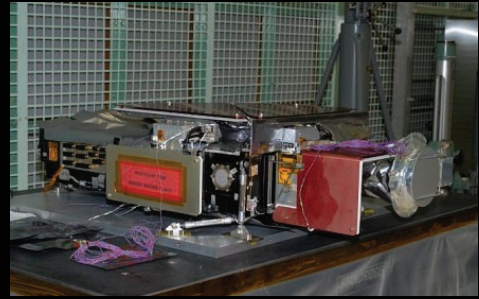


PRIMEFOCUS

Tri-Valley Stargazers



June 2016



Meeting Info

What:

The Sun - Inside and Out

Who:

Prof. Phil Scherrer

When:

June 17, 2016

Doors open at 7:00 p.m.

Meeting at 7:30 p.m.

Lecture at 8:00 p.m.

Where:

Unitarian Universalist
Church in Livermore
1893 N. Vasco Road

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June Meeting

The Sun - Inside and Out

Prof. Phil Scherrer

The Sun is not just the source of light and heat, it also is the source of "space weather" which includes solar flares, coronal mass ejections and other disturbances in space that can cause many effects on Earth. The NASA Solar Dynamics Observatory, launched six years ago, provides us with real time images of the solar corona and the visible surface - the photosphere. We make maps of magnetic fields motion in the photosphere each few seconds, all the time. These provide not just views of what is happening on and above the Sun but also provide us with data to probe the Sun's interior with helioseismology methods. This talk will provide an overview of SDO and some of the things that we are learning.

Visit <http://sun.stanford.edu> for links to our projects.

Professor Phil Scherrer, long-time friend to TVS, does research on the nature and evolution of solar activity and its effects on terrestrial systems. His group's primary emphasis is on the structure and dynamics of the solar interior using techniques of helioseismology and on the source of space weather using solar magnetic field observations. The primary observations from space have been made with the Michelson Doppler Imager instrument on the Solar and Heliospheric Observatory mission (since 1995) and the Helioseismic and Magnetic Imager instrument on the Solar Dynamics Observatory (since 2010). His group also studies solar magnetic fields from the ground using the Wilcox Solar Observatory at Stanford, which has been operating since 1975.

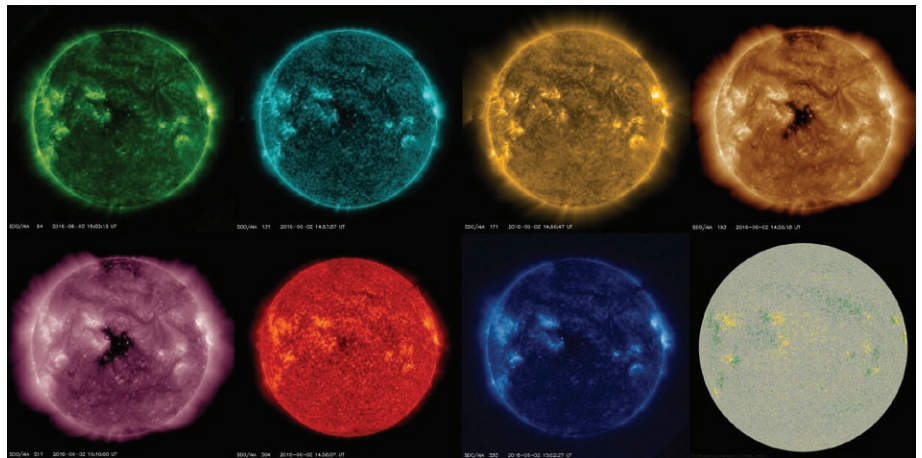


Image Caption: SDO images taken at multiple wavelengths (l. to r., top to bottom): 94A and 131A (flaring regions), 171A (quiet corona), 193A (corona and hot flare plasma), 211A (active-region corona), 304A (chromosphere), 335A (active-region corona), and a magnetogram. See: <http://aia.lmsal.com/public/instrument.htm>

News & Notes

2016 TVS Meeting Dates

The following lists the TVS meeting dates for 2016. The lecture meetings are on the third Friday of the month, with the Board meetings on the Monday following the lecture meeting.

Lecture Meeting	Board Meeting	Prime Focus Deadline
Jun. 17	Jun. 20	
Jul. 15	Jul. 18	Jun. 24
Aug. 19	Aug. 22	Jul. 29
Sep. 16	Sep. 19	Aug. 26
Oct. 21	Oct. 24	Sep. 30
Nov. 18	Nov. 21	Oct. 28
Dec. 16	Dec. 19	Nov. 25

Money Matters

As of the last Treasurer's Report on 5/23/16, our club's checking account balance is \$13,444.20.

Club Star Parties

This year's club star parties will be held on:

Saturday 6/25/16: Tesla Winery Star Party

Saturday 7/9/16: Boy Scout Camp Mines Rd.

Friday-Sunday 7/15-17/16: Yosemite Star Party

Saturday 7/16/16: Boy Scout Camp Mines Rd.

Saturday 7/30/16: Tesla Winery Star Party

Saturday 8/27/16: H2O Open House

Saturday 9/24/16: Tesla Winery Star Party

The Tesla Winery Star Parties will be open to club members and their guests. Start and end times for the parties will be announced later, but we usually plan to arrive at the observing site about 30 minutes before sunset and wrap up around midnight. Our Tesla Winery Star Parties will have a new twist this year. For those wishing to participate, each party will have a different observing theme. Additional suggestions include lunar features observing, planetary night, star cluster observing, beginner's night, and constellation identification. If you have an idea for another theme, please mention it to a board member during any meeting.

Boy Scout Star Parties, July 9 and July 16: Volunteers are needed to bring telescopes to the star parties at the Rancho Los Mochos Boy Scout Camp on Mines Rd. The camp is on the right side of Mines Rd. just before the 15 mile marker, on the way toward H2O from Livermore. The expected start time is 8:30pm. Contact Eric for more information (coordinator@trivalleystargazers.org).

Yosemite Star Party, July 15-17: Eric Dueltgen will be coor-

inating this year's TVS star party at Glacier Point, Yosemite National Park. TVS members who bring telescopes for public observing will receive free camping at the Bridalveil campgrounds. The Moon is 4 to 2 days from being full. On these dates sunset occurs at about 8:25pm with sunrise at about 6:00am. Contact Eric for more information (coordinator@trivalleystargazers.org).

The August 27 H2O Open House will be open to all club members and the public. We will meet at the corner of Mines and Tesla and leave for H2O at 6:30 PM. Admission is \$3/car; please bring the exact amount. The site is primitive, with 2 pit toilets, and no running water. Bring warm clothes, and food and water for the evening. Use a flashlight with a red filter so that people's dark adaptation is not ruined by white light.

Calendar of Events

June 10, 8:00pm

What: Friday Night Hikes

Who: Chabot Staff

Where: Chabot Space and Science Center, 10000 Skyline Blvd., Oakland, CA 94619

Cost: \$15 (does not include admission to the Center), RSVP recommended, Limited space, Call (510) 336-7373

Enjoy a hike through the beautiful redwoods! After the hike, stay and explore other amazing objects in the night sky through our telescopes (weather permitting) or tour the Telescope Makers Workshop. Hike will take place rain or shine.

See <http://www.chabotspace.org/events.htm> for more information, or call (510) 336-7373.

June 11, 8:30pm

What: The Beating Hearts of Galaxies

Who: Dr. Norbert Werner, Kavli Institute, Stanford

Where: Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area

Cost: Free

Did you know that black holes can blow bubbles? Join us on a fascinating journey through the Universe where you will learn about the intimate connection between the intergalactic gas, the birth and death of stars and galaxies, and the growth of supermassive black holes in the centers of galaxy clusters.

For more information see: <http://www.friendsofmonttam.org/astronomy/schedule>

Header Image: The Helioseismic and Magnetic Imager extends the capabilities of the SOHO/MDI instrument with continual full-disk coverage at higher spatial resolution and new vector magnetogram capabilities. PI: Phil Scherrer, PI Institution: Stanford University. See: <http://sdo.gsfc.nasa.gov/mission/instruments.php>

Calendar of Events (continued)

June 13, 7:30pm

What: New Horizons, NASA's Pluto-Kuiper Belt Mission
Who: Dr. Jeffrey Moore, NASA
Where: California Academy of Science, 55 Music Concourse Dr., Golden Gate Park, San Francisco, CA
Cost: Advanced ticketing required. Academy members \$8, Seniors \$10, General \$12. Reserve a space online or call 1-877-227-1831.

In 2006, NASA dispatched an ambassador to the planetary frontier, the New Horizons spacecraft. After 10 years and more than 3 billion miles, on a historic voyage that has already taken it over the storms and around the moons of Jupiter, New Horizons has shed light on new kinds of worlds on the outskirts of the solar system. On July 14, 2015, New Horizons flew 12,500 km (7,800 mi) above the surface of Pluto and continues into rare territory, as just the fifth probe to traverse interplanetary space so far from the sun and the first ever to travel to Pluto.

See www.calacademy.org/events/benjamin-dean-astronomy-lectures for lecture and reservation information.

June 14, 12:00pm

What: Evolution of the Solar System Inferred from Sm-Nd Isotopic Studies
Who: Lars Borg, Lawrence Livermore National Lab
Where: SETI Institute Colloquium, Microsoft Silicon Valley Campus (Galileo Room), 1065 La Avenida St., Mountain View, CA
Cost: Free

Dr. Borg has recently conducted high precision SmNd isotopic analyses of a suite of 11 Martian basaltic meteorites in order to better constrain the age of planetary core formation on Mars. Dr. Borg will show how these data can be used to evaluate the merits and disadvantages of various mathematical approaches that have been employed in previous isotopic work on Martian core formation.

Dr. Borg will explain how late accretional heating of Mars could either be associated with protracted accretion occurring at a quasi-steady state or alternatively be associated with a late giant impact. If this scenario is correct, then accretion of Mars-sized bodies takes up to 60 Ma and is likely to be contemporaneous with planetary core formation.

Dr. Borg will explain how this further challenges the concept that isotopic equilibrium is attained during primordial evolution of planets, and may help to account for geochemical evidence implying the addition of material into planetary interiors after core formation was completed.

For more information see: <http://www.seti.org/csc/lectures>, e-mail info@seti.org, or phone 650-961-6633.

June 21, 12:00pm

What: QUEST! The Search for Life Beyond Earth and Science of the SETI Institute
Who: Bill Diamond, SETI Institute
Where: SETI Institute Colloquium, Microsoft Silicon Valley Campus (Galileo Room), 1065 La Avenida St., Mountain View, CA
Cost: Free

Detail not available.

For more information see: <http://www.seti.org/csc/lectures>, e-mail info@seti.org, or phone 650-961-6633.

June 28, 12:00pm

What: The Evolution and Explosion of Massive Stars
Who: Tuguldur Sukhbold, UC Santa Cruz
Where: SETI Institute Colloquium, Microsoft Silicon Valley Campus (Galileo Room), 1065 La Avenida St., Mountain View, CA
Cost: Free

Massive stars (at least ~8 solar masses) play an essential role to the evolution of the universe. They lose energy in radiation

continued on page 4

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Astronomical League Representative:
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 Laurie Grefsheim
Star Party Coordinator:
 Eric Dueltgen
coordinator@trivalleystargazers.org
Webmaster:
 Hilary Jones
webmaster@trivalleystargazers.org

Web & E-mail

www.trivalleystargazers.org
info@trivalleystargazers.org

TVS E-Group

So how do you join the TVS e-group, you ask? Just send an e-mail message to the TVS e-mail address (info@trivalleystargazers.org) asking to join the group. Make sure you specify the e-mail address you want to use to read and post to the group.

Calendar of Events (continued)

and neutrinos as they evolve, to create elements necessary to life and to stir the interstellar medium. Upon their death, they experience a dynamical instability that often creates spectacular explosions, which are the birth cries of exotic compact remnants - neutron stars and black holes.

The field of evolution and explosion of massive stars has progressed tremendously in the past half-century, yet there are still many issues remain at large. In this talk, soon to be Dr. Sukhbold will provide a generic overview of the problem and will discuss recent developments on surveying the explosion outcomes of massive stars (nucleosynthesis, remnants, light curves) through 1-dimensional calculations.

For more information see: <http://www.seti.org/csc/lectures>, e-mail info@seti.org, or phone 650-961-6633.

July 9, 8:30pm

What: Habitability and Life Beyond Earth
Who: Dr. Nathalie Cabrol, Director, Carl Sagan Center, SETI Institute
Where: Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area
Cost: Free

Dr. Cabrol will discuss the current scientific revolution in astrobiology, with the latest updates from current missions, the existing plans for new ones, and where we stand on our quest to understanding habitability and finding life beyond Earth.

For more information see: <http://www.friendsofmttam.org/astronomy/schedule>

July 18, 7:30pm

What: The Beauty of the Universe as Revealed by Hubble
Who: Zoltan Levay, Space Telescope Science Institute
Where: California Academy of Science, 55 Music Course Dr., Golden Gate Park, San Francisco, CA
Cost: Advanced ticketing required. Academy members \$8, Seniors \$10, General \$12. Reserve a space online or call 1-877-227-1831.

The Hubble Space Telescope is NASA's flagship space science mission. Hubble's long duration and its position in space, providing an unobstructed view of the universe for over 26 years, has led to a dramatic impact on astronomers' knowledge of the universe. Hubble also has become familiar to many non-scientists around the world via traditional media, popular culture, and most recently social media, influencing everyone's understanding of astronomy. One of the many reasons for this is a steady stream of dramatic, colorful images that show us wonders of the cosmos in more detail than ever before and help to communicate Hubble's science discoveries. A combination of objective techniques and more subjective artistic

principles help translate Hubble's exquisite science data into engaging views of cosmic landscapes. Computer modeling and visualization bring motion and volume to these views to illustrate the full depth of the dynamic universe.

See www.calacademy.org/events/benjamin-dean-astronomy-lectures for lecture and reservation information.

Mercury Transit

For the western U.S. the Mercury transit of the Sun on May 9 was underway at sunrise. To image the complete transit, Gert Gottshalk and his wife Sibylle Frolich planned an international imaging campaign, with Sibylle capturing the Mercury ingress and about 2/3 of the transit from Germany, and Gert capturing the latter 2/3 of the transit and egress. However, mother-nature intervened, and we in northern California were clouded out. Luckily, the weather in Berlin was fantastic, and Sibylle captured most of the event in detail (see p. 5).

Sibylle used an Orion 80mm ED Refractor, a Lunt LS60FH alpha Filter, an Imaging Source Camera DMK 41 AU 02.AS (BW), and a Coronado Cemax 2x Barlow. The exposures were 1/60sec, Video 10sec (= 130frames), processed with Registax. To see more of her fantastic Mercury transit images, see: http://drkert.dyndns.ws:8000/merkurtransit_2016/merkurtransit_2016.html

The next Mercury Transit will be November 11, 2019. It will be visible from the U.S., though the transit will be underway at sunrise here in California. First contact is at 12:35UT, second contact at 12:37UT, mid-transit at 15:20UT, third contact at 18:02UT, and last contact at 18:04UT. Plan ahead, as you'll have to wait until November 13, 2032 for the subsequent Mercury transit. Mercury transit information can be found at: <http://eclipse.gsfc.nasa.gov/transit/catalog/MercuryCatalog.html>

Transits of Mercury occur with a 217 cycle. Transits occur in May and November, corresponding to the descending and ascending nodes of its orbit, respectively. November transits occur more frequently because Mercury is near perihelion, and thus from the perspective of Earth there is less parallax. Being closer to the Sun at perihelion, Mercury displays a smaller disk during November transits compared to the May aphelion transits. For more information see: https://en.wikipedia.org/wiki/Transit_of_Mercury

Mercury Transit Photos

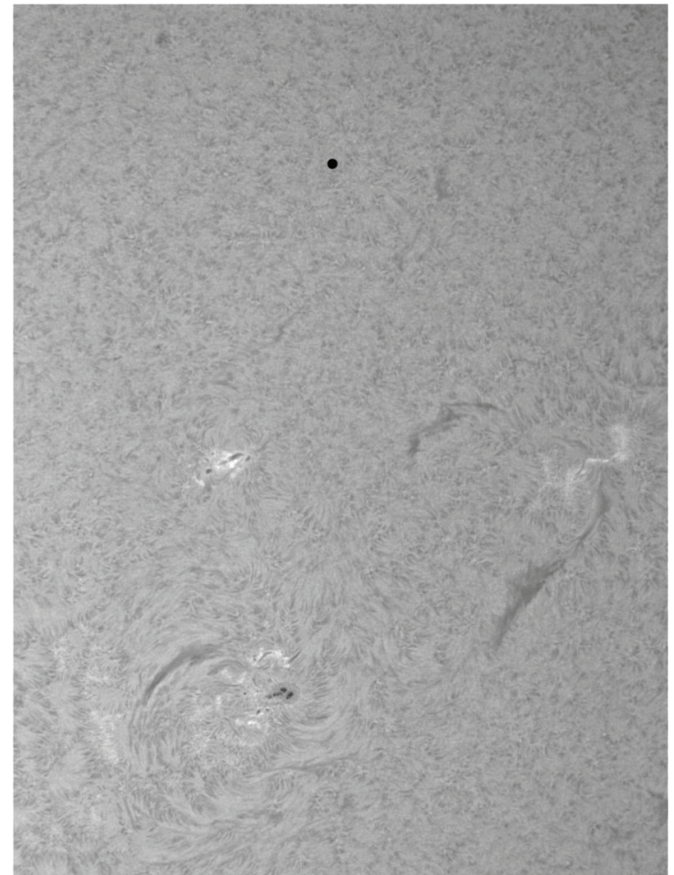
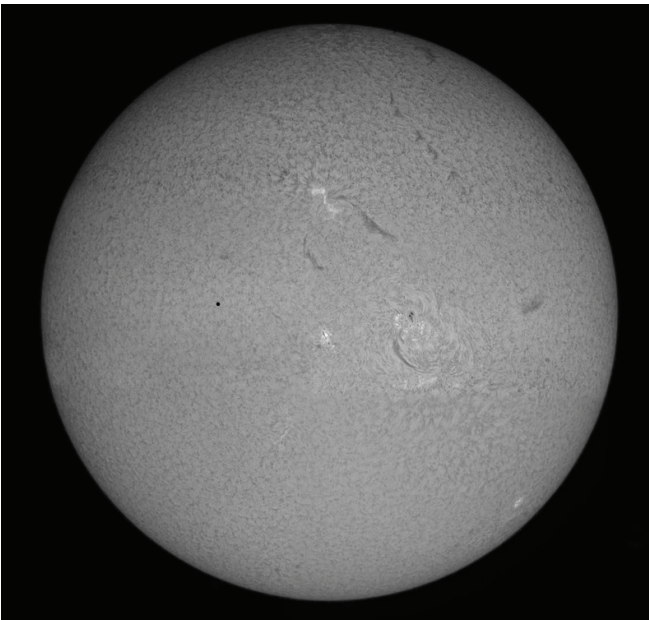
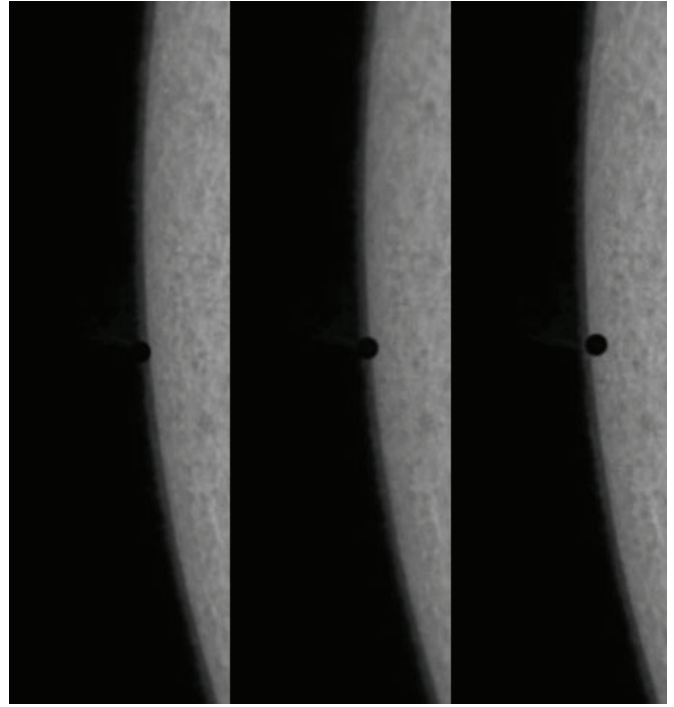


Image Caption: Sibylle Frolich's solar imaging set-up in Berlin (top-left). Sibylle's Mercury transit images from May 9, 2016: Mercury ingress sequence (top-right), Mercury against the full solar disk (bottom-left), and Mercury in the vicinity of Sunspot AR2542 and numerous filaments (bottom-right). For more of Sibylle's Mercury Transit images see: http://drgert.dyndns.ws:8000/merkurtransit_2016/merkurtransit_2016.html

What's Up By Ken Sperber (adapted from S&T and The Year in Space)

All times are Pacific Daylight Time.

June

- 9 Thu Regulus, the brightest star in Leo, is 7 degrees above and left of the crescent Moon (Evening)
- 10 Fri The Moon is halfway between Jupiter and Regulus
- 11 Sat The Moon forms a triangle with Jupiter and Sigma Leonis
- 12 Sun **First-Quarter Moon (1:10am)**
- 14 Tue Spica is 5 degrees below the Moon
- 17 Fri Saturn and Mars, 18 degrees apart, make a wide, flat triangle with the Moon
- 18 Sat The Moon and Saturn are separated by 3 to 5 degrees. Antares is below and to the right of the pair
- 20 Mon **Full Moon (4:02am)**
- 20 Mon Summer Solstice (3:34pm), the longest day of the year in the Northern Hemisphere

July

- 2 Sat Crescent Moon 3-4 degrees to the lower-left of Aldebaran (~1 hour before dawn)
- 4 Mon **New Moon (4:01am)**
- 7 Thu Regulus, the brightest star in Leo, is 3 degrees above and right of the crescent Moon (Dusk)
- 8 Fri The Moon is 4 degrees to the lower-right of Jupiter. Sigma Leonis is <1 degree above Jupiter (Dusk)
- 11 Mon **First-Quarter Moon (5:52pm)**
- 11 Mon Spica is 5-6 degrees below-left of the Moon (Evening)
- 15 Fri The Moon, Saturn, and Antares form a vertical line, setting at about 3am
- 19 Tue **Full Moon (3:56pm)**
- 26 Tue **Last-Quarter Moon (4:00pm)**
- 28 Thu Delta Aquariid Meteor shower peaks (predawn)
- 30 Sat Mercury shines 1/2 degree from fainter Regulus (Dusk)

NOAA's Joint Polar Satellite System (JPSS) to Revolutionize Earth-Watching

By Dr. Ethan Siegel

If you want to collect data with a variety of instruments over an entire planet as quickly as possible, there are two trade-offs you have to consider: how far away you are from the world in question, and what orientation and direction you choose to orbit it. For a single satellite, the best of all worlds comes from a low-Earth polar orbit, which does all of the following:

- orbits the Earth very quickly: once every 101 minutes,
- is close enough at 824 km high to take incredibly high-resolution imagery,
- has five separate instruments each probing various weather and climate phenomena,
- and is capable of obtaining full-planet coverage every 12 hours.

The type of data the Joint Polar Satellite System-1 (JPSS-1) will take will be essential for extreme weather prediction and in early warning systems, which could have severely mitigated the impact of natural disasters like Hurricane Katrina. Each of the five instruments on board are fundamentally different and complementary to one another. They are:

1. The Cross-track Infrared Sounder (CrIS), which will measure the 3D structure of the atmosphere, water vapor and temperature in over 1,000 infrared spectral channels. This instrument is vital for weather forecasting up to seven days in advance of major weather events.
2. The Advanced Technology Microwave Sounder (ATMS), which assists CrIS by adding 22 microwave channels to improve temperature and moisture readings down to 1 Kelvin accuracy for tropospheric layers.
3. The Visible Infrared Imaging Radiometer Suite (VIIRS) instrument, which takes visible and infrared pictures at a resolution of just 400 meters (1312 feet), enables us to track not just weather patterns but fires, sea temperatures, nighttime light pollution as well as ocean-color observations.
4. The Ozone Mapping and Profiler Suite (OMPS), which measures how the ozone concentration varies with altitude and in time over every location on Earth's surface. This instru-



ment is a vital tool for understanding how effectively ultraviolet light penetrates the atmosphere.

5. Finally, the Clouds and the Earth's Radiant System (CERES) will help understand the effect of clouds on Earth's energy balance, presently one of the largest sources of uncertainty in climate modeling.

The JPSS-1 satellite is a sophisticated weather monitoring tool, and paves the way for its' sister satellites JPSS-2, 3 and 4. It promises to not only provide early and detailed warnings for disasters like hurricanes, volcanoes and storms, but for longer-term effects like droughts and climate changes. Emergency responders, airline pilots, cargo ships, farmers and coastal residents all rely on NOAA and the National Weather Service for informative short-and-long-term data. The JPSS constellation of satellites will extend and enhance our monitoring capabilities far into the future.

This article is provided by NASA Space Place. With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology. Visit spaceplace.nasa.gov to explore space and Earth science!

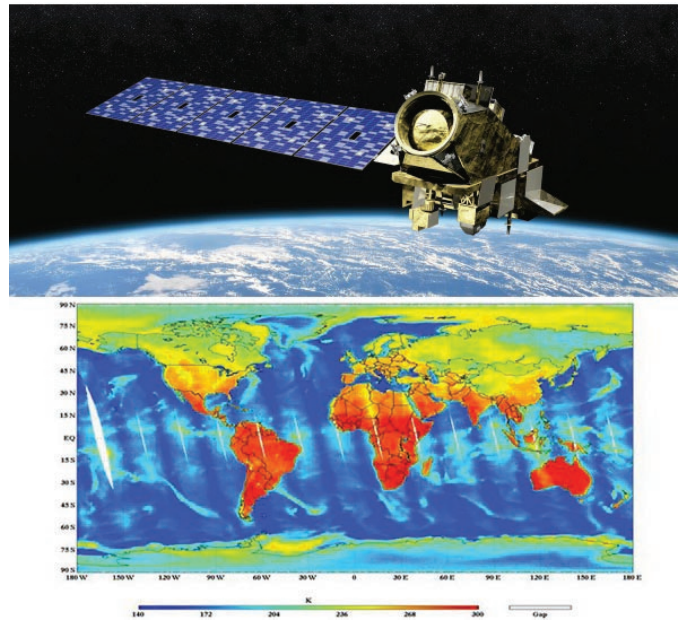


Image Credit: an artist's concept of the JPSS-2 Satellite for NOAA and NASA by Orbital ATK (top); complete temperature map of the world from NOAA's National Weather Service (bottom).



Tri-Valley Stargazers
P. O. Box 2476
Livermore, CA 94551
www.trivalleystargazers.org

Tri-Valley Stargazers Membership Application

(or apply for membership online: www.trivalleystargazers.org/membership.shtml)

Contact information:

Name: _____ Phone: _____

Street Address: _____

City, State, Zip: _____

Email Address: _____

Status (select one): _____ New member _____ Renewing or returning member

Membership category (select one): Membership term is for one calendar year, January through December.

_____ Student member (\$5). Must be a full-time high-school or college student.

_____ Regular member (\$30).

_____ Patron member (\$100). Patron membership grants use of the club's 17.5" reflector at H2O. You must be a member in good standing for at least one year, hold a key to H2O, and receive board approval.

Hidden Hill Observatory Access (optional):

_____ One-time key deposit (\$20). This is a refundable deposit for a key to H2O. New key holders must first hear an orientation lecture and sign a usage agreement form before using the observing site.

_____ Annual access fee (\$10). You must also be a key holder to access the site.

Magazine Subscriptions (optional): Discounted subscriptions are available only to new subscribers. All subsequent renewals are handled directly with the magazine publishers.

_____ One-year subscription to Sky & Telescope magazine (\$32.95).

_____ One-year subscription to Astronomy magazine (\$34).

Donation (optional):

_____ Tax-deductible contribution to Tri-Valley Stargazers

Total enclosed: \$ _____

Member agrees to hold Tri-Valley Stargazers, and any cooperating organizations or landowners, harmless from all claims of liability for any injury or loss sustained at a TVS function. TVS will not share information with anyone other than other club members and the Astronomical League without your express permission.

Mail this completed form along with a check to: Tri-Valley Stargazers, P.O. Box 2476, Livermore, CA 94551.