The Objective View

July 2009

Newsletter of the Northern Colorado Astronomical Society

Robert Michael, President
pres@ 970 482 3615
Dan Laszlo, VP and Newsletter Editor
objview@ Office 970 498 9226
Chad Moore, Secretary
sec@
John Caldwell, Treasurer
treas@
Greg Halac, Web Editor
web-edit@ 970 223 7210
Dave Chamness, AL Correspondent 970 482 1794
add ncastro.org to complete email address

Next Meeting: July 2 7:30 pm

Planetary Nebulae in the NGC, by Lee Gregory

Club Business at 7:15 pm

Fort Collins Museum, 200 Mathews St Fort Collins

http://www.fcgov.com/museum/

Club Brochure: http://www.ncastro.org/Contrib/2009_Brochure.pdf

NCAS Programs

Aug 6 TBA
Sep 3 Dr Bill Possel Space Missions of LASP

City of Fort Collins Natural Area Program at Sunset

Bobcat Ridge: Jul 23, Aug 27, Sep 24, Oct 22

Rocky Mountain National Park Starwatching

Meet at dusk at the Upper Beaver Meadows trailhead. July 10, 24; Aug 14, 28

http://www.ncastro.org/Sites/RockyMtnNP.htm

Dark Site Observing Dates

July 17, 18, 24,25 Foxpark WY or Keota, ask FRAC

Other Events

Little Thompson Observatory, Berthoud Closed in July for maintenance http://www.starkids.org

CSU Madison Macdonald Observatory Public Nights
On East Drive, north of Pitkin Street
Tuesdays after dusk if clear, when class is in session

Cheyenne Astronomical Society July 17, 18
Camp Jack Star Party
Weekend Under the Stars, Foxpark WY Aug 20, 21, 22

http://home.bresnan.net/~curranm/

Chamberlin Observatory Open House, 7 to 10 pm
July 25, Aug 29 303 871 5172
http://www.du.edu/~rstencel/Chamberlin/

Longmont Astronomical Society
http://www.longmontastro.org/

June 4 Program: Black Holes Demystified, by Dr. Gavin Polhemus, U Colo Boulder and Poudre High School

Gavin agreed to tackle any questions submitted. Black holes are easy to make in nature. Any starting material works. They are a natural consequence if you have enough material. If you start with 30 solar masses, it will collapse and blow up, with loss of over half the matter. 3 solar masses seems to be the lower starting limit. Rotation is a complex problem. The extreme angular momentum gets very messy to model. We know of dozens of xray binaries. 1.4 solar masses seems to be the upper limit for neutron stars. Some uncertainty in mass remains. Black holes over 1 million solar mass are common. These supermassive black holes accompany galaxy formation. Most if not all galaxies have them. The Milky Way has a 4 million solar mass black hole at its center. Galaxy M87 has a 1 billion solar mass black hole. Quasars are supermassive black holes on an eating binge. Some galaxies might have a central binary. A sequence of images shows stars orbiting the central black hole as close as 90 AU. Black holes very slowly evaporate through radiation and end with an explosion. It can take 10e100 years for typical black holes. Gavin showed movies of a collision of a black hole binary, and the view falling in. 90% of the galaxy is dark matter. Black holes also gobble up dark matter. Dark energy does not interact. The amount of dark energy is growing as the universe expands. There are probably no astrophysical micro black holes. The mass of Mount Everest would compress smaller than a proton. It would take 2 seconds to evaporate and blow up. Energy is released at the end. The wavelength emitted by a black hole is a function of its size, so small ones evaporate rapidly. An asteroid-mass one would last much longer. Black holes bend spacetime a lot. They cause intrinsic curvature. Gavin illustrated the behavior of light around black holes with plots of time versus radius from the center of the black hole. This showed the light becoming trapped when it was emitted inside the event horizon. If we cross the event horizon, our future is the singularity. To an outside observer, we appear to slow down as we approach the event horizon, then disappear due to redshift. If we approach a supermassive black hole, nothing

exciting occurs to us at the event horizon. Tidal disruption would be violent at the smaller black holes, which give spaghettification. There is stretching and crushing. Length becomes infinite as the other 2 dimensions shrink to zero. If you spin a black hole it can form a ring singularity. Picture an O ring that is infinitely squashed. A Reissner-Nordstrom black hole is electrically charged but not rotating. If the black hole were electrically charged, it is conceivable to pass through one to the other side, but this would be so improbable to be impossible, and very disruptive. Gavin showed animation created for a National Geographic program and NOVA. It took several days with a supercomputer to generate. If the surface of a black hole were visible, it would appear like a sphere with its whole surface visible from one side, with a rim that had light which had taken multiple orbits.

About our speaker: Gavin Polhemus, Ph.D, grew up in Denver CO. He attended Stanford University and received his Ph.D. in Physics at the University of Chicago. He divides his time between teaching at Poudre High School and work at JILA in the group of Andrew Hamilton at U Colo Boulder. He enjoys backpacking and is a juggler.

For more info:

What Would It Look Like to Fall Into a Black Hole?
http://www.newscientist.com/article/dn16885-what-would-it-look-like-to-fall-into-a-black-hole.html

Andrew Hamilton's homepage:
http://casa.colorado.edu/~ajsh/

Death by Black Hole. Neil deGrasse Tyson. 2007. WW Norton.

Black Holes: The Membrane Paradigm. Thorne, MacDonald and Price, eds. 1986. Yale Univ Press.

June 4 Club Business
President Bob Michael called the meeting to order. Change in meeting location was discussed and we decided to request a room at the Fort Collins Museum, 200 Mathews St. Event dates were announced. Treasurer John Caldwell reported the club account stands at $437.34. Next outreach events are at Bobcat Ridge, Rocky Mtn Natl Park and Greenbriar Park in Ft Collins.

Secretary's Corner
From Chad Moore

On June 5th I attended a meeting of the Denver Astronomical Society to see the lot of urban astronomers to our south. Like NCAS, they feature a guest speaker every month, this month being a presentation by astro-engineer Laura Ellen Dafoe on the Descent Imager / Spectral Radiometer aboard the Huygens probe. The talk was interesting, not only for the science and discoveries, but also for the inevitable glitches, work-arounds, and triumphs that space exploration is known for. While I watched the blurry pictures in fascination back in 2006, I had not yet seen the final rendered terrain images of the hazy moon. The Titan descent video was amazing, revealing a landscape seeming like a hybrid of Mars and an Earthbound reservoir in a drought year. Imagine a world where H_2O behaves like SiO_2 does on Earth, and CH_4 behaves like H_2O.

The club president, Ron Mickle, was gracious and welcoming, and the meeting had a nice touch with "chief observer" Jack Eastman giving a few highlights in the June sky. The club has about 300 members, of which 50 attended the meeting along with 20+ non-member guests and interested public. After the meeting about half the crowd retired to the Chamberlain Observatory, 6 blocks from the meeting location on the DU campus. What a gem that observatory is! A 20" F~16 Clark Refractor is the heart of the 1894 stone building. Spinning clock drives, wood observing ladders, the iron pier, and the tin dome amplify the historic appeal of this telescope, the 12th largest Clark in operation. With the full moon and an urban setting, the scope was somewhat restrained. Saturn at 350x was a crowd pleaser, but the M63 galaxy eluded the operator under the limiting magnitude 4.8 skies.

Like NCAS, the DAS has their hands full with outreach and an observing schedule to satisfy the die hard observer. It might be interesting to do a joint observing session with them sometime. On another note, the Rocky Mountain Star Stare is at a new location this year at Wet Mountain Valley. By June 1, the star party had already filled its quota of about 250 people. Missing that registration window, I'll be off to the Nebraska Star Party in July, and will bring back a report for the club.

Former NCAS President Thom Peck and Wife Have Asteroid Named in Their Honor
From Tom Teters

Greetings all,
Thom Peck & his wife Twila have had a asteroid named after them, in honor of the astronomy outreach they have volunteered for over several decades. He was the NCAS president about a decade ago and now is in Tucson producing high-precision astronomical mirrors for private, public & government concerns. Twila has been helping with educational outreach programs dealing with astronomy. Among them the Annual Adirondack Astronomy Retreat. (117586)

Twilathom 2005 EV43 2005 03 03 Vail-Jarnac 66243 Jarnac

This is Vail-Jarnac survey, that among others,David Levy has been involved with.
More information at:
http://www.cfa.harvard.edu/iau/lists/NumberedMPs115001.html

Congratulations Thom & Twila !!

The Very Long Mystery of Epsilon Aurigae, by Robert Stencel

See Sky and Telescope, May 2009
http://mysite.du.edu/~rstencel/epsaur.htm

Rocky Mtn Natl Park Beaver Meadows Observing June 2009

The RMNP Beaver Meadows public night on Friday 6/12/09 started off partly-cloudy with a lot of high cirrus clouds. The transparency waxed and waned for the first couple of hours after sunset. We showed the public Saturn, M3, and a couple of doubles, then most of the visitors left by about 10:00 PM, due to the hazy skies. However, things cleared quite nicely by about 10:30 PM in the northern 1/2 of the sky. The Western sky never really became very clear, so we didn't get any good views of Virgo-Coma galaxies, but M51 / M101, etc. in Ursa Major looked nice. However, by 11:30 the skies were pretty much socked-in so the last two of us packed up to go. Unfortunately, after all was packed-up, the Southern 1/2 of the sky cleared beautifully and we got some great binocular views of Scorpius/Sagittarius/Ophiuchus region and the summer Milky Way through to Cygnus and Cepheus. We were pretty tired however, and having packed-up our scopes, we called it a night at midnight. Best part of the night was the amazing seeing (sub-arc second). Got fantastic views of Saturn, double stars (cleanly split Gamma Virginis, Izar, Epsilon Lyrae, and others with only a 6" aperture). Here's hoping for clearer nights on upcoming RMNP public nights!

Clear Skies Soon!!!
- Mike Prochoda (Estes Park)

The June 26 public night opened with Longs Peak enveloped in rolling clouds and some fast-shifting overhead coverage. The group started with about 60 visitors and volunteers brought four 8 inch SCTs, several refractors, and several Newtonians including a 4 inch, 10 inch and 18 inch. The Moon was mostly obscured early. After a few drops of rain at sunset, clouds eventually retreated to less than 50% coverage. Visitors who stayed past 2130 were treated to a glimpse of Saturn, most got a crisp look at M13 overhead. After moonset we had improving looks at M51, M81/82, M97, M57, M101, NGC4565, and NGC7789. The Milky Way was blocked by a wave cloud most of the night, until we quit at 2 AM. Wind picked up periodically to 10+MPH. Patience was rewarded late with a peek at the Veil Nebula and the Dumbell Nebula. It was possible by chasing sucker holes to see M4, M8, M20, M22, M28, B86 and late M16 and M17. Seeing allowed crisp looks at M3, M92, and my favorite M5. M31 was peeking over the trees when we called it a night. Jupiter was awash in a jet stream.

Dan Laszlo, Fort Collins

Rocky Mountain Star Stare 2009

I attended RMSS 2009 near Gardner Colorado on Wednesday 6/17/09 through Sunday morning 6/21/09. As to the site, the Colorado Springs Astro Society chose a real winner! While the drive is substantial (a little over 3 hours South of Denver) the site is beautiful with wide-open meadows fringed by Pinyon/Juniper forest and fantastic views of the Greenhorn Mountain wilderness to the East and the Sangre de Cristo mountains to the West. The site lies at about 7000 feet and is about 3.5 miles up a well-maintained dirt road from SH 69, and about 5 miles North of Gardner, Colorado. Gardner is a tiny town with no light pollution whatsoever, so was not an issue as far as dark skies go. Gardner has a general store, gas station, and liquor store for any needed supplies. The observing site is 35 acres in size and was purchased by CSAS last year as a permanent site for RMSS. They limited registration to 300 registrants this year, as they did not know how many people the land could accommodate. As it was, the main meadow sites felt somewhat crowded on Friday when the most attendees were present, however, there were more remote parts of the site that were not occupied (but they also had trees blocking significant parts of the sky).

I arrived on Wednesday afternoon to significant wind and clearing skies with warm temperatures. By 8 PM the wind completely ceased and observing was excellent with very dark skies and good seeing by 10:30 PM. There were minimal light domes to about 5-7 degrees above the NE horizon due to Pueblo and C. Springs. Some patchy clouds rolled in about 12:30 PM so I called it a night (I had gotten almost no sleep the previous night and the long drive had me totally worn out) but others told me the night cleared completely shortly thereafter and remained clear until dawn.

Thursday was partly cloudy with significant wind during the day, but again the wind calmed completely by dusk and the sky was gorgeous and dark with fair to good seeing until moonrise at about 3 AM when I called it a night. The Milky Way was fantastic and marbled with dark nebulosity - almost as good as Fox Park (I think only the elevation made a difference between RMSS and Fox Park).

Friday was beautifully clear all day and I enjoyed a great morning of mountain biking along some local dirt roads. Many attendees arrived that afternoon, but by dusk the skies clouded over and were socked-in by nightfall. We had no observing at all that night.

Saturday morning greeted me with light rain which persisted on and off all day long. About 1/2 of the attendees (including almost everyone who arrived on Friday) packed-up and went home on Saturday. The clear sky clock looked promising however, so I stayed. By dusk we were greeted to clear skies and a fantastic night of observing followed. I observed until dawn.

Sunday morning was clear and warm and I packed-up and left

for Estes Park with a big smile on my face! I had a great time with 3 out of 4 clear nights of observing (I finally got my photon fix!!!) along with fun times meeting old friends and making some new ones.

The ATM walkabout was great this year and I will post pictures of the event in the next few days.

Of note, the nights were warm (sweater and beenie cap alone kept me warm all night, except on Saturday night (after rains) when I needed typical winter gear as it was in the 40s and clammy). There was no dew except on Saturday (after rains) when I had minor dew on my OTA, but no dew on optics or eyepieces. I WILL return to this site and star party again and again in the future!

Clear Skies,
Mike Prochoda
(Estes Park)

Western Nebraska Stargazing 2009

I have viewed in Glendo and it is dark!! I can't remember any light domes. The closest town is Guernsey and I saw nothing from there. It isn't Fox Park, with it's elevation, but a very good viewing spot withactivities in the day.

I got back from the Western Nebraska Star Gaze IV was great. Two fine nights of viewing. One cloudy night of talking. There was only on mercury light coming from the golf course, but Bruce thought he could get them to control that one next year.

I took a few pictures, but wanted to do mostly viewing, since it has been so long. More later today or tomorrow after I get the pictures. But it was REALLY worth going.
But you folks missed a good if not very small star party.

Think cosmic !!

Tom Teters

I spent Friday night with the Panhandle Astronomy Club at Courthouse Rock, 5 miles south of Bridgeport NE. The skies were very dark with no light pollution except for a couple of farm lights. The sky was very clear and stable until about 1:30 AM. I found 15 Messier objects star hopping I had not seen before including 10 that I sorted out in the Virgo cluster.
It was cloudy all day Saturday so I left when it didn't look good for the night. It was a small but great star party,

Dave Bender
12" Modified Celestron Star Hopper
BASS, DAS

Foxpark June 2009

Well the mosquitoes were out (though not as bad as I've seen them).

The RTVers were out (I counted 24 campers/RVs) but they were quite civilized and only produced some intermittent light annoyance. It got cold - probably around 28F. But the stars were out! It ended up being a perfect Foxpark night. Clouds didn't even begin to make an appearance until about 3am - by then I was done.

I logged a personal best of 85 galaxies (and no GOTO) - though that isn't as hard as it seems with Virgo still up well enough in the Southwest. That's why I wanted Foxpark - on a good night you can observe down almost to the tree tops. I also did some deep galaxy hunting. Does anyone know the name of the galaxy cluster in SW Hercules (just east of the head of Serpens Caput)? I was catching some fleeting photons from the group that contains NGC 6041. I saw six galaxies that are cataloged between magnitude 14.6 - 15.3. And that was with my 12.5 inch Newtonian. That's the faintest I've ever seen. I couldn't hold any of them steady, they would come and go. The faintest I only got a fleeting glimpse but I confirmed it was the galaxy using a photographic finder chart and matching to adjacent star positions. It was like seeing Saturn for that fleeting instant when the air is just right - then it was gone. All in all it was the best observing night of the season.

John Figoski

Live Earth from DISH Network, from Randy Moench

I was channel surfing on Dish Network the other day and discovered they are now broadcasting a live view of Earth from their satellite in orbit 22,000 miles up. The picture updates about every 15 seconds. Its pretty cool. Channel 212

Wyoming Infrared Observatory Accepting Applications From Leonard Sitongia

I just saw the following announcement and am passing it along. I don't know the details.

PUBLIC OBSERVING TIME AT THE WYOMING INFRARED OBSERVATORY
As the recipient of an NSF PREST grant, the Wyoming Infrared Observatory is offering time to the community on the 2.3 m telescope between 2009 July and 2012 June. Currently available instruments include an optical prime-focus camera and an optical longslit spectrograph. Both service and visitor observing modes are available. We are also willing to entertain the possibility of visitor instruments. Although we cannot provide funding for travel or subsistence, we can offer visiting astronomers free lodging at the observatory. Proposers should consult the WIRO web page at http://physics.uwyo.edu/observatories and are encouraged to contact observatory director Chip Kobulnicky (chipk@uwyo.edu) for additional information prior to the quarterly proposal submission process.

Best Looks

Moon By Jupiter Jul 10; by Venus and Mars Jul 18, 19
By Saturn July 24;

Mercury Difficult in WNW dusk, last week
Venus In E predawn
Mars In E predawn
Jupiter In SE in morning
Saturn High in S evenings. Ring tilt 4 degrees
Uranus In SSE predawn in Pisces
Neptune By Jupiter all month in Aquarius

International Space Station Passes for Loveland – Fort Collins July 2009

Date	Mag	Starts			Max. altitude			Ends		
		Time	Alt.	Az.	Time	Alt.	Az.	Time	Alt.	Az.
30 Jun	-0.4	01:47:26	17	NE	01:47:26	17	NE	01:48:19	10	NE
30 Jun	-0.1	03:20:05	10	NW	03:21:20	12	NNW	03:22:35	10	NNE
30 Jun	0.2	04:57:00	10	N	04:57:35	10	N	04:58:10	10	NNE
1 Jul	-0.6	02:10:37	19	NNW	02:10:37	19	NNW	02:12:35	10	NNE
2 Jul	0.1	01:02:16	11	NE	01:02:16	11	NE	01:02:22	10	NE
2 Jul	0.1	02:34:13	10	NW	02:35:25	12	NNW	02:36:37	10	NNE
2 Jul	0.3	04:11:00	10	N	04:11:40	11	N	04:12:20	10	NNE
3 Jul	-0.2	01:25:15	17	N	01:25:15	17	N	01:26:35	10	NNE
3 Jul	0.0	04:34:54	10	NNW	04:36:44	15	NNE	04:38:33	10	ENE
4 Jul	0.2	01:48:15	10	NW	01:49:25	12	NNW	01:50:36	10	NNE
4 Jul	0.4	03:24:54	10	N	03:25:40	11	N	03:26:26	10	NNE
4 Jul	-1.0	04:59:01	10	NW	05:01:37	28	NNE	05:04:10	10	E
5 Jul	-0.2	00:39:10	16	N	00:39:10	16	N	00:40:30	10	NNE
5 Jul	0.0	03:48:48	10	NNW	03:50:41	16	NNE	03:52:32	10	ENE
5 Jul	-0.7	23:29:18	17	NNE	23:29:18	17	NNE	23:30:13	10	NE
6 Jul	0.3	01:02:12	10	NW	01:03:20	12	NNW	01:04:27	10	N
6 Jul	0.5	02:38:44	10	N	02:39:34	11	N	02:40:23	10	NNE
6 Jul	-1.2	04:12:53	10	NW	04:15:30	30	NNE	04:18:06	10	E
6 Jul	-3.5	22:13:51	10	SW	22:16:45	71	SE	22:19:40	10	ENE
6 Jul	-0.3	23:50:09	10	WNW	23:52:14	18	NNW	23:54:19	10	NNE
7 Jul	0.0	03:02:37	10	NNW	03:04:32	16	NNE	03:06:26	10	ENE
7 Jul	-3.4	04:37:12	10	NW	04:40:11	84	SE	04:42:58	10	SE
7 Jul	-2.0	21:03:56	10	S	21:06:13	21	SE	21:08:30	10	E
7 Jul	-1.6	22:38:34	10	W	22:41:17	35	NNW	22:44:01	10	NE
8 Jul	0.4	00:16:05	10	NNW	00:17:09	11	N	00:18:13	10	N
8 Jul	0.4	01:52:31	10	N	01:53:24	11	N	01:54:16	10	NNE
8 Jul	-1.3	03:26:40	10	NW	03:29:19	31	NNE	03:31:56	10	E
8 Jul	-2.2	05:02:01	10	WNW	05:04:26	24	SW	05:06:50	10	SSE
8 Jul	-3.5	21:27:36	10	SW	21:30:31	75	SE	21:33:26	10	ENE
8 Jul	-0.2	23:03:57	10	WNW	23:06:01	17	NNW	23:08:04	10	NNE
9 Jul	-0.1	02:16:22	10	NNW	02:18:18	16	NNE	02:20:14	10	ENE
9 Jul	-3.5	03:50:56	10	NW	03:53:51	86	SW	03:56:43	10	SE
9 Jul	-1.4	21:52:18	10	W	21:55:01	34	NNW	21:57:43	10	NE

9 Jul	0.4	23:29:51	10	NNW	23:30:53	11	N	23:31:55	10	N
10 Jul	0.4	01:06:12	10	N	01:07:08	11	N	01:08:03	10	NNE
10 Jul	-0.5	02:40:22	10	NW	02:41:04	15	NNW	02:41:04	15	NNW
10 Jul	-3.4	20:41:16	10	SW	20:44:11	79	SE	20:47:07	10	NE
10 Jul	-0.1	22:17:41	10	WNW	22:19:42	17	NNW	22:21:43	10	NNE
11 Jul	0.0	01:30:00	10	NNW	01:30:51	14	N	01:30:51	14	N
11 Jul	-1.3	21:05:58	10	W	21:08:39	33	NNW	21:11:20	10	NE
11 Jul	0.4	22:43:31	10	NNW	22:44:32	11	N	22:45:33	10	N
12 Jul	0.3	00:19:46	10	N	00:20:46	11	N	00:21:45	10	NNE
12 Jul	-0.1	21:31:18	10	WNW	21:33:18	17	NNW	21:35:18	10	NNE
13 Jul	0.1	00:43:33	10	NNW	00:44:21	14	N	00:44:21	14	N
13 Jul	0.3	21:57:07	10	NNW	21:58:05	11	N	21:59:04	10	N
13 Jul	0.1	23:33:16	10	N	23:34:19	11	N	23:35:22	10	NNE
14 Jul	-0.2	20:44:50	10	WNW	20:46:48	16	NNW	20:48:46	10	NNE
14 Jul	-0.3	23:57:01	10	NNW	23:58:26	16	N	23:58:26	16	N
15 Jul	0.2	21:10:38	10	NNW	21:11:34	11	N	21:12:28	10	N
15 Jul	0.0	22:46:42	10	N	22:47:47	12	N	22:48:52	10	NNE
16 Jul	0.1	00:20:55	10	NW	00:21:16	12	NW	00:21:16	12	NW
16 Jul	-0.7	23:10:25	10	NNW	23:12:30	18	NNE	23:12:42	17	NNE
17 Jul	-0.1	22:00:03	10	NNW	22:01:10	12	N	22:02:17	10	NNE
17 Jul	-0.7	23:34:16	10	NW	23:35:35	21	NNW	23:35:35	21	NNW
18 Jul	-0.8	22:23:43	10	NNW	22:25:50	18	NNE	22:27:02	14	NE
18 Jul	0.1	23:58:23	10	WNW	23:58:28	11	WNW	23:58:28	11	WNW
19 Jul	-0.3	21:13:19	10	NNW	21:14:28	12	NNE	21:15:36	10	NE
19 Jul	-1.9	22:47:32	10	NW	22:49:57	36	NNE	22:49:57	36	NNE
20 Jul	-1.0	21:36:56	10	NNW	21:39:04	18	NNE	21:41:12	10	ENE
20 Jul	-1.0	23:11:37	10	WNW	23:12:53	23	WNW	23:12:53	23	WNW
21 Jul	-2.3	22:00:43	10	NW	22:03:29	38	NNE	22:04:24	29	ENE
22 Jul	-1.1	20:50:04	10	NNW	20:52:13	18	NNE	20:54:22	10	ENE
22 Jul	-3.0	22:24:46	10	WNW	22:27:23	59	WSW	22:27:23	59	WSW
23 Jul	-2.4	21:13:48	10	NW	21:16:35	39	NNE	21:18:58	13	E
23 Jul	-0.7	22:49:30	10	W	22:50:24	15	WSW	22:50:24	15	WSW
24 Jul	-3.1	21:37:49	10	WNW	21:40:42	61	SW	21:42:01	28	SSE
25 Jul	-2.4	20:26:48	10	NW	20:29:36	40	NNE	20:32:22	10	ESE
25 Jul	-1.1	22:02:32	10	W	22:04:34	17	SW	22:05:07	17	SSW
26 Jul	-3.0	20:50:47	10	WNW	20:53:40	59	SW	20:56:31	10	SE
27 Jul	-1.0	21:15:29	10	W	21:17:29	17	SW	21:19:28	10	S
29 Jul	-0.8	20:28:21	10	W	20:30:19	17	SW	20:32:15	10	S

http://www.heavens-above.com/main.aspx?lat=40.4997&lng=-105.05736&loc=Fort+Collins+CO+USA&alt=0&tz=MST