

Vol 39 No. 4

Bringing Astronomy to the Public –

January 2023

President's Message

Pat Donnelly

As I write this column, the year 2022 is rapidly ending. It was a great year... if you liked sports. However, for FPOA, it was less than optimal. This year has been a rough year for conducting public programs at the peak. We were only able to conduct half of our scheduled solar and evening programs due to adverse weather conditions. Also, our attempt to restart the intern program fizzled. We had a couple volunteer interns, who both had difficulties with travel and weather uncertainties and needed to cancel. Although several evening programs were lost, the Star-BQ (or the FPOA Annual Members Meeting) was a success, and weather cooperated. I am cautiously optimistic that 2023 will be a better year for the FPOA and its activities.

I would like to report that we have two new FPOA officers elected during the November 2022 FPOA Board Meeting. Lenore Edman will serve as Secretary, and Windell Oskay will serve as Vice-President. Rob Hawley and I remain as Treasurer and President, respectively. I want to thank Eric Egland for all his work as Secretary over the last few years. He performed his job well, in addition to generating the newsletter, taking care of our social media sites, and as foreman of construction and maintenance. Thank you again Eric. Finally, I wish to thank Chris Angelos for dedicated service as

2023 Program Dates

Saturday Evening Programs

March	18, 25	July	8, 15, 22
April	15, 22	Aug.	12
May	13, 20, 27	Sept.	9, 16, 23
June	10, 17, 24	Oct.	7, 14, 21

Solar Programs

March	18	July	15
April	15	Aug.	12
May	13, 27	Sept.	9
June	10, 24	Oct.	7

Board Meetings

Jan.	21	May	20	Sept.	16
Feb.	18	June	17	Oct.	14
Mar.	25	July	22	Nov.	11
April	22	Aug.	19		
Annual Meeting Star-BQ Aug. 1					19

Please check our web <u>Schedule</u> for updates

our Vice-President for the last three (3) years.

2022 was a spectacular year for space exploration. The James Webb Telescope launched into space and currently orbits the L2 Lagrange Point. Astrophotos from the telescope continue to exceed all expectations. I was especially thrilled to see the photo of Neptune capturing the planet, the rings, and a couple of moons. Webb's spectral capabilities are quite helpful to see all the detail. You really should check this image out, if you have not seen it yet. The other space spectacular was the successful Artemis Mission to the moon and back. The purpose of the mission was to test the equipment that will take people back to the moon. It looks like we will be returning to moon in the near future. I recently watched the occultation of Mars by the Moon and the excellent configuration of the Moon-Venus-Mercury after sunset Christmas Eve.

During this time of the year, there are many fascinating objects in the night sky that are mostly neglected by amateur astronomers. Here are two (2) of my favorite neglected objects. The first is the variable star R Leporis (R Lep). R Lep is a Mira type variable with a period of approximately 430 days. It varies in magnitude from +6 to +10. What is fascinating about this star is its color. R Lep is a red carbon star. It may be the reddest star in the sky. Several individuals could not believe the intense red color, when they first observed the star through the telescope. The other object is Omicron-2 Eridanus (40 Eridani). 40 Eridani is a gravitationally bound, triple system in a configuration similar to the Sun-Earth-Moon system. The brightest star is a yellow dwarf with a white dwarf star orbiting it and a red dwarf star orbits the white dwarf. The magnitudes and angular separations are such that any 4" or larger telescope will easily resolve the system. The white dwarf is the easiest white dwarf star in the sky to observe. You really should check out both of these objects, if you get the chance.

Let me conclude this article by wishing that all of you have a very successful and

happy 2023. I hope to see many of you at the peak starting in March.



Observations



PD

Rob Hawley, Mateusz Kulikowski

Member news and insights from observing at FPOA and abroad. Send stories to **editor at fpoa.net**.

New Weather Resources Rob Hawley

This year has been an especially challenging one for weather. In a typical year we might lose a program or two in spring due to lingering winter weather. We might also lose one in June or early July due to the monsoon. By August we should have clear skies (modulo an early winter). This year we lost programs throughout the entire season. This led me to search for a better way of warning about upcoming weather problems so we could appropriately staff. The techniques I used in the first part of the year are presented in the <u>August 2022</u> Observer.

Since that article I discovered two websites which may offer a better solution, particularly for short term forecasts; Windy.com and Ventusky.com (the latter also has an excellent <u>iPad app</u>). Each of these offers direct access to pro weather models other sites use such as ClearOutside and the US aviation forecast. Both of these offer a premium option which you should subscribe to if you are serious about this. Since these offer direct access to the weather models, a little background is required

Weather Models

There are a number of numerical models used by the world's weather services. These each have their own characteristics and differ in their quality. Here are the main models presented by these tools:

MODEL	DURATION	RESOLUTION	UPDATE FREQUENCY
HRRR	36 hrs	3 km	1-2 hrs
ECMWF	7 days	9 km	0, 6, 12, 18 UTC
ECMWF	9 days, but limited	35 km	0, 6, 12, 18 UTC
ICON	5 days	13 km	6 - 7 hrs

HRRR is a high resolution, frequently updated, short-term forecast. Its highresolution means (or seems to mean) that it understands surface altitude and is precise enough that it does not lump the peak in with Salinas or Hollister.

ECMWF (9km) is generally considered the best mid-range forecast. It may also offer good short-term forecast if you work around its limitations of poor resolution. It will give a fairly reliable indication on Thursday if weather might be a problem on Saturday. The 35 km display that is available on Ventusky is quite limited.

ICON is a German global forecast; ECMWF is considered more accurate.

Both ECMWF and ICON also make longer predictions, but the accuracy rapidly falls off.

Display Websites

Both Windy.com and Ventusky display some of these models. Differences lie in the presentation and the choice of models.

Windy.com is a set of Lego bricks. To use it, choose a model to use, then the time frame, and then select what to display. For temperature, humidity, and wind, we plug in pressure altitude (weather forecasting is done at constant pressure in lieu of elevation). Use either 925 or 900 hPa (1 hPa

> = 1 mbar) to match our typical FPOA pressure altitude range. It offers a prediction of cloud bases and tops.
> From my experience, the latter is useless and the former is suspect.

Ventusky is more packaged. The user selects a piece of information and a prediction time, and Ventusky automatically selects the model. It picks HRRR when it can. It uses ICON for most longer timeframes. Thus, it is more solution focused and requires less knowledge of what is going on under the hood. It is the best choice on Friday for Saturday's weather.

One disadvantage of Ventusky is that its access to the ECMWF model is limited. The version of ECMWF offered is the 35 km version which has limited options. Forecasts more than 48 hrs. out switch to ICON which is considered inferior to ECMWF. So, if this is Wednesday and you are looking at Saturday's weather you should use the ECMWF forecast in Windy.com (with a premium subscription).

Results so far

I have been using these tools since I discovered them in late August. From my experience, these come with some caveats. (1) The models may not agree. HRRR has the advantage that if weather conditions are changing it may update to reflect the change. ECMWF is updated at 5 PM PDT and then not again until the program is over. If conditions are rapidly changing, its single 0000Z forecast may lock in an obsolete answer. However, if it is 7 AM and you want to predict that night, it is pretty much apples to apples.

(2) Even though HRRR is high resolution, it does not predict what happens when moist air is blown over the peak. On one night it correctly predicted that <u>most</u> of its 3 km square around the peak would be clear. Unfortunately, we were not in the "most". We did get a heads up for Peak fog since it predicted we were at the inversion height where clouds collect. The Ft Ord profiler confirmed fog at the Peak, but as an observation.

(3) There was an evening where high clouds were forecast to clear near the end of the program. At 7 AM ECMWF predicted an earlier clearing. HRRR predicted a later one. Each time HRRR updated, the model advanced the clearing time. Ditto the time when HRRR predicted high winds and the others more moderate. HRRR eventually converged with the others, but we had already posted a "weather may affect programs" alarm.

Despite these misfires, HRRR has been a reliable tool to predict when we will have a good weather night (especially when ECMWF offers a concurring second opinion). Neither model may be enough if we have the local effects described above.

Using the Tools

These seem to offer better observatory weather insights than any of the individual sources I discussed in August. To get the best picture of what the weather will be, I would ask the weather models for

- Clouds at each height (low, medium, high). "Low" might include the observatory.
- Temperature (each level from the surface through 900 hPa, See below)
- Humidity (on Windy, w/o a dedicated setting, set atm. pressure to 925 or 900)
- Wind (on Windy, w/o a dedicated setting, set the atmospheric pressure)

One important detail in May through September is whether there is a <u>temperature inversion</u>. An inversion traps the normal coastal stratus. In a normal year, this layer should be below us. This year it often was not. To predict where the layer is expected, see if there is an increase in temperature as the pressure decreases. (Please see my discussion in the <u>August</u> Observer)

Figure 1 (p. 5) shows an inversion. If that change happens within the 950 – 900 hPa range, watch out. If the temperature decreases with pressure, then there is no inversion. The picture illustrates an evening program that is probably OK, but not assured. <u>Predicting the inversion is the most</u> important value add of this extra work.

With no inversion, the observatory may be subject to clouds on the peak especially with high humidity and a west wind. At the Peak, I combine this with the SNS aviation forecast for cloud base height and the Ft Ord profiler to detect what level the inversion is located at.

There is a technique on Windy.com where you can find the current mapping of pressure to altitude or an indication of seeing, but these are out of scope for this article.



Figure 1 – Ft. Ord profiler shows a relatively steady Inversion layer hovering at about 925 hPa through the night of 5/25/05

Summary

So... are these tools useful? No weather model is 100%. I have provided my experience using these from the middle of August through October. At this point, there isn't a clear winner (but I am fine with the more complex Windy). As an example, I <u>captured the predictions and display</u> of an oncoming post-Thanksgiving weather system. Next summer I will update this to ensure Peak weather relevance.

I will be interested to see what happens next Spring and Summer when we *expect* programs weather issues.

My current take:

 Windy + ECMWF: 24- 72 hrs. out A good view several days out. However, I would treat this more as a warning that there might be problems rather than as confirmation of good viewing. However, more work is required to understand predictions well.

- Windy + ECMWF: < 24 hrs. out Not an inaccurate forecast of evening conditions, though not updated after 5 PM PDT. ECMWF corrected a couple of errors that HRRR made for area-wide weather (high cloud departure and winds). It does not have the resolution necessary for low cloud predictions.
- Windy + HRRR

The cloud extents have more levels of shading (easier to see predictions of 100% cloud cover vs less). Still, I would treat any shading as a warning. The higher resolution might be helpful in some cases. If it shows the peak surrounded, evening observing might be at risk. I would confirm the cloud base with the METAR from SNS, and build the temperature vs humidity plot described above.

• Ventusky + HRRR

An easier way to view the shortterm forecast. This might indicate if clouds are going to affect the peak (check METAR from SNS). "Surface" seems to reflect the observatory elevation if you get the sample at the right place (36 45 38, 121 20 3). Ditto the previous comments on HRRR. The Ventusky app provides convenient access on the peak.

Ventusky + ICON

Only as an indication of completely clear vs needing to look again when HRRR is available Friday morning.

Let's hope that next year, these tools will only predict clear, dry skies at 925 hPa with clouds below us. And remember, you can always look at the <u>fire cameras</u> for a real time weather view, or watch for public night weather status updates on the FPOA website.

RJH

Electronically Assisted Astronomy Mateusz Kulikowski

Last year I enhanced public programs at FPOA with Electronically Assisted Astronomy (EAA).

Visual observation, "hands-on" astronomy, requires good eye sight, dark skies and large aperture telescopes. Because human eyes have limited low light vision, many of the deep sky objects appear as blurry grayscale blobs and even more are not visible at all.

EAA improves on visual observation using a digital camera and short exposure images.

Improvements over visual observing:

• Images are sharper, and in full color, even for people with bad eyesight.



Figure 1 - M106 single frame at 30s exposure



Figure 2 - M106 10 frame stack at 30s each (300s)



Figure 3 - M106 31 frame stack at 30s each (930s)

 More objects can be observed - both small (galaxies) and very large (like Barnard's Loop), including HII regions and dark nebulae that are very hard to observe visually.

- Light pollution is less relevant; EAA is possible even in the middle of big cities during full moon (although dark sky is still preferred).
- Images can be saved and processed later (beneficial for those with poor drawing skills).
- Images can appear live as single frames, but EAA is also able to do live stacking which combines multiple images together adding more detail and reducing noise as time passes. On the previous page (Fig. 1-3), there are three stacked images of Messier 106 (taken during EAA session in May) with increasing 30s subframe counts: [1, 10, 31]. While a single frame is noisy, a 10frame stack (5 min total observation time) shows nebulae inside the galaxy.

EAA sessions will return this year (weather and time permitting).

Imaging Gear:

Cameras:

- Imaging camera: QHY 268C, 26 MPix cooled color CMOS camera
- Software: Sharpcap

Telescopes:

- May 22: Celestron EdgeHD 8" SCT with 0.7 reducer lens (~1400mm, f/7)
- Sep 03: Explore Scientific ED80 80mm F/6 APO Refractor
- Sep 25: Orion 10" f/4 Newtonian with coma corrector

Filters:

Most images done with UV/IR cut (also known as luminance filter). I also used Optlong L-extreme - dual narrowband Ha/O3 filter for dim nebulae (like Crescent).



Figure 4 - Here's a day photo of my setup at my kid's school; the same as for the May FPOA evening program



Setup Photos:

Figure 5 - My Newtonian setup from the September 25th FPOA evening program



Figure 6 - An example of live stacking from the May 22nd FPOA evening program

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Facilities

Eric Egland

It's been a quiet winter season for facilities, aside from some adjustments to the roof alignment bracket. The rolling roof guide backet with the roof park alignment mark only has one back bolt and can move.



Until we replace the bolt, please call Facilities (telescope operation manual) if the shutter brace fits tight or loose with the marks aligned.

Other improvements include a rotary dimmer for the lecture room white lights to prevent eye strain, and new long life red LED pad bulbs.

Rob Hawley recently installed a new



weather station at the observatory with

three wireless external sensors reporting temperature and humidity. Outside at both stairs, and inside the telescope room. Windell Oskay kindly made a dark red acrylic cover for the station to keep it dark adapted.

We've started looking at improvements to the observing ladder. How to improve observer access to vertical telescope positions; improve ladder safety and stability; and to add additional utility (lens holder). Windell Oskay is testing some designs with modeling software and we can make some basic improvements (new wheel bearings) to improve things in the short term. In the long term, a subfloor overlay will improve stiffness and stability of the observing ladder.

ETE

Support



Thanks to those who renewed in 2022. FPOA receives most of its income from Memberships. Most of the annual members are now Observers.

For those that have not renewed we still need your support. Contributions cover our observers, our phone, insurance, etc.

Please also consider volunteering, it's great fun and a service to our community. Please see <u>back page</u> for details.

New 2023 Board Members

The Board elected several new members for 2023 at the November meeting; Secretary Lenore Edman, VP Windell Oskay, and board alternate Jeff Shapiro. Pat and Rob will continue in their roles as President and Treasurer. 2024 Board members will be elected for a three-year term by paper ballot on August 19. To request a position on our board, please submit a board ballot placement request by August 13.

Membership Renewal

Rob Hawley

FPOA Memberships are for 12 months with Observer memberships available as a separate option. Please use our web enrollment forms on the membership page to join or renew.

Members <u>may pay with PayPal</u> or mail a check to the address below:

FPOA Membership c/o Rob Hawley 1233 Hillcrest Dr. San Jose, CA 95120



Feature Photos

Please submit Spring issue photos to the <u>editor</u> by Feb 1st



Above: A view south of incoming fog from the bench. Fog came right up to the observatory, stayed low, and we opened up in a clearing inversion layer.

A wandering visitor and a tarantula about its business

Below: Jeff picks a lens







Top left: Pat and Rob setup the solar program. Weather was an issue throughout the season.

Below left: A sunset glow in the west lecture room window





We walked around the new LED bulbs, discussing brightness options vs. seeing and finally agreed that we have an improvement in durability and reliability. We'll see how they hold up over the winter. Lamp bases oxidize...

Left and Below: Sunset photos on Intl. Mountain Day, capturing a little alpenglow to the north and a view over the south ridge toward sun glint from the Elkhorn Slough Natural



Left: Moving the ladder around to get a sense of difficult observation positions. Some observers would like to get closer to the telescope, but the base hits the piers. Wish list also includes steadier observing with a lens holder at the top of the ladder.

Below: The ladder hand rail just clears the south flashing





Skyglow is an increasing issue north and to the east of the observatory. Here we see lights of Murphy Hill south of Watsonville, SJB infill development, and skyglow from Gilroy and Morgan Hill.

The SETI CAMS networking dish glows transferring video capture data from meteor streaks.



Astroscan in Repose

Observing Reservations



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Please send the following information **48 hours in advance** to:

schedule at fpoa.net

- Member name
- Reservation date
- Estimated arrival time
- Duration of stay
- Number in party
- Vehicle description and license plate
- Specific observing site request (pad)

Public Program Volunteers



• Also, please email name, vehicle, and the program date to *schedule at fpoa.net*.

Fremont Peak Observatory Association

Box 1376, San Juan Bautista, CA 95045

Phone Number:

General info Schedule Membership Editor Treasurer

Website: Facebook: Twitter: (831) 623-2465

info at fpoa.net schedule at fpoa.net membership at fpoa.net editor at fpoa.net treasurer at fpoa.net

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Officers and Directors 2023

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Ron Dammann

Rob Hawley

Rob Hawley

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Dates and Delivery

Members, The Observer is now sent by email and posted on our website at <u>FPOA Observer online</u> Please send email updates to *membership at fpoa.net.*

The *Fremont Peak Observer* publishes four times a year following Winter, Spring, Summer and Fall. We welcome articles and photos from our members. Please email those to *editor at fpoa.net* by Mar. 1, June. 1, Sept. 1 and Dec. 1 in plain text or Word format.