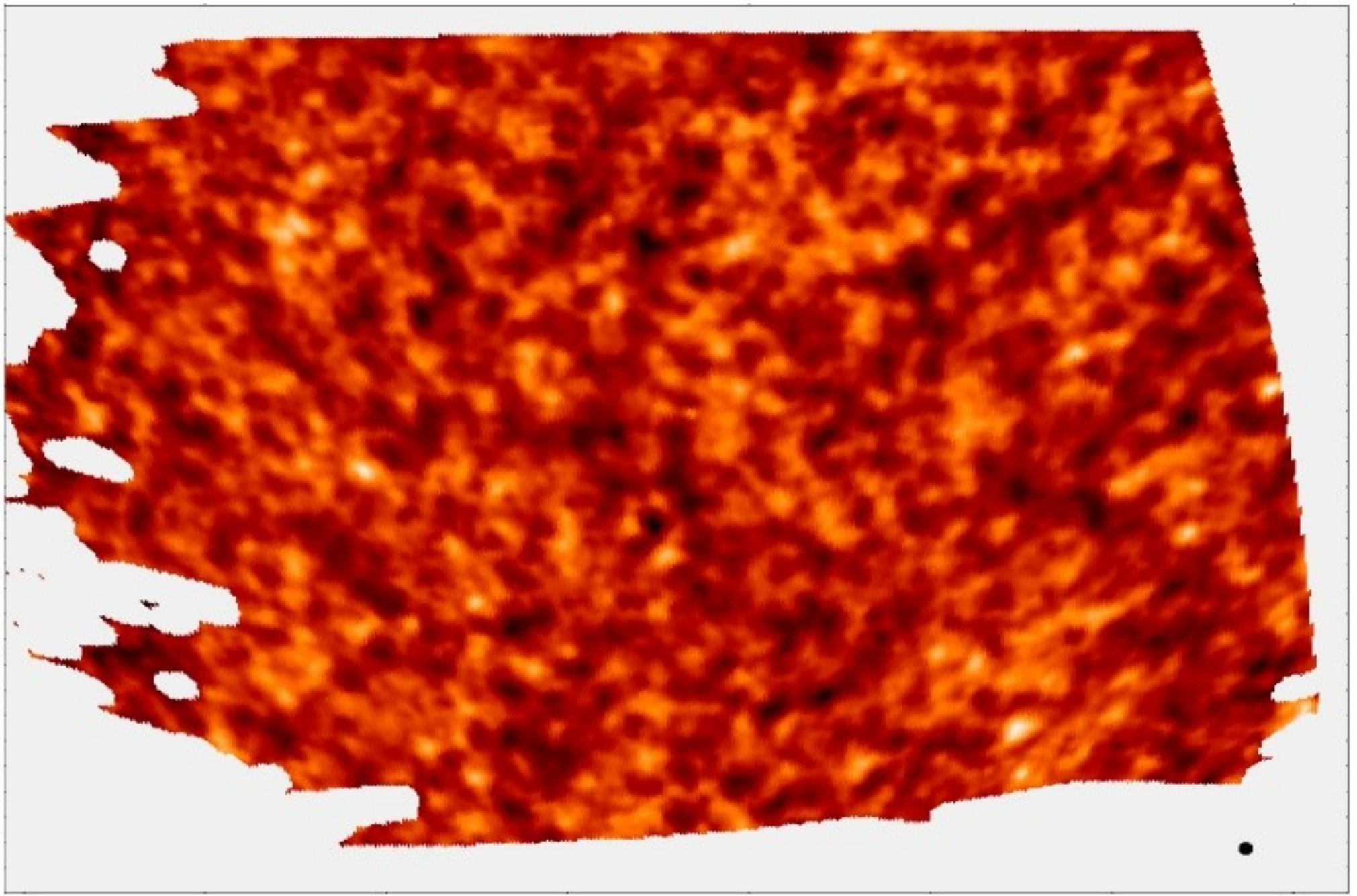
Age, Geometry, and Content of the Universe

Relies on student involvement

< 1/10 cost of equivalent satellite

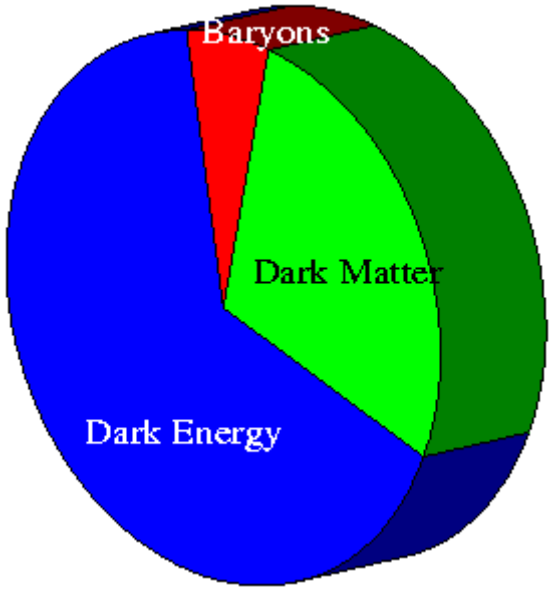
CalTech Rome
CWRU JPL
IROE NERSC
Toronto


0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°


−300 μK
300 μK
−300
−200
−100
0
100
200
300

Some Conclusions:

What is the Universe made of?



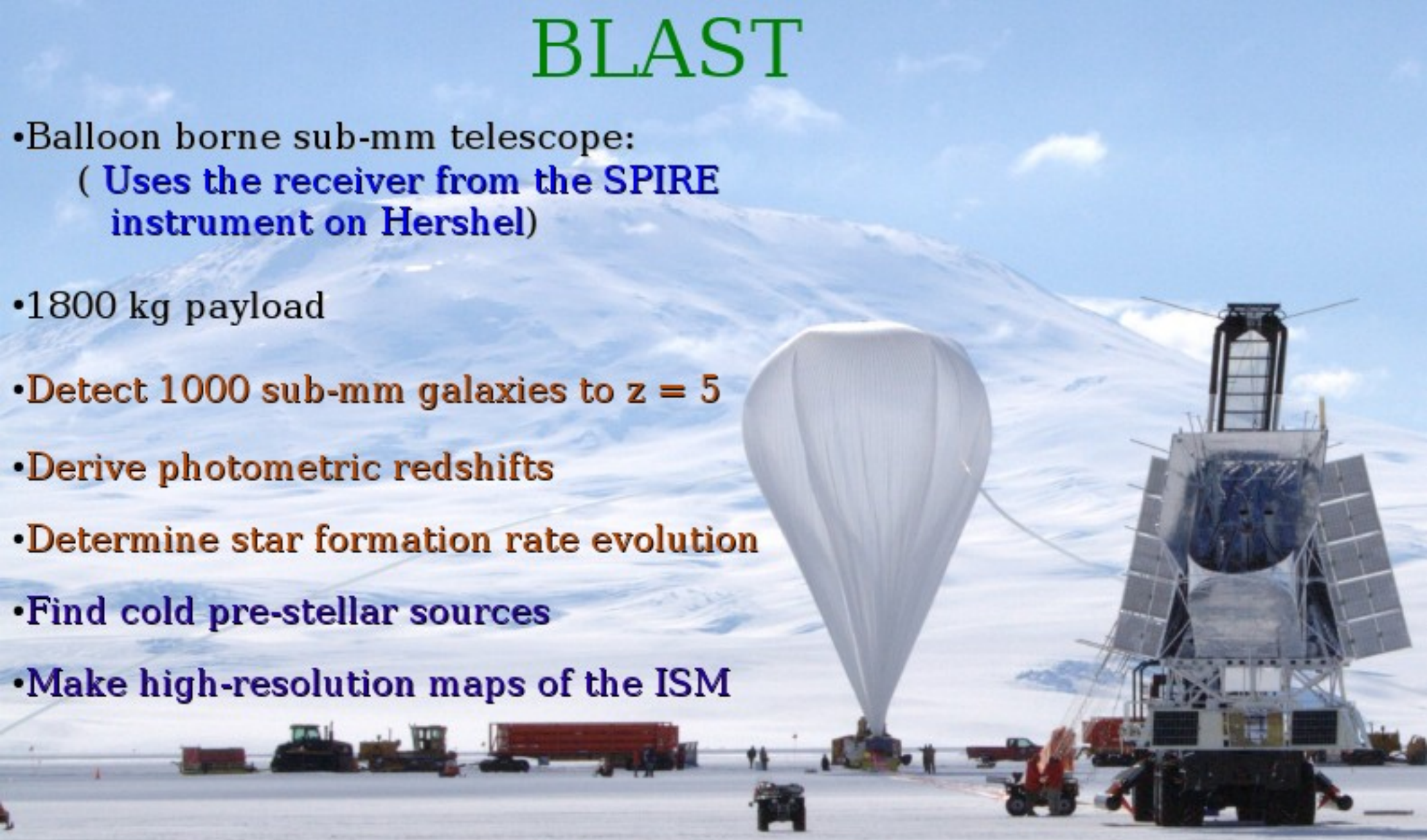
What is the Geometry of the Universe?

Euclidian (Flat)

* Includes contributions from other astrophysical data (supernovea, or Ho, or LSS...)
* Confirmed by other CMB observations (DASI, MAXIMA, VSA, CBI, ACBAR, WMAP...)

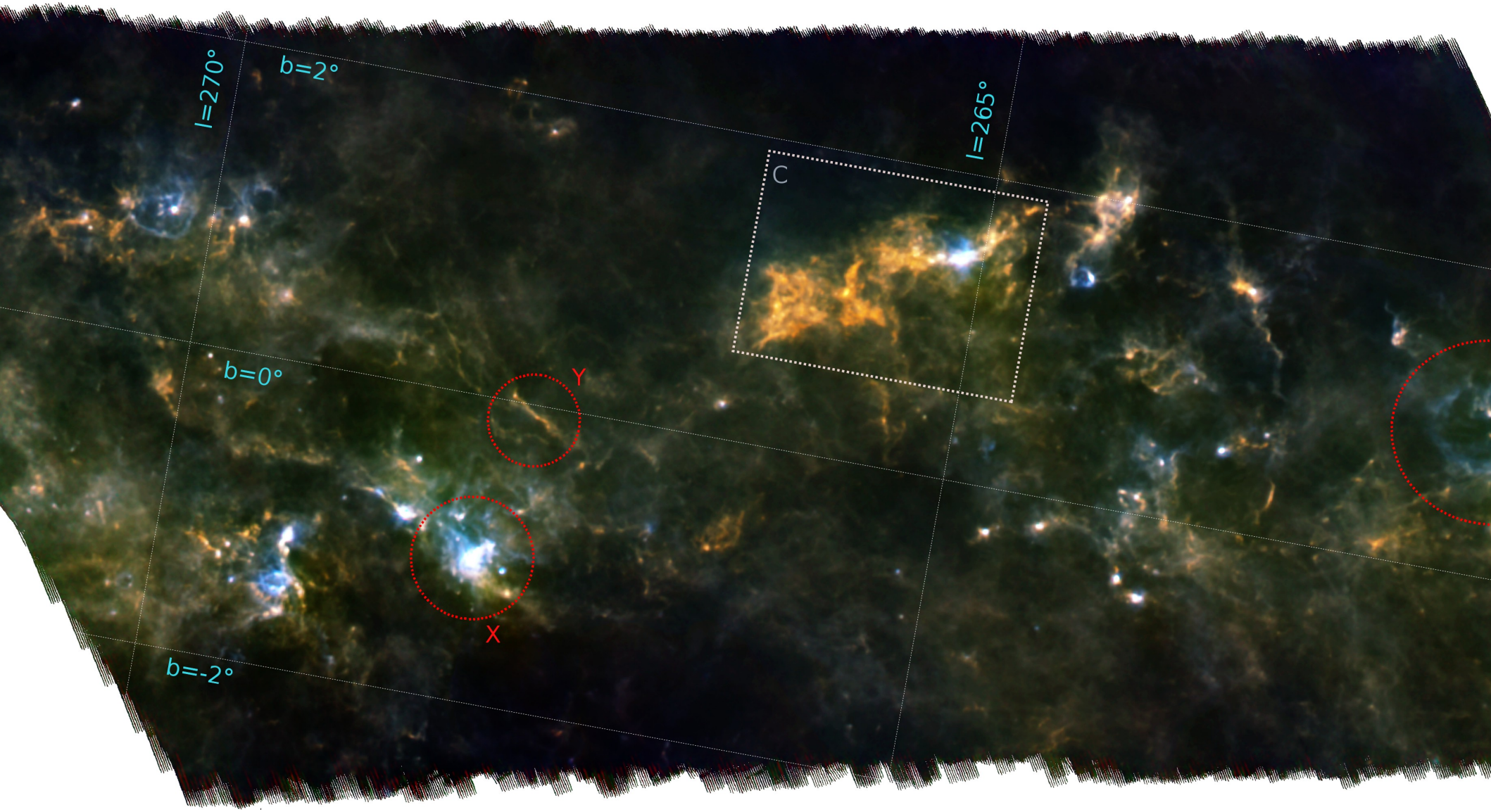
BLAST

- Balloon borne sub-mm telescope:
  (**Uses the receiver from the SPIRE instrument on Hershel**)
- 1800 kg payload
- **Detect 1000 sub-mm galaxies to z = 5**
- **Derive photometric redshifts**
- **Determine star formation rate evolution**
- **Find cold pre-stellar sources**
- **Make high-resolution maps of the ISM**



University of Pennsylvania	University of Toronto
Brown University	UBC
University of Miami	Cardiff University
JPL	INOE (Mexico)

The galactic plane towards Vela



Orange: <~15K – not visible in IRAS or Spitzer
Blue: >20K: warmed up by star formation

Distant star forming Galaxies