Balloon-Borne Observations of Cosmic Magnetism

Giles Novak, Northwestern University

2012 target: Vela C (ESA/Herschel map)
The Milky Way
Near-IR image; Sword of Orion

Note:
Orion Nebula
Orion Nebula Cluster
Trapezium (bright white spot)

Sword of Orion
One of the best-known nebulae in the sky, easily visible to the naked eye from nearly everywhere in the world.
stages of star formation
(picture from Shu, Adams, & Lizano 1987)
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low-mass star formation (picture from Shu, Adams, & Lizano 1987)
extreme-ultraviolet picture of Sun
spinning grains acquire a net alignment whereby longer axes are aligned \( \perp B \)

( Hiltner 1949, Hall 1949, Mathewson & Ford 1970)

optical polarization of starlight
spinning grains acquire a net alignment whereby longer axes are aligned \( \perp B \)
the Earth’s atmosphere blocks most wavelengths of electromagnetic radiation
Ostriker, Stone, & Gammie (2001) simulated cloud

3-dimensional simulation of magnetohydrodynamic (MHD) turbulence;

this map assumes strong B-field

Ostriker, Stone, & Gammie (2001)
simulated cloud

this map assumes weak B-field

Ostriker, Stone, & Gammie (2001)
winter-over scientist Greg Griffin filling SPARO

_Submillimeter Polarimeter for Antarctic Remote Observations_
David Chuss
Villanova U.

Jill Prince
NASA – Langley

Women in Aerospace Achievement Award - 2010
SPARO B-vectors on mid-IR map (MSX mission)
Balloon-borne Large-Aperture Submm Telescope

BLAST:
266 pixels
3 colors
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BLAST results:
BLAST Deep and Wide Fields … 100’s of protogalaxies detected

Balloon-borne Large-Aperture Submm Telescope

BLAST:
- 266 pixels
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BLAST results:
hazards of astrophysical ballooning

Below: 2006: telescope dragged across ~hundred km of ice after parachute fails to release following 2006 observations.

At left: 2010: scattered sunlight melts IR blocking filter after telescope spins out of control during ascent.
- BLAST-TNG (stands for “the next generation”)
- ~2300 MKID detectors (cooled to 0.3 °K)
- primary mirror: carbon fiber reinforced polymer; Vanguard Space Technologies;
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(2012 B-field map removed from posted presentation, but should be available on-line soon)