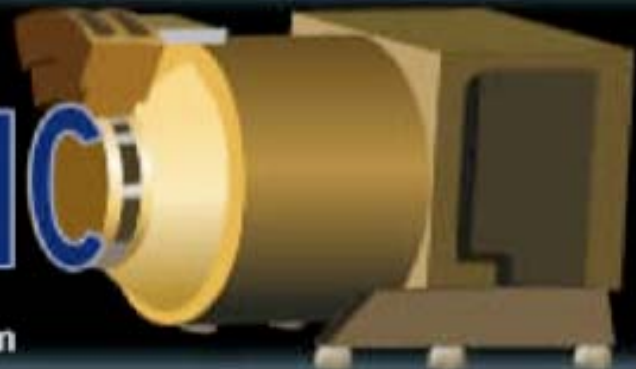


PLASTIC

PLasma And Supra-Thermal
Ion Composition Investigation



SWG 19: Pasadena PLASTIC Status Report

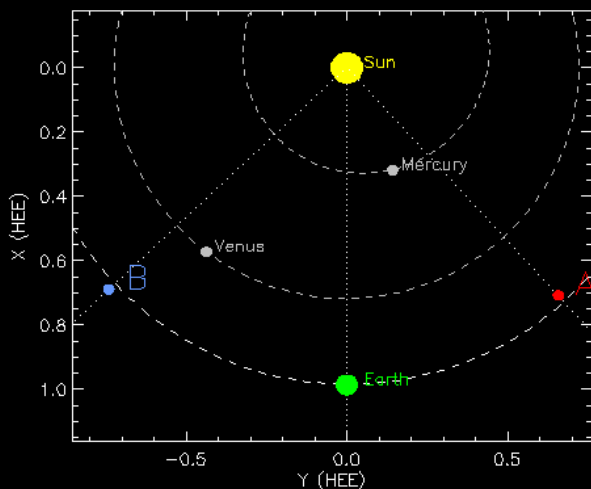
Toni Galvin

M. Popecki, K. Simunac, B. Klecker

L. Kistler, L. Ellis, C. Farrugia, E. Moebius, Y. Liu

M. Lee, J. Barry, P. Bochler, P. Wurz, L. Blush

R. Wimmer-Schweingruber, A. Opitz, L. Berger



Solar Minimum:

Yesterday the
Groundhog saw his
shadow, confirming
Chris StCyr's
report:

Six more months of
Solar Minimum!



Figure received from
Alex Young

Personnel Changes

- Katherine Singer is now working at Hamilton Sunstrand (ISS Air Quality Control)
- Yong Liu, New Post Doc at UNH – working on generation of Oxygen Parameters (Public Domain)
- Peter Bochsler, Visiting Scientist at UNH
- Submission of three candidates to NASA Project for Data Phase Co-Investigators: K. Simunac (UNH), A. Opitz (CESR), and L. Berger (CUA, Kiel)

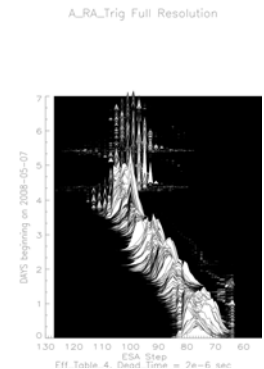
Instrument Activities - 2008

A

- 2/7/08 - DPU FSW load 3.2.7
- 4/14/08 High voltages reset; instrument was restarted.
- 5/11/08 Instrument stalled and entered anomalous hv mode due to delivery timing of some memory register commands

Two previously unknown problems; both needed to create the hangup:

- Leap-year error in the POC s/w (since corrected by UCB, thanks!)
+
- Variation in S/C from MOC-POC ICD about handling time-tag commands



B


- 3/3/08 - DPU FSW load 3.2.7
- 11/19/08 MCP HV increase - 20V
- 11/21/08 Raised DPU-side S-ch switch threshold
- 11/26/08 MCP HV increase - 20V

Science

In addition to these published papers cited in the bibliography, multiple papers have been submitted to Solar Physics, covering a variety of topics.

Others are in progress for the SOHO-STEREO Workshop.

STEREO PLASTIC Instrument Resources
http://stereo.sr.unh.edu/data/PLASTIC_Resources/Reference.htm



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STEREO PLASTIC BIBLIOGRAPHY
Revised January 2009

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STEREO Investigations

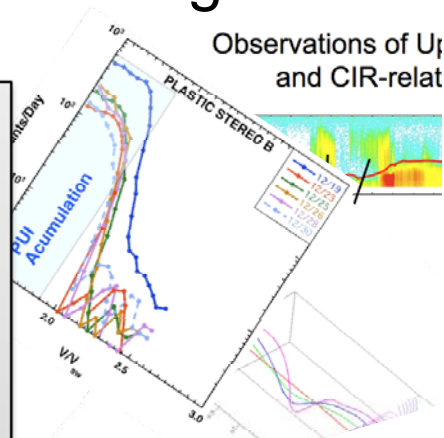
Temporal Evolution of the Solar Wind during the Recent Solar Minimum: Observations and Consequences for Space Weather Modeling

Applications of Grad-Shafranov Reconstruction Techniques on Magnetic Clouds Observed by Stereo and Wind and Comparison to Solar Source

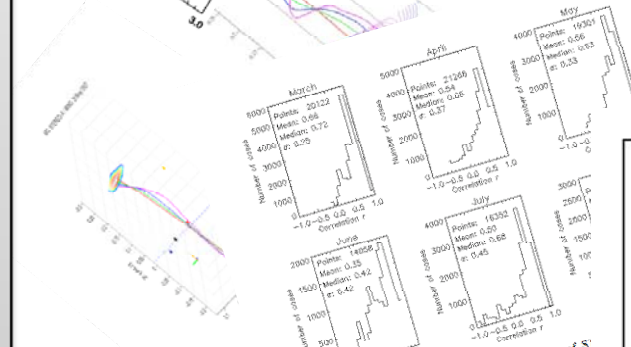
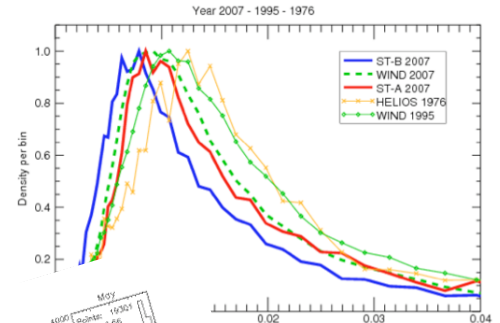
Interstellar Pickup Ion Observations by STEREO: Focus Cone Variations with Solar Wind Streams

High Resolution Minor Ion Composition and Kinetic Properties at Solar Wind Interfaces -- Solar Source Back Mapping

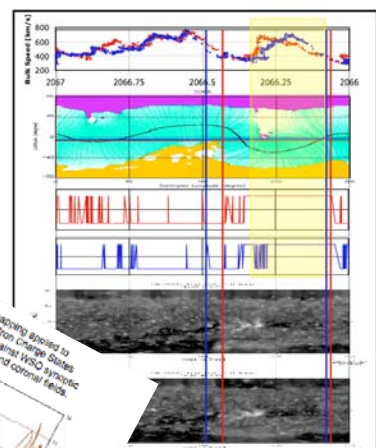
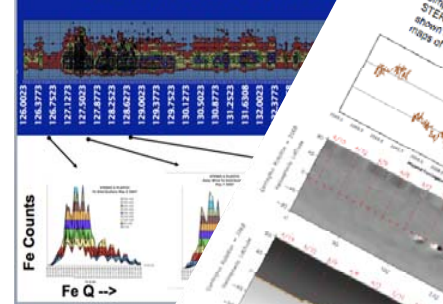
Suprathermal Ions in Compression Regions and in Upstream Events



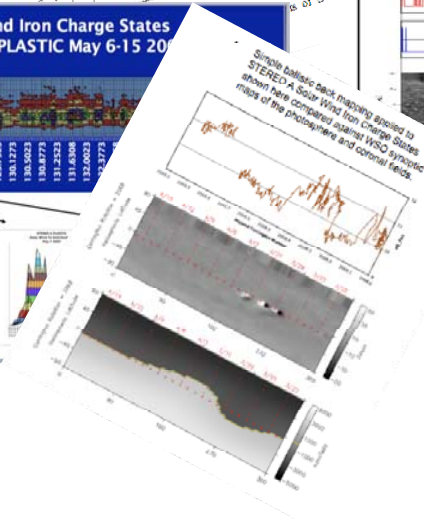
Distribution of QI values in the year 2007 from STEREO-A, STEREO-B, and Wind. For comparison, we show the corresponding distributions at the minima of solar cycle 20 (Helios) and 22 (Wind).



Solar Wind Iron Charge States STEREO A PLASTIC May 6-15 2007



The observed solar wind speed mapped back to its source longitude. The coronal hole and current sheet plot for Carrington Rotation 2066. The axis are the STEREO spacecraft longitudes. The middle panels are the magnetic field of STEREOIMPACT and mapped back to the source longitudes in the same manner as the bottom two panels are 1954 SECCU observations. Note: Time goes from left to right.



STEREO Investigations (Solar Physics)

Is the Current Solar Cycle Minimum Weaker than Previous Cycles?

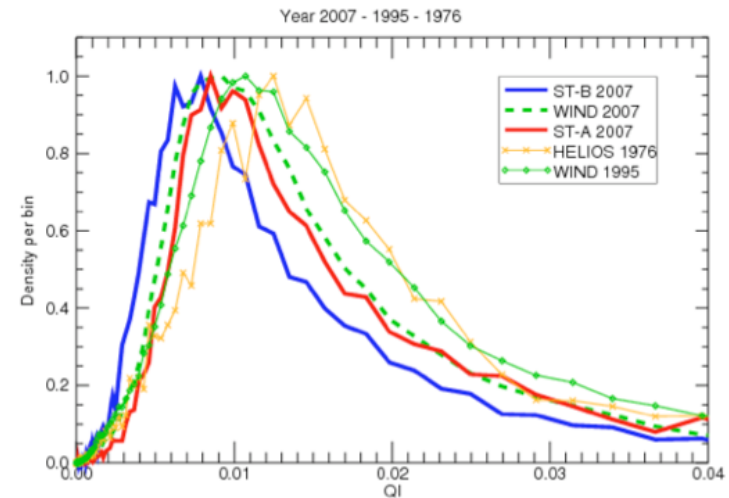
STEREO - Wind - Helios Observations of the Solar Wind QI

The solar wind quasi-invariant (QI) is the ratio of the solar magnetic wind magnetic energy density to the plasma kinetic energy density, that is, the inverse square of the Alfvén Mach number.

QI complements other indices and has implications on the Sun-Solar System connection during an entire solar activity phase.

On average, the QI(2007) is less than that observed during the previous two minima, indicating weaker solar activity. This also implies weaker MHD effects in solar wind flow around planetary magnetospheres which, in turn, alters the flow's interaction with them.

Distribution of QI values in the year 2007 from STEREO-A, STEREO-B, and Wind. For comparison, we show the corresponding distributions at the minima of solar cycle 20 (Helios) and 22 (Wind).



Reference:

(1) M. Leitner, C. J. Farrugia, A. B. Galvin, H. K. Biernat, and V. A. Osherovich, The solar wind quasi-invariant observed by STEREO A and B at solar minimum 2007, and comparison with two other minima, *Solar Phys.*, under review, 2009.

STEREO Investigations (Solar Physics)

Temporal Evolution of the Solar Wind during the Recent Solar Minimum:

Observations and Consequences for Space Weather Modeling

The heliocentric orbits of the two STEREO satellites provide a unique opportunity to study the cross-correlation of solar wind parameters^{1,2}, and, during these solar minimum conditions, the evolution of stream interfaces³ near 1 AU over time scales of hours to a few days, that is, much less than the period of a Carrington rotation.

Presentation this SWG by Kristin Simunac

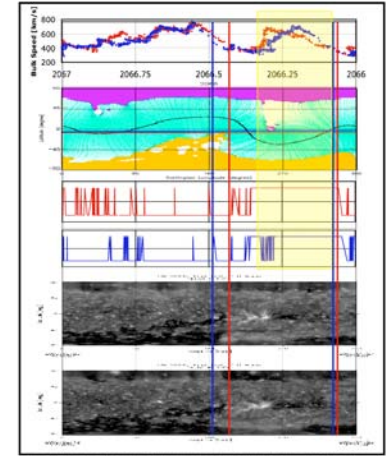
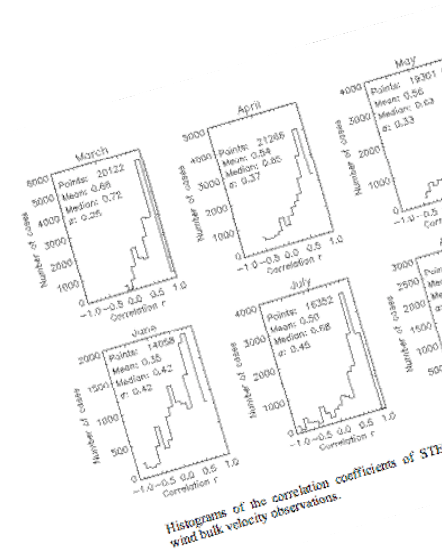


Figure 11. The top panel is the observed solar wind speed mapped back to its source longitude. The second panel is the GOING coronal hole and current sheet plot for Carrington Rotation 2066. The horizontal red and blue traces are the STEREO spacecraft trajectories. The middle panels are the magnetic field polarity observed by STEREO IMPACT and mapped back to the source longitude in the same manner as the previous bulk wind. The bottom two panels are 1954 SOCCO observations. Note: Time goes from right to left in all of the plots.

References:

- (1) A. Opitz et al., Temporal evolution of the solar wind bulk velocity at solar minimum by cross-correlating the STEREO A and B PLASTIC measurements, *Solar Phys.*, accepted, 2009.
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STEREO Investigations (Solar Physics)

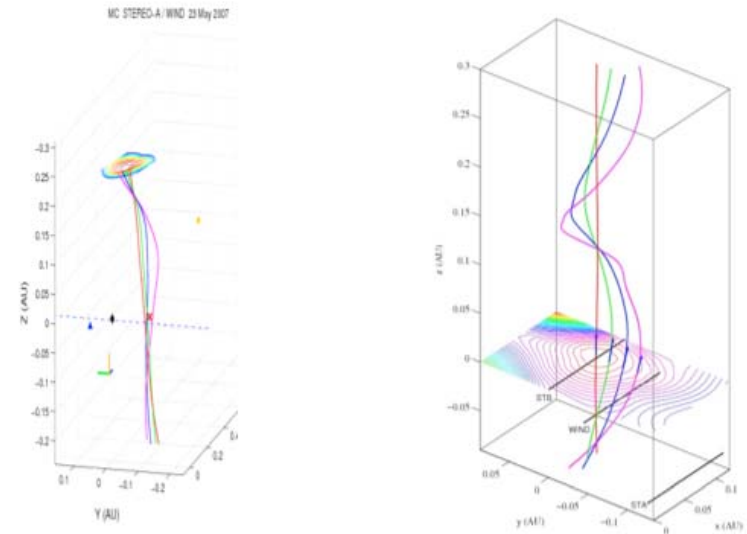
Applications of Grad-Shafranov Reconstruction Techniques on Magnetic Clouds Observed by Stereo and Wind

Comparison to Solar Source

Multi-spacecraft STEREO and Wind observations allowed us to model two magnetic clouds (MCs) with increased accuracy. The model was a Grad-Shafranov Reconstruction where data from two spacecraft were ingested to optimize the magnetic field maps. The MCs were observed in May 2007 when the STEREO spacecraft were about 9° apart.

For one MC it was possible to compare the magnetic flux content with that inferred from the corresponding two-ribbon flare on the Sun. ***For the first time it was shown that most of the magnetic flux of the MC, now better constrained because of the available multi-spacecraft observations, is created during the eruption on the Sun.***

The shape of the magnetic clouds in a plane perpendicular to the invariant axis is composed of field lines showing a deformed elliptical shape (yellow sphere is the Sun, the spacecraft are from left to right: STEREO-B, WIND (Earth), STEREO-A).



References:

- (1) Kilpua, E., P. Liewer, C. J. Farrugia, J. G. Luhmann, C. Moestl, et al., Multi-spacecraft observations of magnetic clouds and their solar origins: May 19-23, 2007, *Solar Phys.*, in press, 2009.
- (2) C. Moestl, C. J. Farrugia, C. Miklenic, M. Temmer, A. B. Galvin, J. G. Luhmann, et al., Multi-spacecraft recovery of a magnetic cloud and its origin from magnetic reconnection on the Sun, *J. Geophys. Res.*, in press, 2009.
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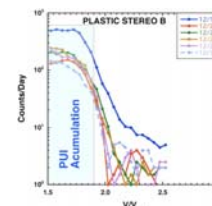
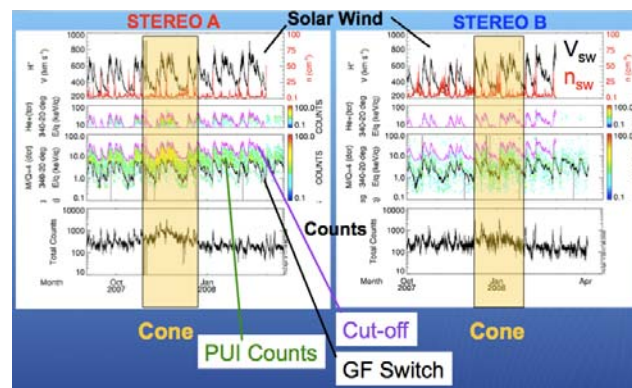
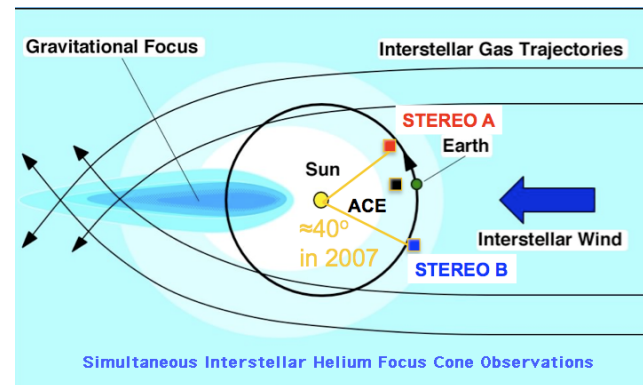
STEREO Investigations (in progress)

Interstellar Pickup Ion Observations by STEREO: Focus Cone Variations with Solar Wind Streams

Pickup helium ions provides diagnostics for Local Interstellar Cloud parameters, such as the LIC flow velocity vector and temperature. However, pickup ion distributions are highly variable and are known to be affected by the interplanetary magnetic field, solar wind density, ionization rates & probably several unknown causes. For deduction of LIC parameters, mitigation is sought with better information to distinguish temporal vs spatial differences. STEREO A/B provide two traversals of the focusing cone per year.

STEREO RESULTS:

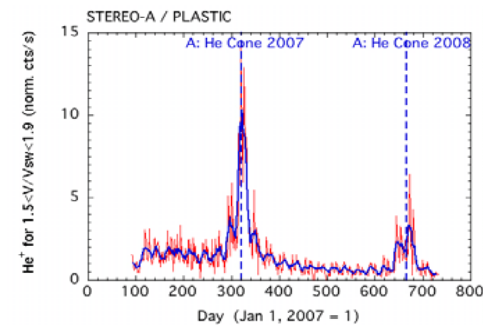
Presentation this SWG by Berndt Klecker



Cut-off

References:

- (1) B. Klecker et al., AGU 2008, SWG 2009
- (2) E. Moebius, B. Klecker et al. Simultaneous Pickup Ion Observations of the Interstellar Helium Focusing Cone with STEREO PLASTIC A & B, Cospar 2008.




Data available through SSC web-site:

All Level 1 CDF: Housekeeping, monitor rates, and all science data, including proton onboard moments. Does not include heavy ion efficiencies. (These files are used in analysis programs SPLAT and PHA_PLAY.)

Level 2 CDF 1-minute cadence data for the 1D-Maxwellian derived proton bulk parameters. March 2007 through Nov. 2008. These files lag by about 30 days because they require the *.fin Level 0 files.

Data: epoch, epoch_1kev, error codes, caution codes, s/c attitude flag, proton density, proton bulk speed, kinetic temperature, thermal velocity, n_s_flow_angle, carrington_rotation, sprcft_lon_carr, heliospheric_dist, sprcft_lon_hee, sprcft_lat_hee, sprcft_lon_hee, sprcft_lat_hee, sprcft_lon_hci, sprcft_lat_hci. New STA processing this week, to incorporate E_W flow angle, and velocity components (RTN, HERTN).



The screenshot shows a web browser window displaying the STEREO Science Center website. The browser's address bar shows the URL http://stereo-ssc.nascom.nasa.gov/data/ins_data/plastic/. The website header includes the STEREO Science Center logo and navigation links for HOME, CONTACT, and SITE MAP. The main content area displays a directory listing for the path `/data/ins_data/plastic/`. The listing table has columns for Name, Last modified, and Size. The entries are:

Name	Last modified	Size
Parent Directory	04-Oct-2007 16:56	-
level1/	08-Apr-2008 15:04	-
level2/	08-Apr-2008 15:05	-

Below the directory listing, there is a section for "Last Revised: Thursday, 10-Apr-2008 12:11:57 EDT" and contact information for the responsible NASA official, Michael L. Kaiser, including links for a Privacy Policy and Important Notices, and a feedback link to the webmaster.

STEREO/PLASTIC Data

PLASTIC He+ Plots

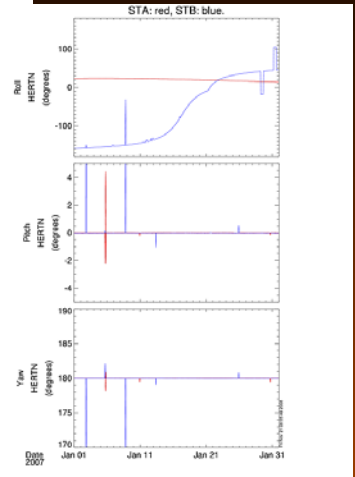
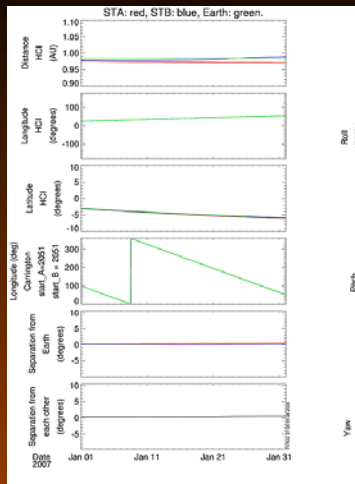
STEREO-A PLASTIC He+

PLASTIC Proton Velocity Components

Internal Index	Def. mom. AB comparison	Observations A, B comparison	Moments Efficiencies	Position Spectrograms
Composition Plots	Observations A, B, monthly	Monitor Rates	RA, OB Moments	WAP-Binned

STEREO PLASTIC Proton Velocity Components HERTN

Vx (km/s), Vy (km/s), Vz (km/s), EW (degrees), NS (degrees), Roll (degrees)



Data available through PLASTIC web-site

Ascii/Excel Proton bulk parameters: 1 min (4/2007-9/2008), 10 min (2/2007-9/2008), 1 hr (2007-7/2008)

Automatically Generated Plots:
 Level 2 Proton Moments (1D Max) Bulk Vel, Density, Temperature, and Thermal_vel through present

On-Board Moments: Bulk Vel, Density, Temperature, Vel. Standard Deviation through present

Solar Wind Stack Plots through 10/2008
 He+ Survey Plots through present
 Spacecraft roll, pitch, and yaw through present

Movie: Solar Wind Fe Charge States at CIR
 Coming this week: STA Proton Velocity Components

Data Plots

Upcoming Meetings

- STEREO SWG for Fall
- SOHO CELIAS / PLASTIC STEREO Team meeting April 7-9 2009, to be held in Concord NH at the STEREO EPO Partner McAuliffe-Sheppard Discovery Center
 - If interested in attending, please contact
 - toni.galvin@unh.edu and berndt.klecker@mpe.mpg.de

The screenshot shows a web browser window displaying the news page of the Christa McAuliffe Planetary Museum. The browser's address bar shows the URL <http://www.starhop.com/about/news.html>. The page features a navigation menu with links for 'events & shows', 'exploration', 'education', 'membership', 'gift shop', 'kids' space', 'about us', 'visit us', and 'contact us'. A blue sidebar on the left contains links for 'Alan Shepard gallery', 'Christa McAuliffe gallery', 'construction gallery', 'events gallery', and 'McAuliffe-Sheppard Discovery Center news'. The main content area is titled 'News' and features a large background image of Earth from space. Below the title, there is a section titled 'Light This Candle!' with the text: 'The Rocket has arrived! The McAuliffe-Sheppard Discovery Center is reaching new heights with the raising of the Mercury Redstone Rocket - a 92 foot replica of the rocket that lifted Alan Shepard and his Freedom 7 spacecraft to space on May 5, 1961! This is a fitting birthday present for Alan who would have been 85 on November 18.' Below the text, there is a grid of six thumbnail images showing the rocket being transported and raised. A caption below the thumbnails reads: 'Click on the thumbnails below to view a larger version of each image.'