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EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

Hubble Space Telescope

Celebrating 33 Years of Discovery

Hubble at the 242nd AAS January 2022

Town Halls

NASA Town Hall
Tuesday 6 June, 12:45-1:45 PM Mountain Time

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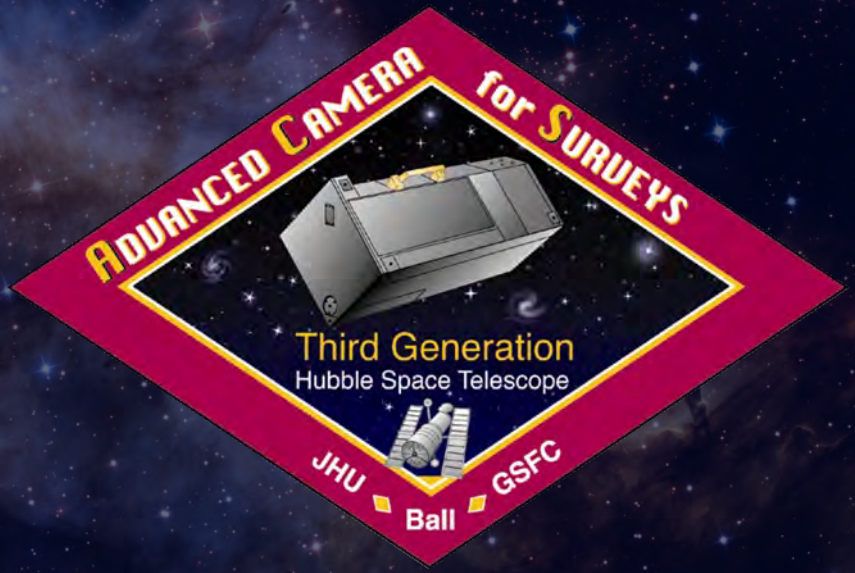
See AAS Job Register

Advanced Camera for Surveys (ACS)



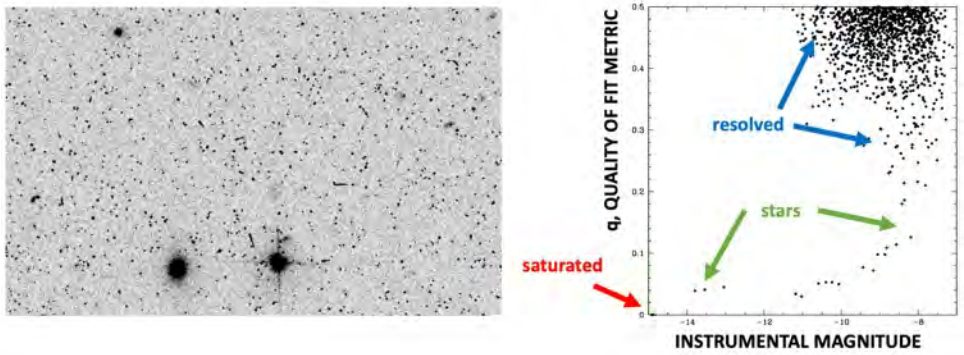
http://www.stsci.edu/hst/acs


Orion Nebula

ACS News and Announcements

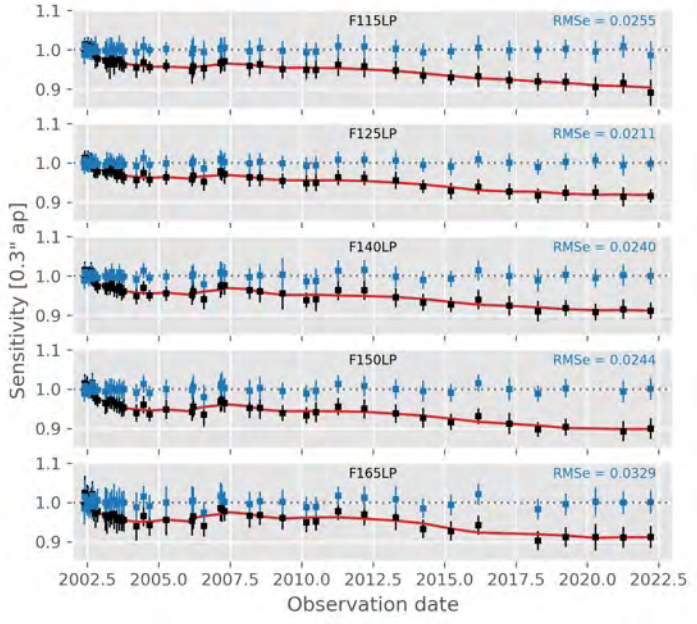
New software routine, *hst1pass*, was publicly released

- Performs PSF-based photometry on HST images (including ACS/WFC and ACS/HRC).
- Uses PSFs from an empirically derived library to measure sources in images, providing high precision photometry, astrometry, and point-source discrimination. (top figure)
- Measures saturated and unsaturated stars and is able to push the measurement into distortion-corrected frames (e.g., *_drz* frames) for easy collation. An early version of *hst2collate* is provided to aid with collation.
- Results presented in ACS ISR 2022-02 (J. Anderson), which serves as a user's manual for the software package.



Recent (Cycle 29) photometry continues to reflect a gradual slowing of MAMA sensitivity loss, particularly for the redder filters (bottom figure)

- Time-dependent sensitivity correction of SBC MAMA photometry (red) continues to limit photometric scatter (blue) to ≤2.5% for all but the reddest filter



ACS News and Announcements

ACS Jupyter notebook tutorials are available at:

- https://github.com/spacetelescope/acs-notebook

Calibrate Raw Files

Now that we have the `*_raw.fits` files, we can process them with the ACS calibration pipeline `calacs`.

Updating Headers for CRDS

By default, the association file will trigger the creation of a drizzled product. In order to avoid this, we will filter the association file to only include table entries with `MEMTYPE` equal to 'EXP-DTH'. This will remove the 'PROD-DTH' entry that prompts AstroDrizzle.

In [ ]:
```
with fits.open(asn_file, mode='update') as asn_hdu:
    asn_tab = asn_hdu[1].data
    asn_tab = asn_tab[asn_tab['MEMTYPE'] == 'EXP-DTH']
```

Due to the computationally intense processing required to CTE correct full-frame ACS/WFC images, we have disabled the CTE correction here by default, however it can be turned on by changing the following variable to True:

In [ ]:
```
cte_correct = False
```

Calibration steps can be enabled or disabled by setting the switch keywords in the primary header to 'PERFORM' or 'OMIT', respectively. Switch keywords all end with the string `CORR` (e.g., `BLEVCORR` and `DARKCORR`). In this case, we want to update `PCTECORR`.

In [ ]:
```
for file in raw_files:

    if cte_correct:
        value = 'PERFORM'
    else:
        value = 'OMIT'

    fits.setval(file, 'PCTECORR', value=value)
```

ACS News and Announcements

DrizzlePac Jupyter notebook tutorials are available at:

- https://github.com/spacetelescope/notebooks

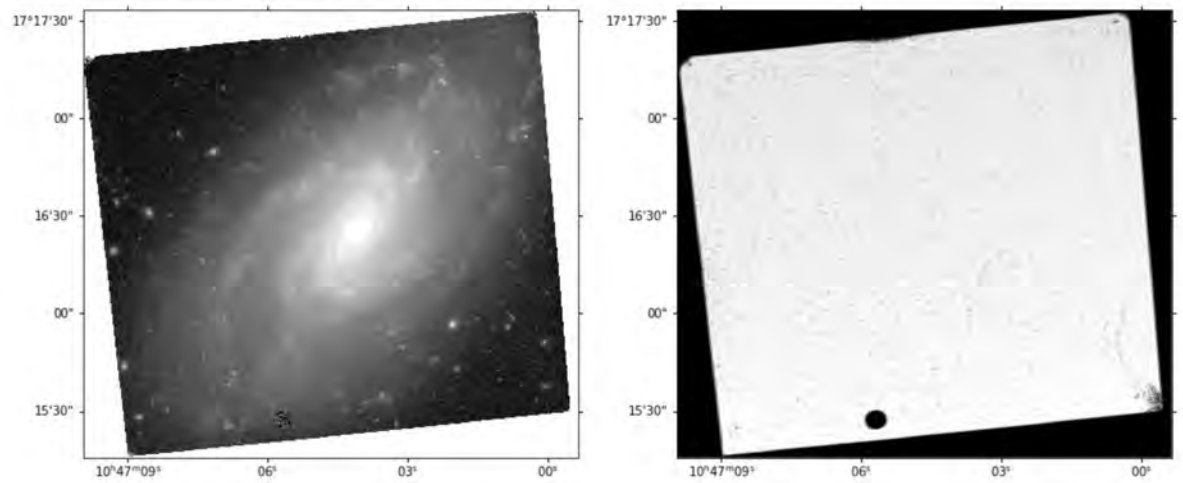
4. Results

The drizzled science and weight images produced from the first call to AstroDrizzle with no optimization of the plate scale and pixfrac are plotted below.

In [6]:
```
with fits.open('f160w_noopt_drz.fits') as hdu:
    im1wcs = wcs.WCS(hdu[1].header)
    sci1 = hdu[1].data
    wht1 = hdu[2].data

norm1 = ImageNormalize(sci1, vmin=-0.2, vmax=25, stretch=LogStretch())
fig, ax = plt.subplots(1, 2, figsize=(16, 8), subplot_kw={'projection':im1wcs})
ax[0].imshow(sci1, norm=norm1, cmap='gray', origin='lower')
ax[1].imshow(wht1, cmap='gray', origin='lower')
```

Out[6]: <matplotlib.image.AxesImage at 0x7f94a88e7e90>



The drizzled science image is on the left and the associated weight image is on the right, both without optimization of the plate scale and pixfrac.

To compare, the figure plotted below shows close ups of the same part of the sky from the two drizzled products.

New ACS Reports in the last year:

- ISR 2022-01: “Revisiting ACS/WFC Sky Backgrounds” (Anand et al.)
- ISR 2022-02: ”One-Pass HST Photometry with hst1pass” (J. Anderson)
- ISR 2022-03: Improved Absolute Astrometry for ACS and WFC3 Data Products” (J. Mack et al.)
- ISR 2022-04: “The Impact of CTE on Faint Sources in ACS” (J. Anderson)
- ISR 2022-05: “Update of the STIS CTE Correction Formula for Spectra” (Ralph C. Bohlin and Sean Lockwood)
- TIR 2022-01: “Python Build of the IDC Table Generator for ACS/WFC” (Hoffmann et al.)

ACS Team Posters at AAS 241:

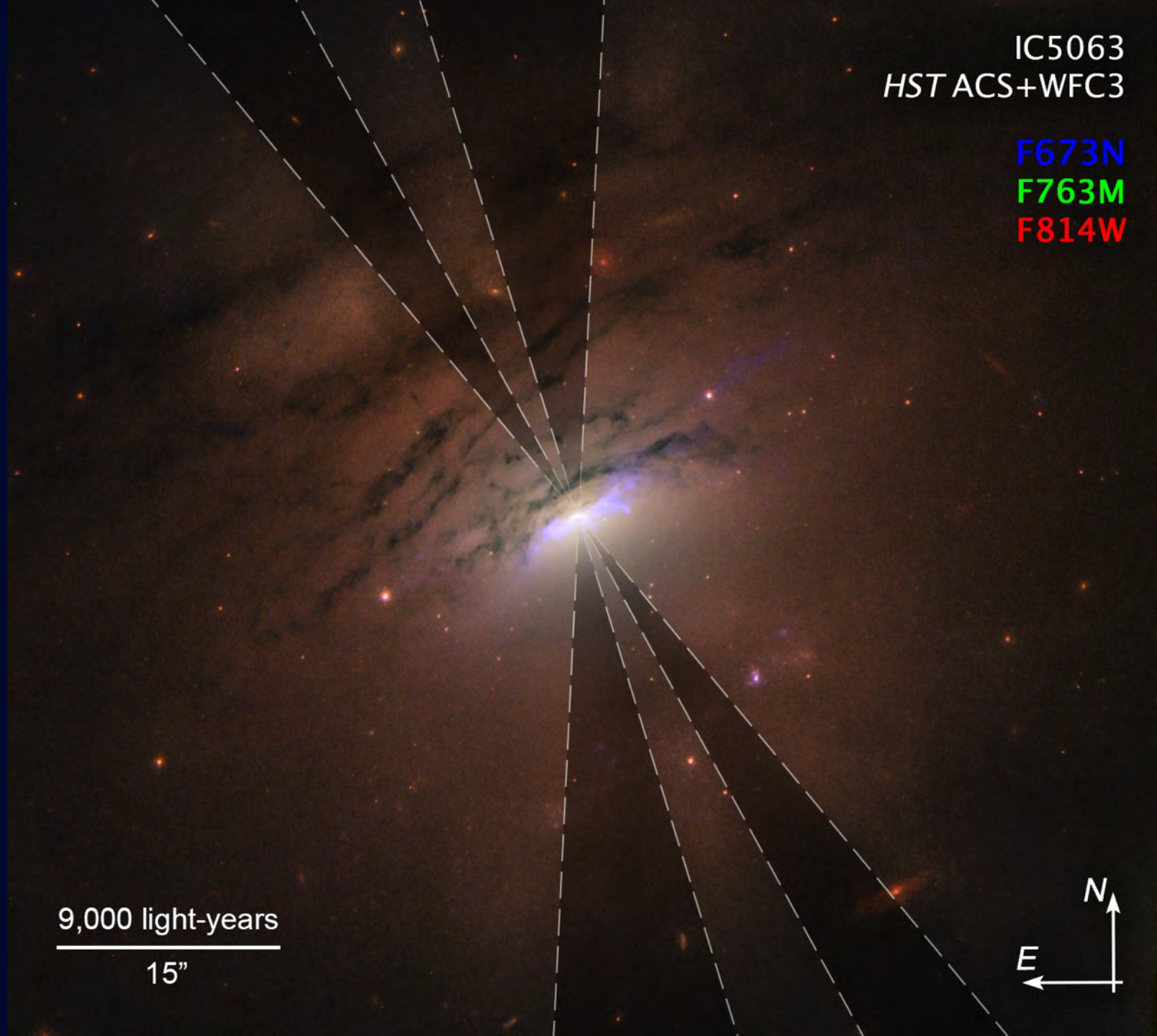
- ID 986: “Absolute Flux Calibration of Hubble’s ACS/SBC Prism Modes” (R. Avila)
- ID 1941: “Characterizing Serial CTE (XCTE) in Hubble's ACS/WFC Detector” (X. Rivers et al.)

Dark Rays in IC 5063

19 November 2020

Nearly 156 million light-years away, IC 5063 is a galaxy with an active galactic nucleus, which is a supermassive black hole feeding on matter in the center of the galaxy. Using data from both the Advanced Camera for Surveys and the Wide Field Camera 3, astronomers think that the dark lanes (shown with dashed lines in the image to the right) are shadows cast by obscuring dusty material close to the black hole. The shadows that are cast by this material are at least 3,600 light-years long.

Image credit: NASA, ESA, STScI, and W. P. Maksym



Coma Cluster

29 November 2018

An Advanced Camera for Surveys mosaic of the Coma Cluster of galaxies. The full resolution 475 megapixel image of this mosaic is available at hubblesite.org.

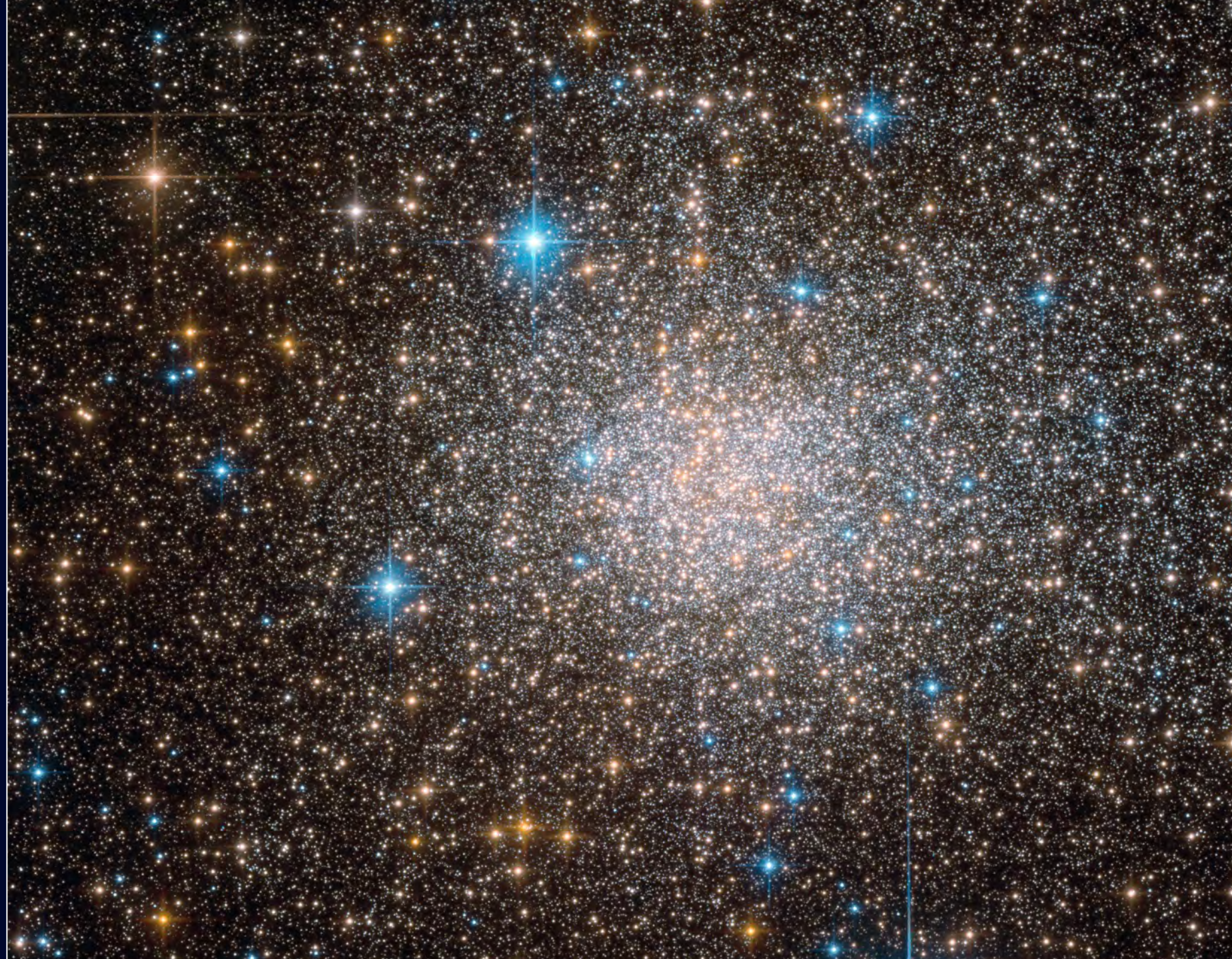
Image credit: NASA, ESA, J. Mack (STScI), and J. Madrid (ANTF).

Cluster Terzan 5

7 September 2016

Results from the Advanced Camera for Surveys, with additional Wide Field Camera 3 infrared data, indicate that the Milky Way globular star cluster Terzan 5 contains two distinct generations of stars separated by roughly 7 billion years. The properties of the stars are unusual for a star cluster, but are similar to the Galactic bulge perhaps indicating that Terzan 5 is a fossil relic of galaxy formation.

Image credit: NASA, ESA, F. Ferraro



Cluster Weslerlund 2

23 April 2015

This optical image mosaic taken with the Advanced Camera for Surveys (with additional IR imaging of the star cluster with the Wide Field Camera 3) was taken as part of the celebration of Hubble's 25th anniversary in 2015.

Image credit: NASA, ESA, the Hubble Heritage Team (STScI/AURA), A. Nota (ESA/STScI), and the Westerlund 2 Science Team

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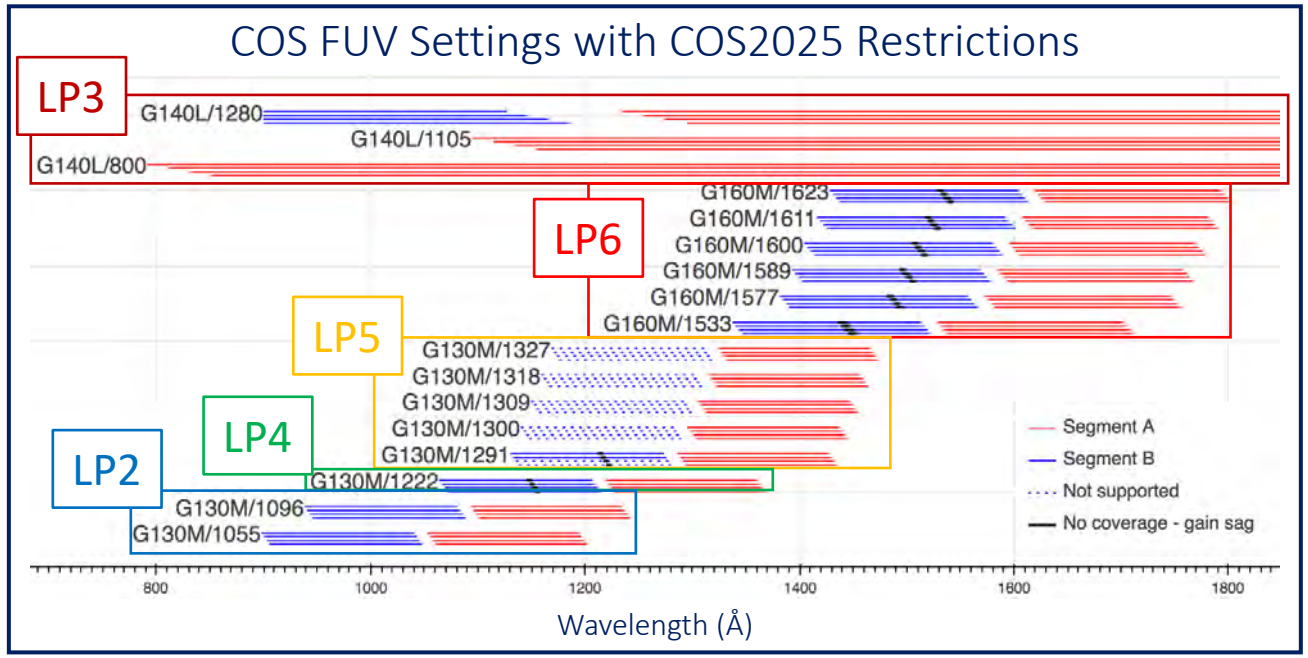
See AAS Job Register

Cosmic Origins Spectrograph (COS)

http://www.stsci.edu/hst/cos

COS News and Announcements

- Multiple Lifetime Positions extend the life of COS:
  - All G140L cenwaves at LP3
  - All G160M cenwaves at LP6 for exposures > 0.5 orbits (otherwise at LP4)
  - G130M cenwaves 1291 – 1327 at LP5
  - G130M/1222 at LP4
  - Blue modes (G130M cenwaves 1055 and 1096) at LP2



- LP6 observations will experience increased overheads and a slight reduction in resolution compared to LP4. Users who require the use of LP4 due to overheads must request to do so during the Phase I process. See the COS Instrument Handbook for more details.
- The COS2025 policy remains in effect. It reduces the number of settings that place Ly α on the FUV detector, increasing its lifetime (COS ISR 2018-16).

COS News and Announcements

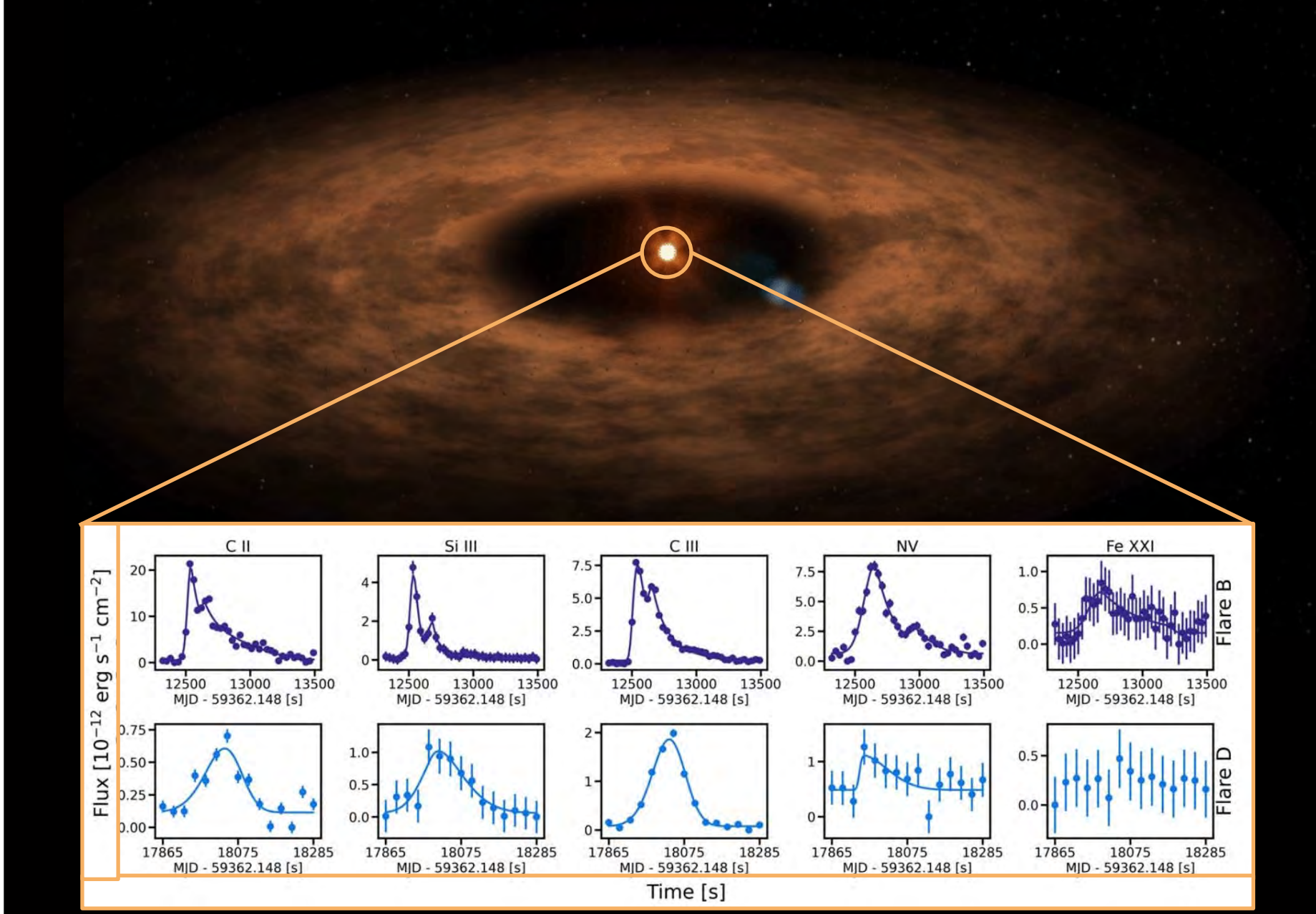
- **A new version of CalCOS (3.4.3) was released** in March 2022. This version includes several fixes and implements the "SPLIT wavecal" wavelength calibration procedure at Lifetime Position 6 (LP6). Further details are available in the March 2022 STScI Analysis Newsletter (STAN).
- **Version 15 of the COS Instrument Handbook** has been published, which includes discussion of the increased wavelength calibration overheads for G160M at LP6 due to the introduction of "SPLIT wavecals" and the circumstances under which G160M observations may be conducted at LP4 instead.
- **Version 5.1 of the COS Data Handbook** has been published, which includes information about LP6 and how to analyze COS data with Python using **stenv**, the STScI python software environment replacing AstroConda.

Implications of high-energy flares on exoplanets

5 hours of far-UV (FUV) observations of AU Mic taken with COS revealed energetic flares emitting on an hourly basis. Photoevaporative mass-losses estimated from these flares suggest significant impacts on the atmospheres of the surrounding exoplanets AU Mic b and c .

Science Credit: NASA, ESA, A. D. Feinstein (U Chicago)

Image Credit: C. Smith (GSFC)

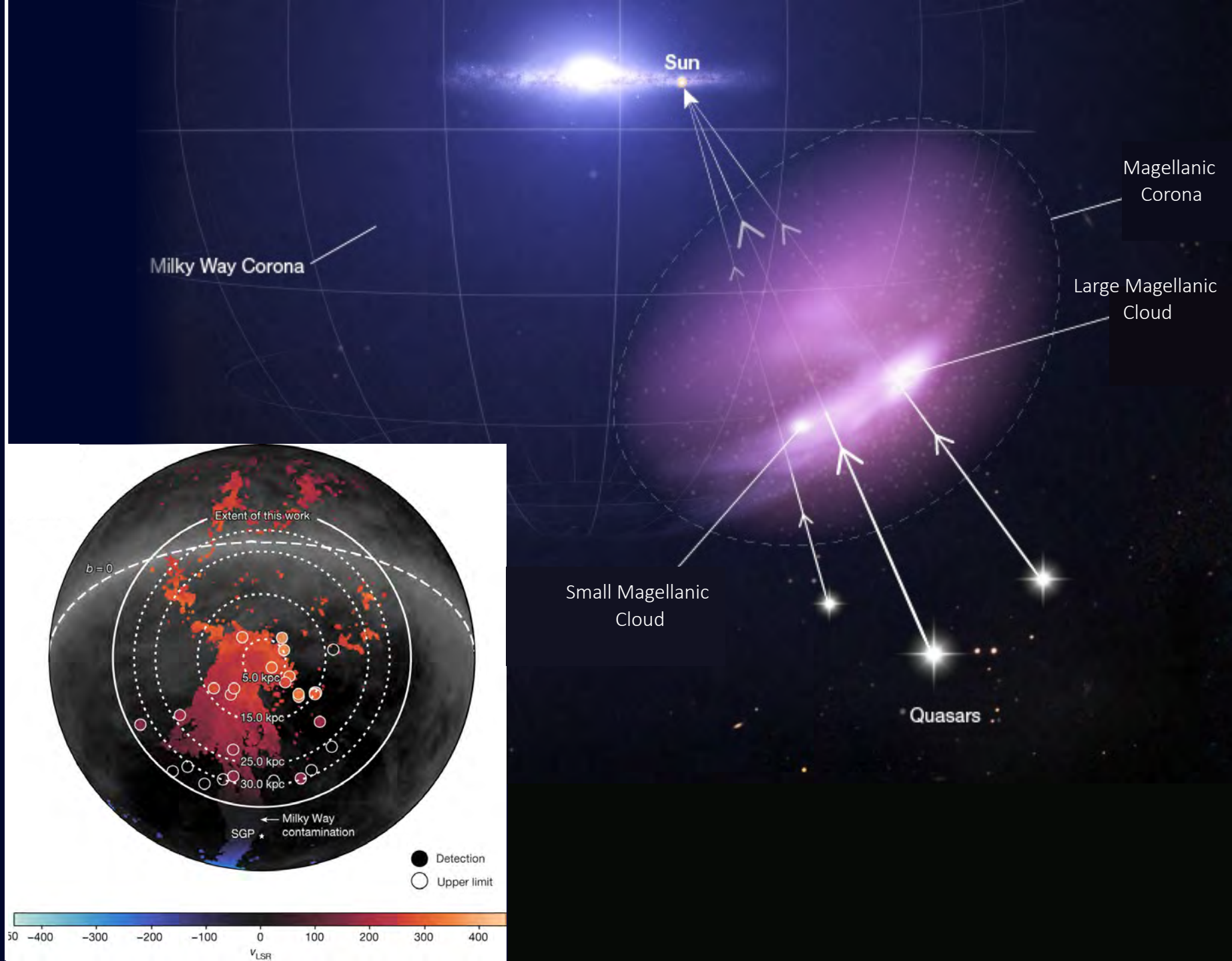


Detecting the elusive Magellanic Corona

A sample of 28 COS spectra of UV-bright quasars behind the Large Magellanic Cloud provided evidence for the Magellanic Corona. Understanding the multiphase Magellanic circumgalactic medium (CGM) is integral to characterizing the Magellanic group and its nested evolution with the Local Group.

Science Credit: NASA, ESA,
and
D. Krishnarao (Colorado College / STScI)

Image Credit: STScI

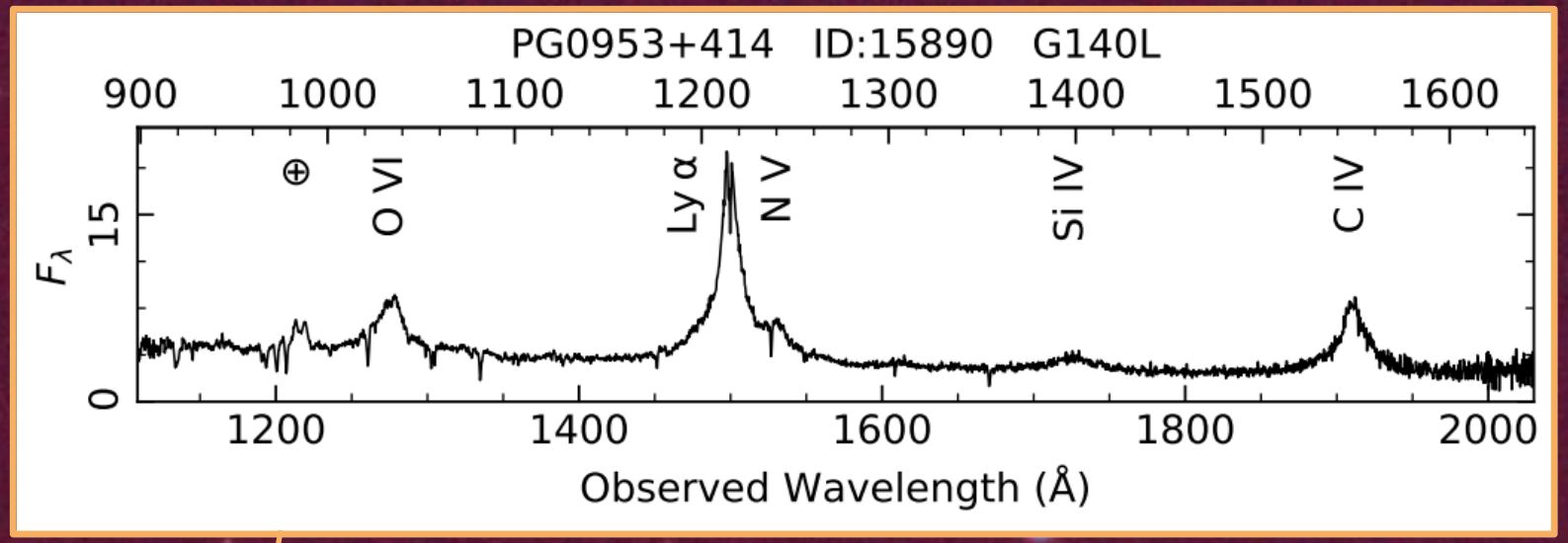


Cataloging AGN Winds in the Ultraviolet

21 AGN from the Supermassive Black Hole Winds in X-rays (SUBWAYS) sample were selected for a UV spectroscopic study of ionized outflows with COS to probe an underexplored regime of AGN between the local Seyfert galaxies and the luminous quasars at high redshifts.

Science Credit: NASA, ESA, and M. Mehdipour (STScI)

Image Credit: PANSTARRS



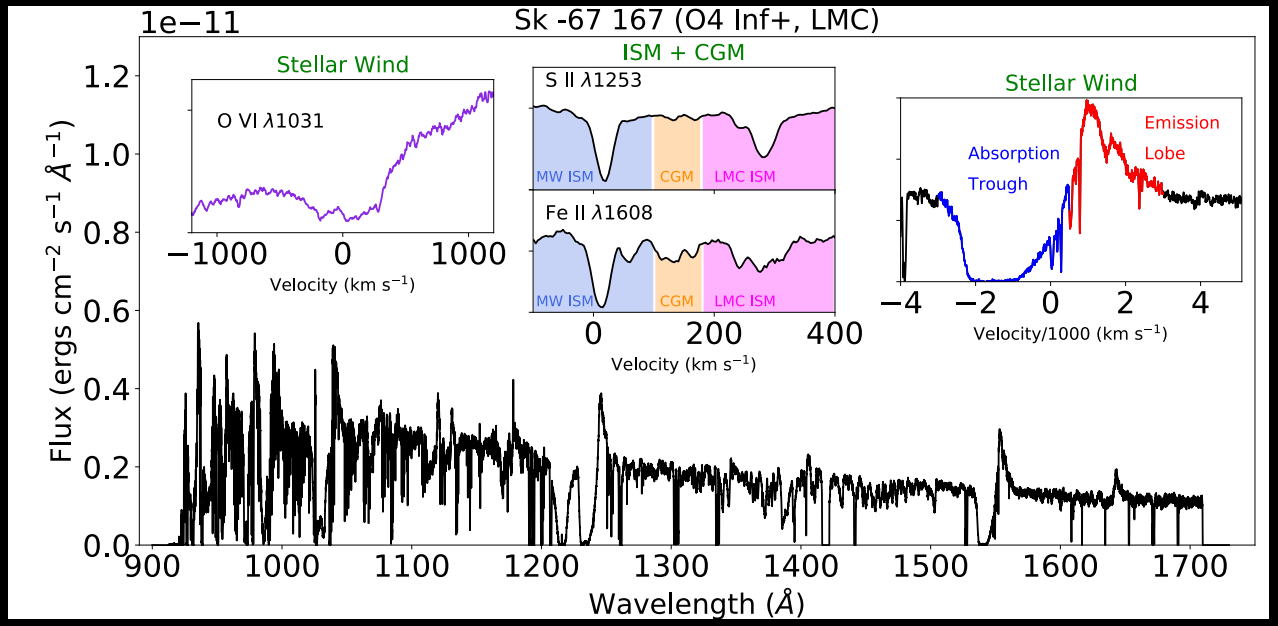
UV Spectral Atlases of Young High- and Low-mass Stars

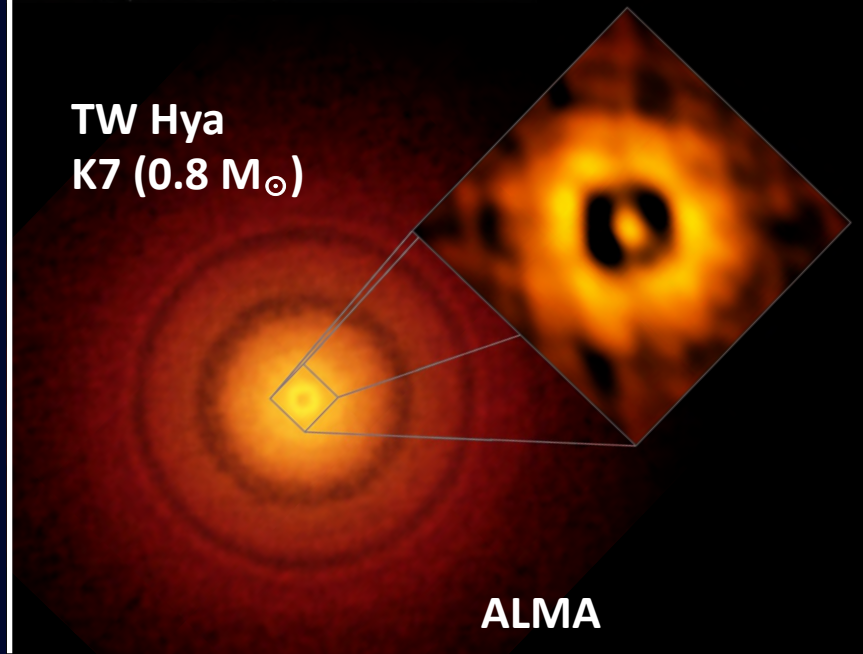
The UV Legacy Library of Young Stars as Essential Standards (ULLYSES) is nearing completion. A 1000 orbit Director's Discretionary program with Hubble (the largest ever executed), ULLYSES uses the COS and STIS spectrographs to obtain a spectroscopic library of young stars, low and high mass, in the nearby universe.

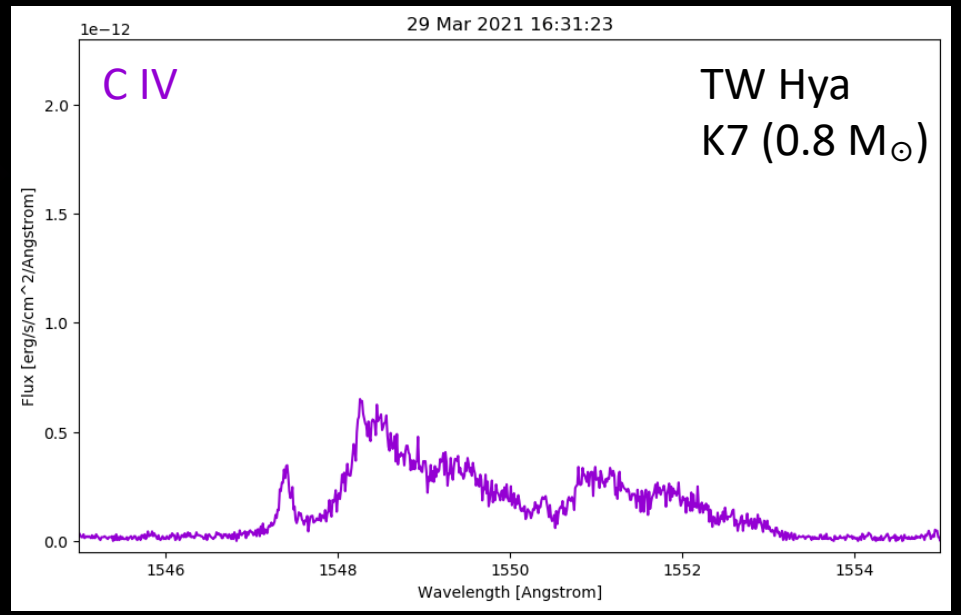
Science Credit: NASA, ESA, and J. Roman-Duval (STScI)

Image credits: NASA, ESA, ALMA

Movie credit: The ULLYSES Team







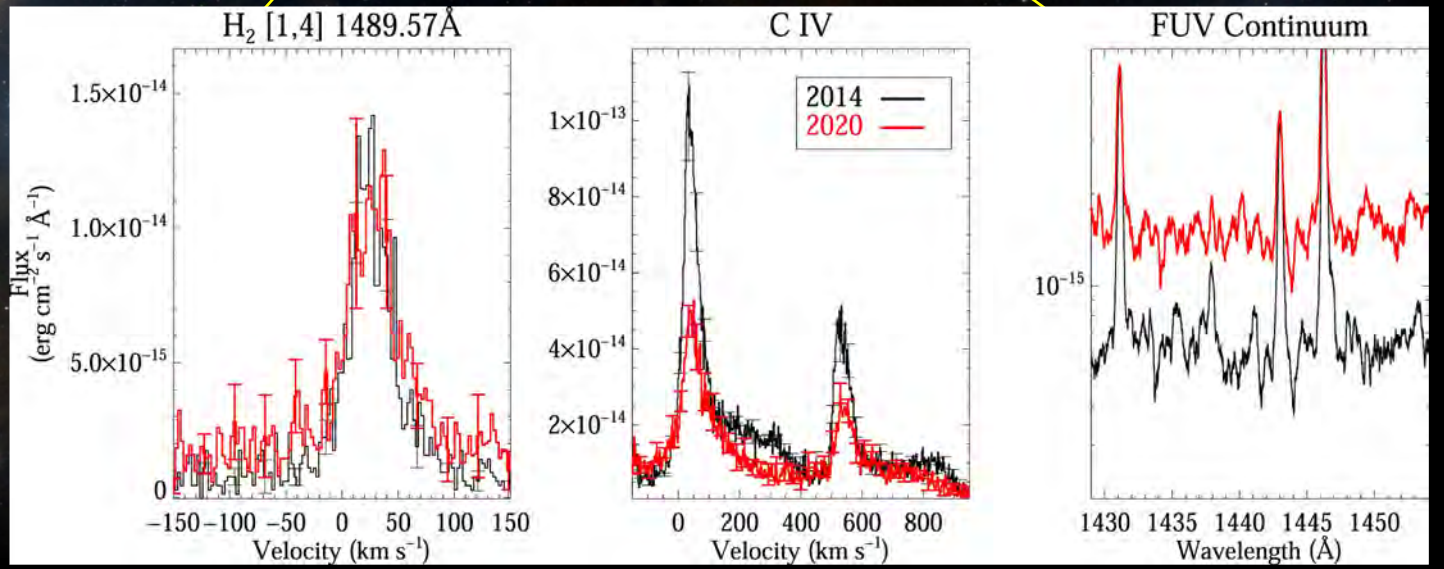
ULLYSES sets sail as ODYSSEUS

The Outflows and Disks around Young Stars: Synergies for the Exploration of ULLYSES Spectra (ODYSSEUS) Survey presents initial results of the classical T Tauri Star CVSO 109 in Orion OB1b as a demonstration of the science that will result from the survey.

Science Credit: NASA, ESA, C.C. Espaillat (Boston U)

Image credit: Aladin

Orion



COS at the 242nd AAS June 2023

iPoster Sessions

Updated Status and Performance of the Cosmic Origins Spectrograph

S. Gomez, J. Debes, S. Dieterich, T. Fischer, W. J. Fischer, E. Frazer, D. French, S. Hasselquist, J. Hernandez, A. Hirschauer, N. Indriolo, B. James, R. Jedrzejewski, C. Johnson, D. Kakkad, L. P. Miller, M. Rafelski, J. Roman-Duval, K. Rowlands, D. Sahnow, R. Sankrit, D. Soderblom

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See AAS Job Register

Space Telescope Imaging Spectrograph (STIS)

http://www.stsci.edu/hst/stis

STIS News and Announcements

- STIS is updating the flux calibration of its major imaging/spectroscopic modes, following updates to the CALSPEC standard star models (Bohlin et. al 2020)
  - **AAS iPoster 462.05**
  - https://www.stsci.edu/hst/instrumentation/stis/flux-recalibration

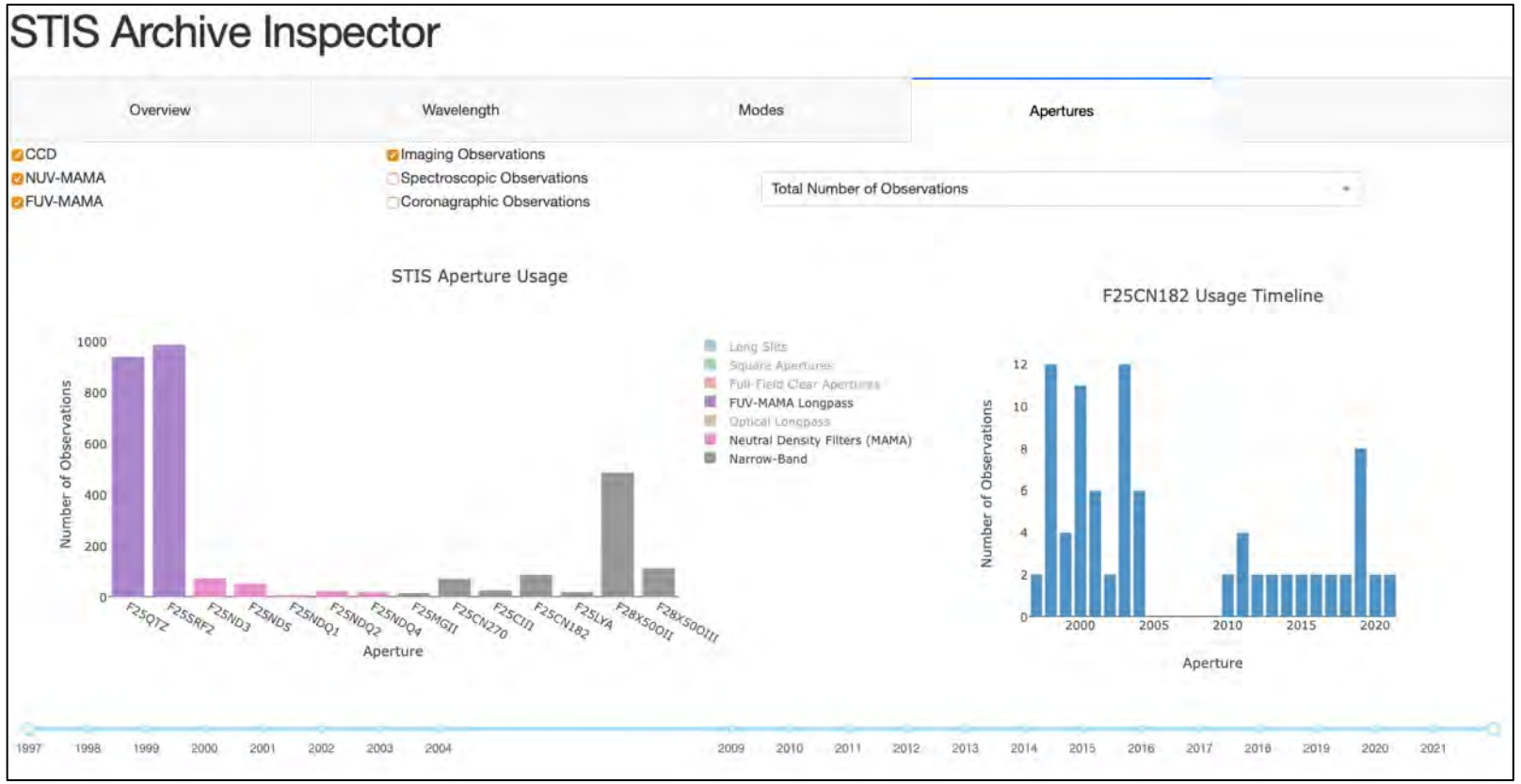
- New Jupyter Notebook tools are available!
  - **AAS iPoster 250.01**
  - https://github.com/spacetelescope/STIS-Notebooks

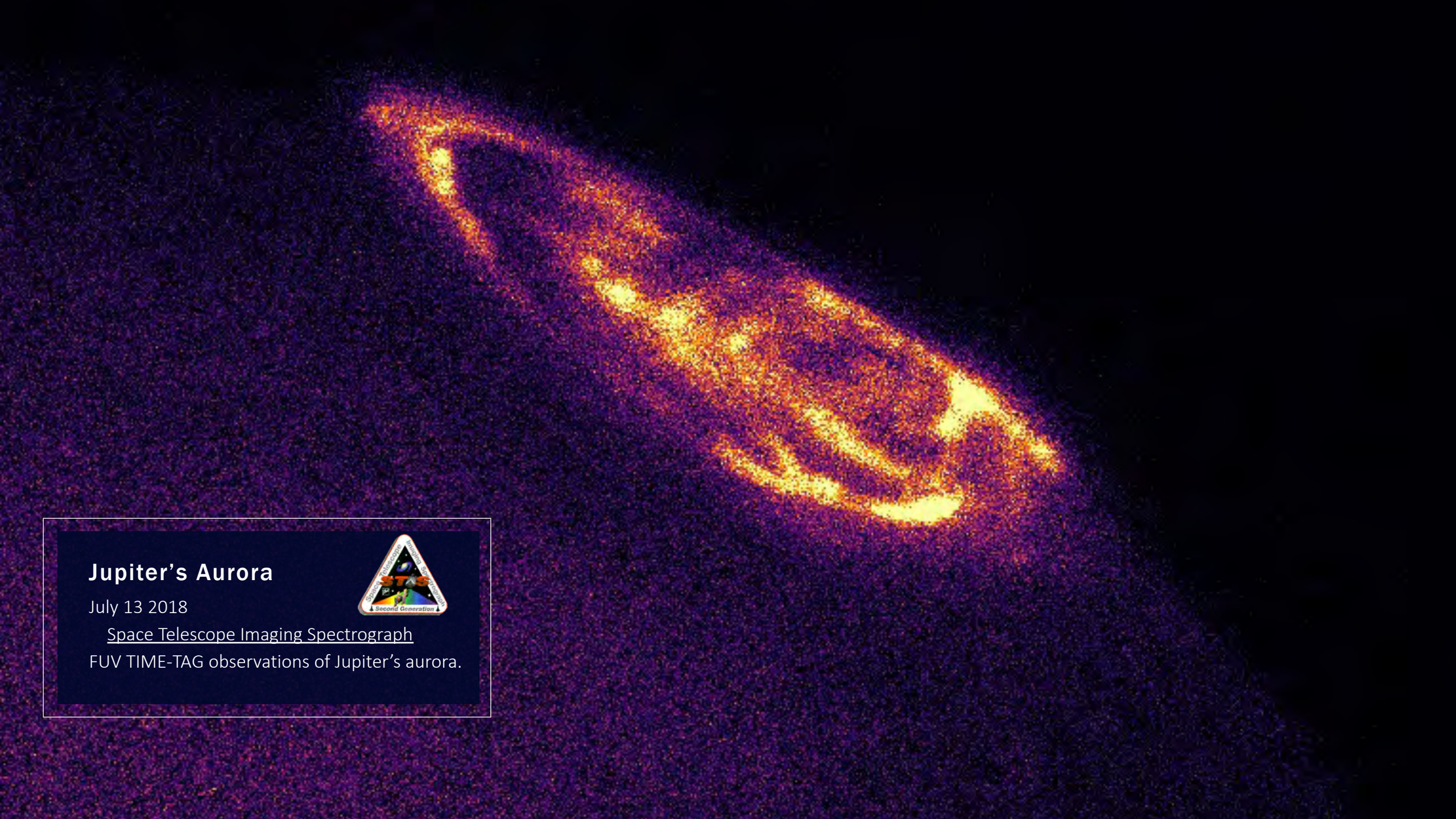
- See the latest status of STIS calibration and operations (including general CCD performance updates, mode changes, and overview of latest instrument science reports)
  - **AAS iPoster 462.04**

STIS Archive Inspector

Explore STIS's archival holdings with STIS archive Inspector

- Visit https://github.com/spacetelescope/stis-archive-inspector to download/install





Jupiter's Aurora

July 13 2018

Space Telescope Imaging Spectrograph

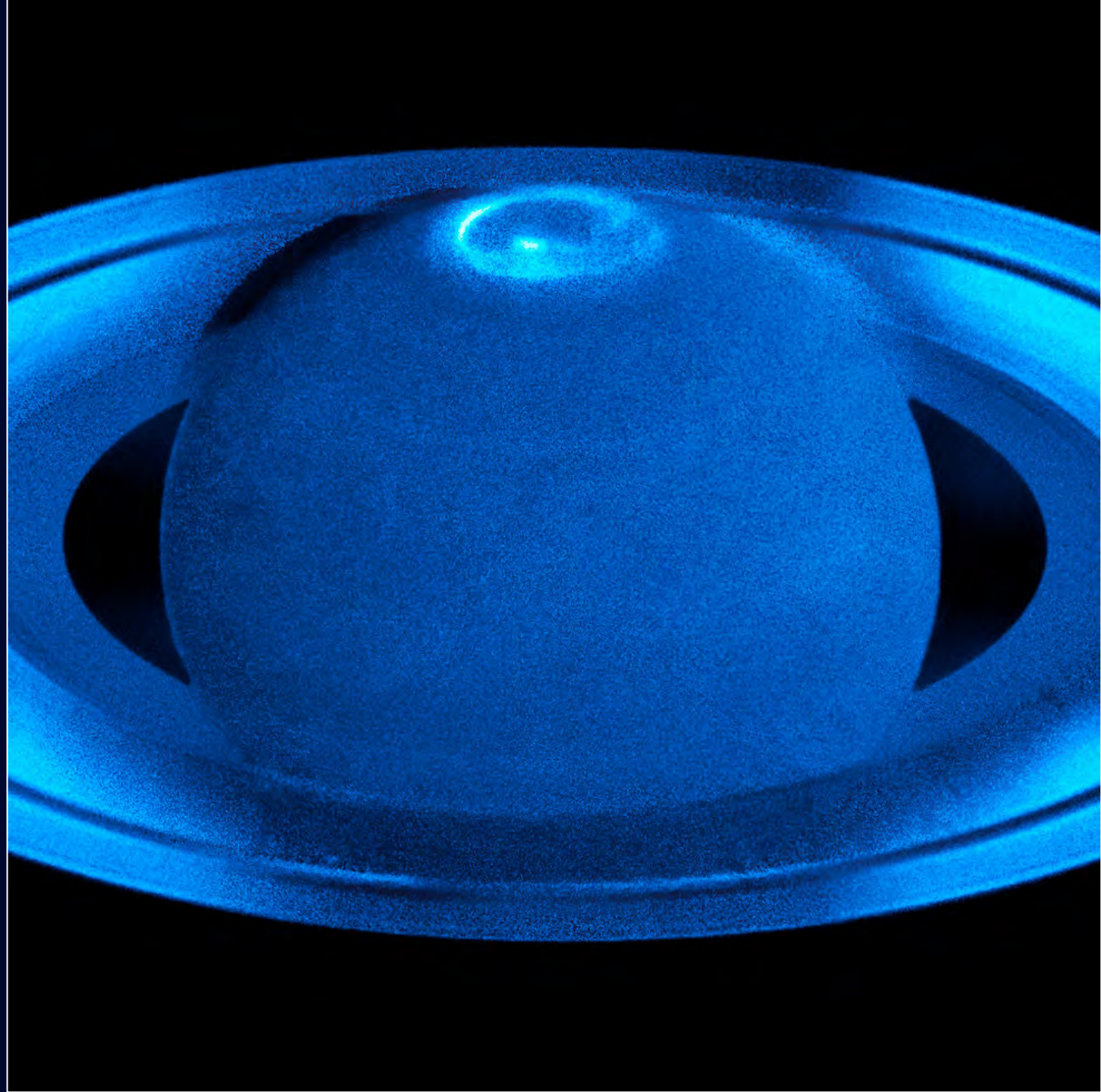
FUV TIME-TAG observations of Jupiter's aurora.

Aurorae on Saturn

30 August 2018

Captured with the Space Telescope Imaging Spectrograph, this image shows the ultraviolet aurora at Saturn's northern pole. The aurora is highly variable due to the interaction of Saturn's magnetosphere and the solar wind, but additional peaks in brightness at dawn and just before midnight have been observed. The previously unobserved midnight peak appears to be related to the interaction of the solar wind and magnetosphere during Saturn's solstice.

Image credit: NASA, ESA, and L. Lamy (Observatoire de Paris)

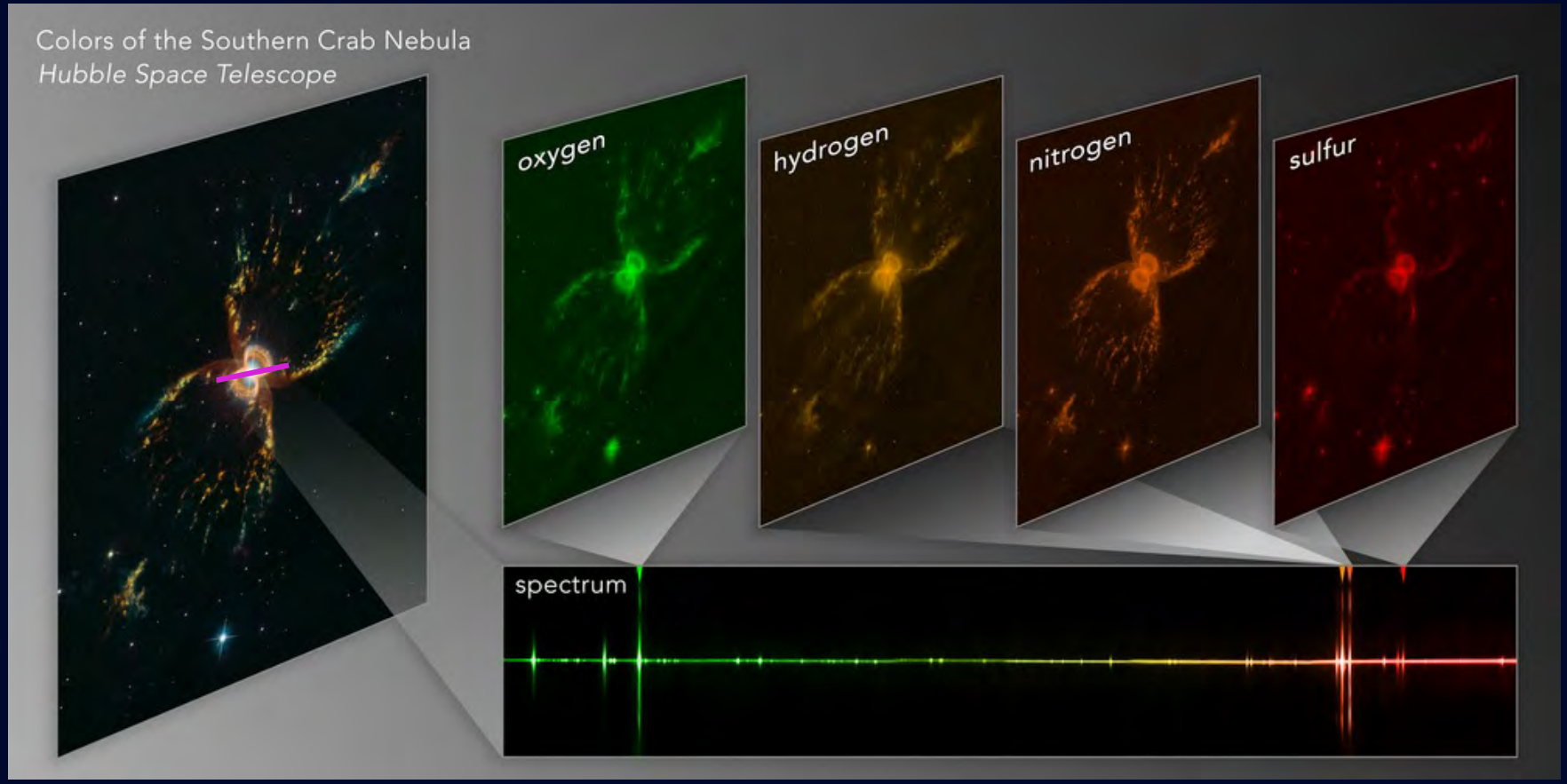


Southern Crab: Resolved Spectra

18 April 2019

The Southern Crab Nebula is an hourglass shaped nebula, formed by outflow from a red giant-white dwarf binary system at the center. The image is composed of WFC3 observations, while the Space Telescope Imaging Spectrograph spectrum was obtained by placing a slit (represented by the magenta line on the image) on the central binary pair at an angle to the hourglass shape. The spatially-resolved spectrum allows astronomers to trace both the location of relative speed of glowing elements, such as oxygen, hydrogen, nitrogen, and sulfur.

Image credits: NASA, ESA, J. DePasquale *(STScI)*

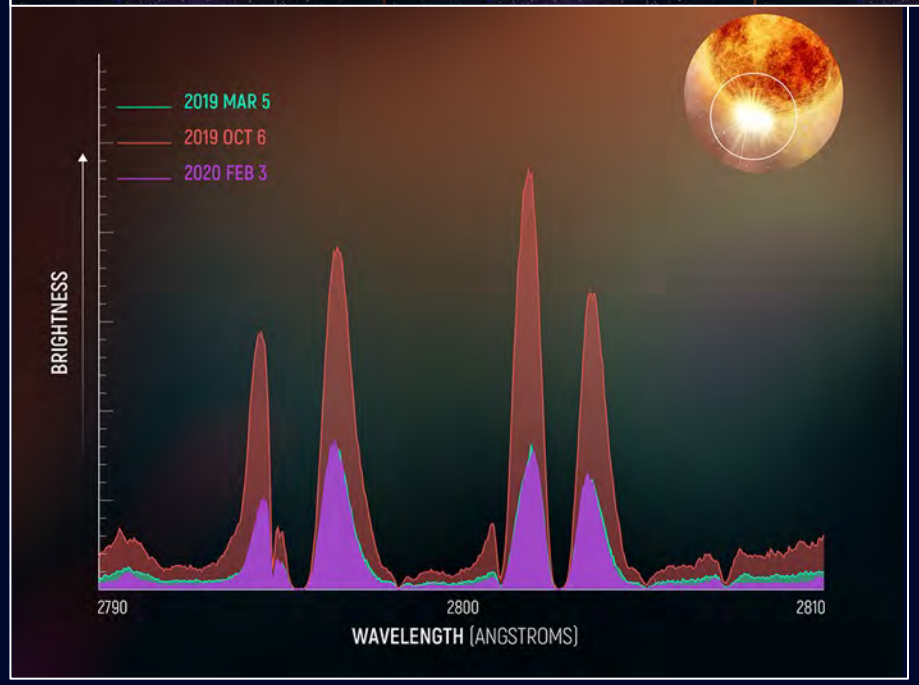


Betelgeuse's Outburst

13 August 2020

The red super-giant Betelgeuse underwent an historic dimming event that began in October 2020. Pre-dimming ultra-violet spectra obtained with the Space Telescope Imaging Spectrograph caught signs of an enormous outburst in the star's southeastern region, traced by emission of ionized magnesium. It is thought that the material from this outburst later cooled into dust, blocking our view of a portion of the star.

Image credits:
***Top**: NASA, ESA, E. Wheatley (STScI)*
***Bottom**: NASA, ESA, A. Dupree (CfA), E. Wheatley (STScI)*

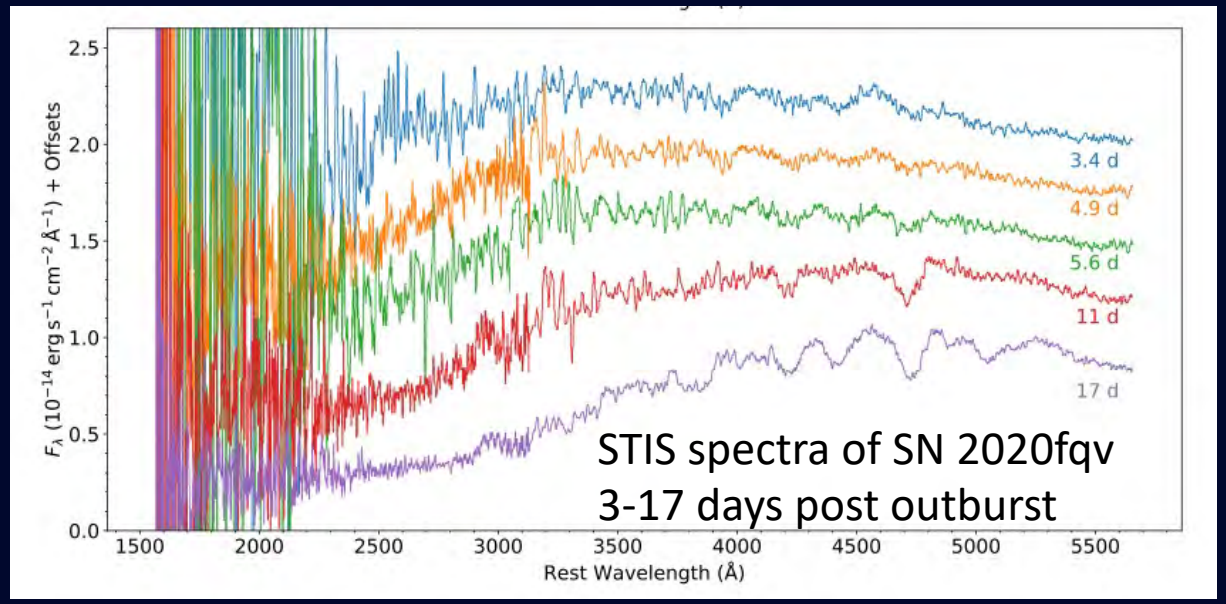


Watching a Star's Destruction

21 October 2021

Researchers obtained ultra-rapid follow-up spectra from the Space Telescope Imaging Spectrograph of Supernova SN 2020fqv, allowing them to track changes in the days following the explosion. Combining these data with other ground and space based monitoring pre- and post-outburst provides a holistic view of the progenitor star and the circumstellar environs soon after the star's demise.

Image credits:
Top: AUTHOR: Ryan Foley (UC Santa Cruz)
Bottom: *S. Tinyanont et al., 2021, MNRAS, 512, 2777, https://doi.org/10.1093/mnras/stab2887*

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Hubble Space Telescope
Wide Field Camera 3 (WFC3)
AAS 242 June 2023

http://www.stsci.edu/hst/wfc3

HST/WFC3 Posters @ 242nd AAS June 2023

HST/WFC3 Photometric Calibration: Recent Results and Tools
M. Marinelli et al.

Updates for Slitless Spectroscopy with HST/WFC3 and ACS
A. Pidgeon et al.

HST/WFC3: Recent Calibration and Machine Learning Updates for 2023
I. Rivera et al.

WFC3 Highlights

- More than 330,000 WFC3 images in archive - mast.stsci.edu/search/hst
- WFC3 Software Library – github.com/spacetelescope/WFC3Library
  New notebooks: HSTaxe, IR time-variable background, subarray pixel area map corrections and more
- WFC3 Instrument Handbook - hst-docs.stsci.edu/wfc3ihb
- WFC3 Data Handbook – hst-docs.stsci.edu/wfc3dhb
- CTE losses – revised model/mitigation strategies (ISR 2021-09); table-based corrections (ISR 2021-13)
  new ***hst1pass*** software (ISR 2022-05)
- Hubble Advanced Products – available now: single visit mosaics, multi-visit mosaics (ISR 2021-06)
- Observers: Mitigate UVIS CTE losses by ensuring ~20 e-/pix total background (ISR 2020-08)
  Improve IR repeatability by using >9 pix dithers (ISR 2019-07)
  For >4 dither points, use custom patterns (ISRs 2020-07, 2016-14)
- WFC3 STAN newsletter – Last one: Jan 2023 (on WWW site); next one: June 2023
  stsci.edu/hst/instrumentation/wfc3/documentation/stsci-analysis-newsletter-stan

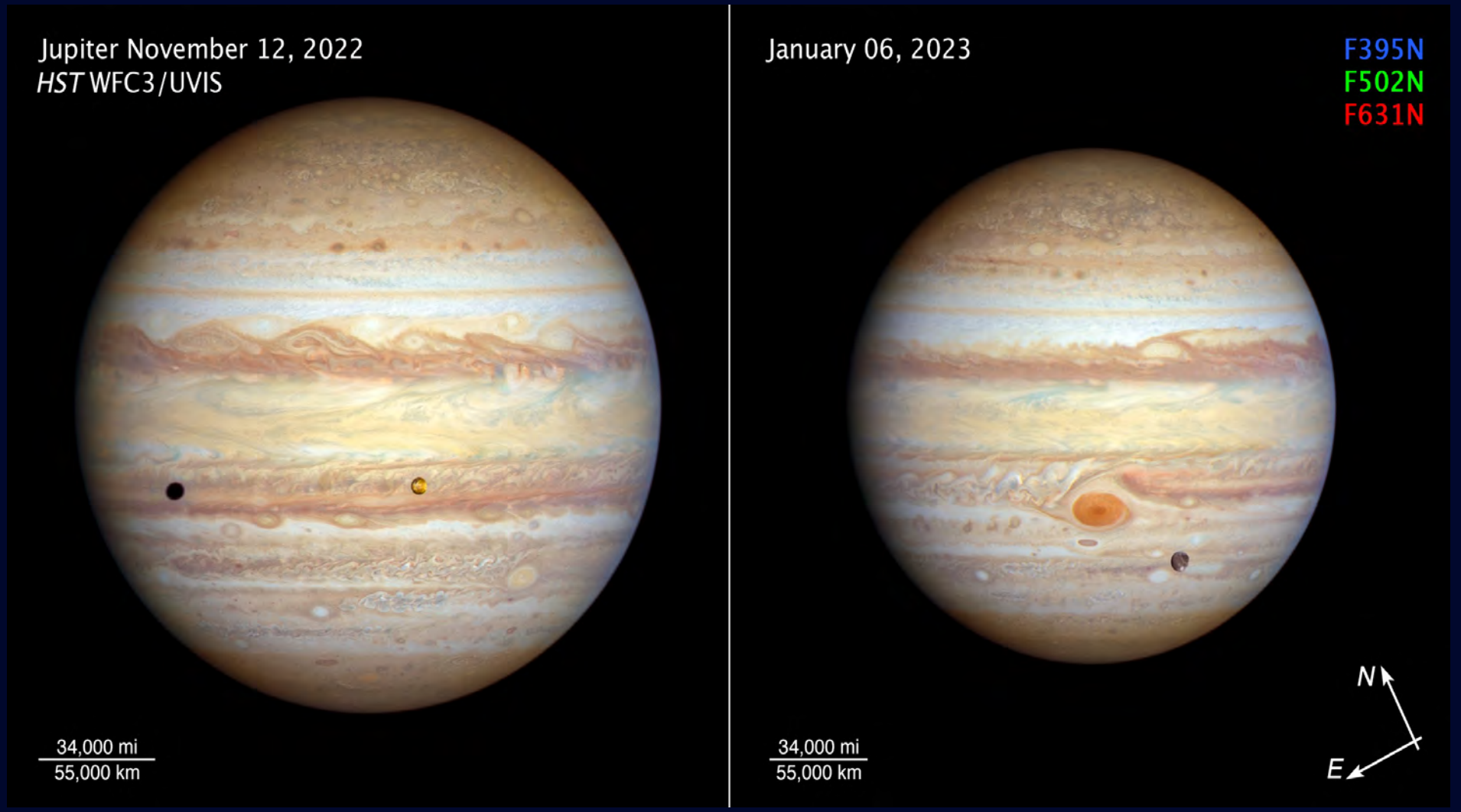
Jupiter

23 Mar 2023

Left: A prominent string of alternating storms, a wave pattern of nested anticyclones and cyclones, are locked together like in a machine with alternating gears moving clockwise and counterclockwise. The orange moon Io photobombs this view of Jupiter.

Right: Jupiter's legendary Great Red Spot takes center stage. The icy moon Ganymede can be seen transiting the giant planet at lower right.

Science: NASA, ESA, STScI, A. Simon (NASA-GSFC), M. H. Wong (UC Berkeley)



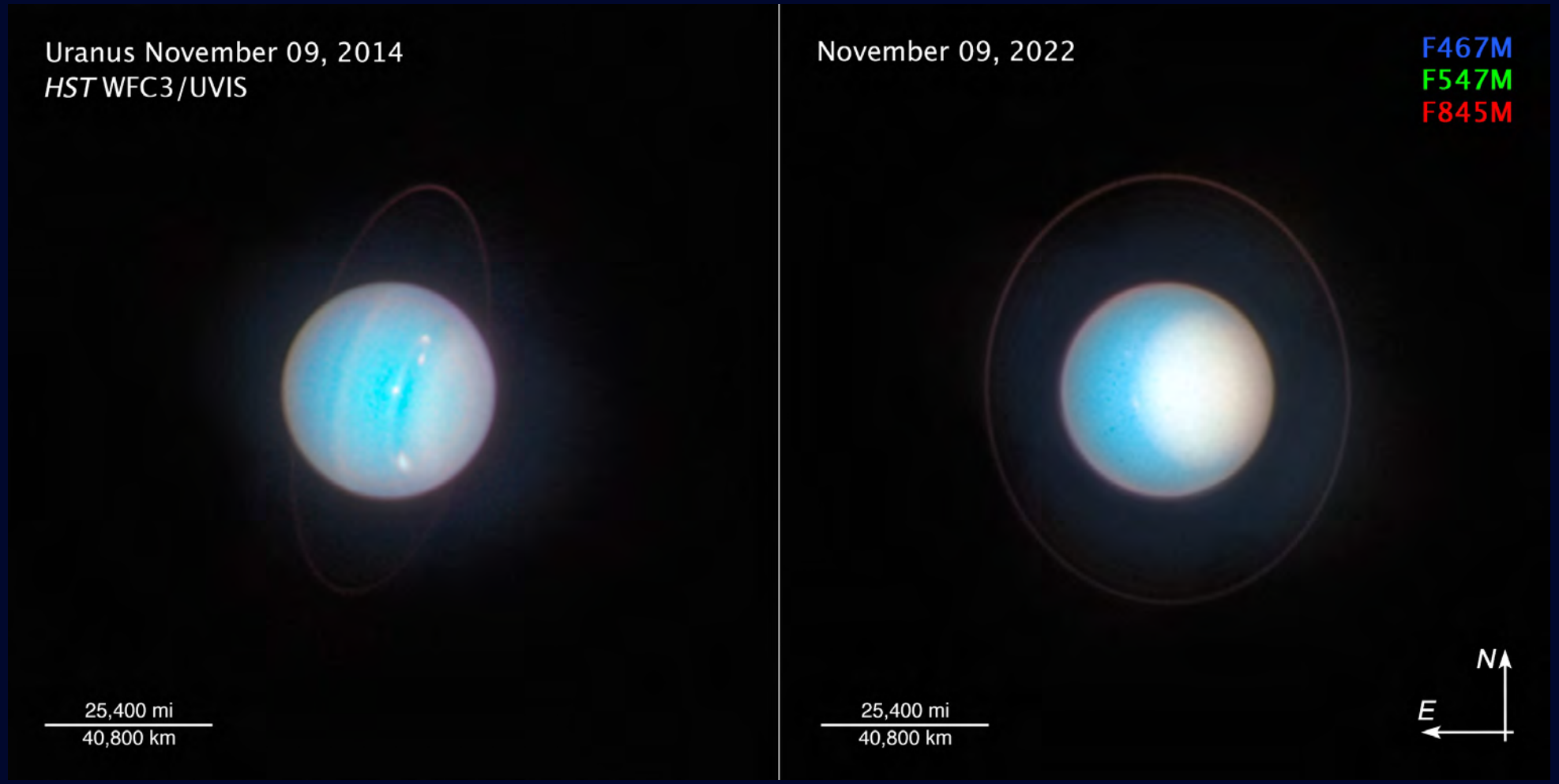
Uranus

23 Mar 2023

Left: Uranus in 2014, seven years after northern spring equinox when the Sun was shining directly over the planet's equator. Multiple storms with methane ice-crystal clouds appear at mid-northern latitudes above the planet's cyan-tinted lower atmosphere.

Right: Uranus' north pole shows a thickened photochemical haze that looks similar to the smog over cities. Several little storms can be seen near the edge of the polar haze boundary. At the Uranian equinox in 2007, neither pole was particularly bright. As northern summer solstice approaches in 2028 the cap may grow brighter still, and will be aimed directly toward Earth, allowing good views of the rings and north pole; the ring system will then appear face-on.

Science: NASA, ESA, STScI, A. Simon (NASA-GSFC), M. H. Wong (UC Berkeley)



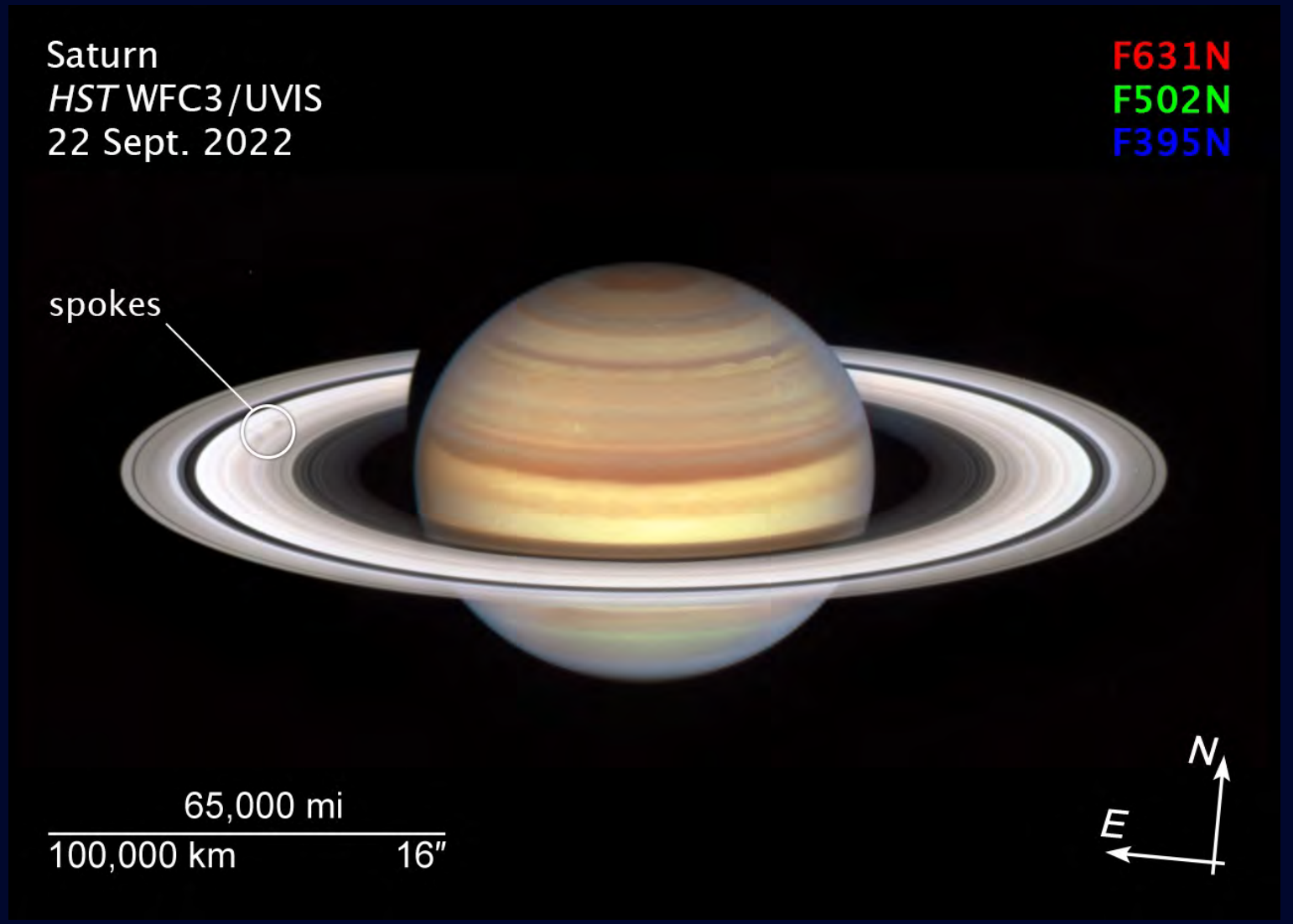
Hubble captures start of a new spoke season at Saturn

09 Feb 2023

New images of Saturn from NASA's HST herald the start of the planet's "spoke season" surrounding its equinox, when enigmatic features appear across its rings. The cause of the spokes, as well as their seasonal variability, has yet to be fully explained by planetary scientists.

Like Earth, Saturn is tilted on its axis and therefore has four seasons, though because of Saturn's much larger orbit, each season lasts approximately seven Earth years. Equinox occurs when the rings are tilted edge-on to the Sun. The spokes disappear when it is near summer or winter solstice on Saturn.

As the autumnal equinox of Saturn's northern hemisphere on May 6, 2025, draws near, the spokes are expected to become increasingly prominent and observable.



Credits
Science: NASA, ESA, A. Simon (GSFC)
Image Processing: A. Pagan (STScI)

DART Asteroid Impact Debris

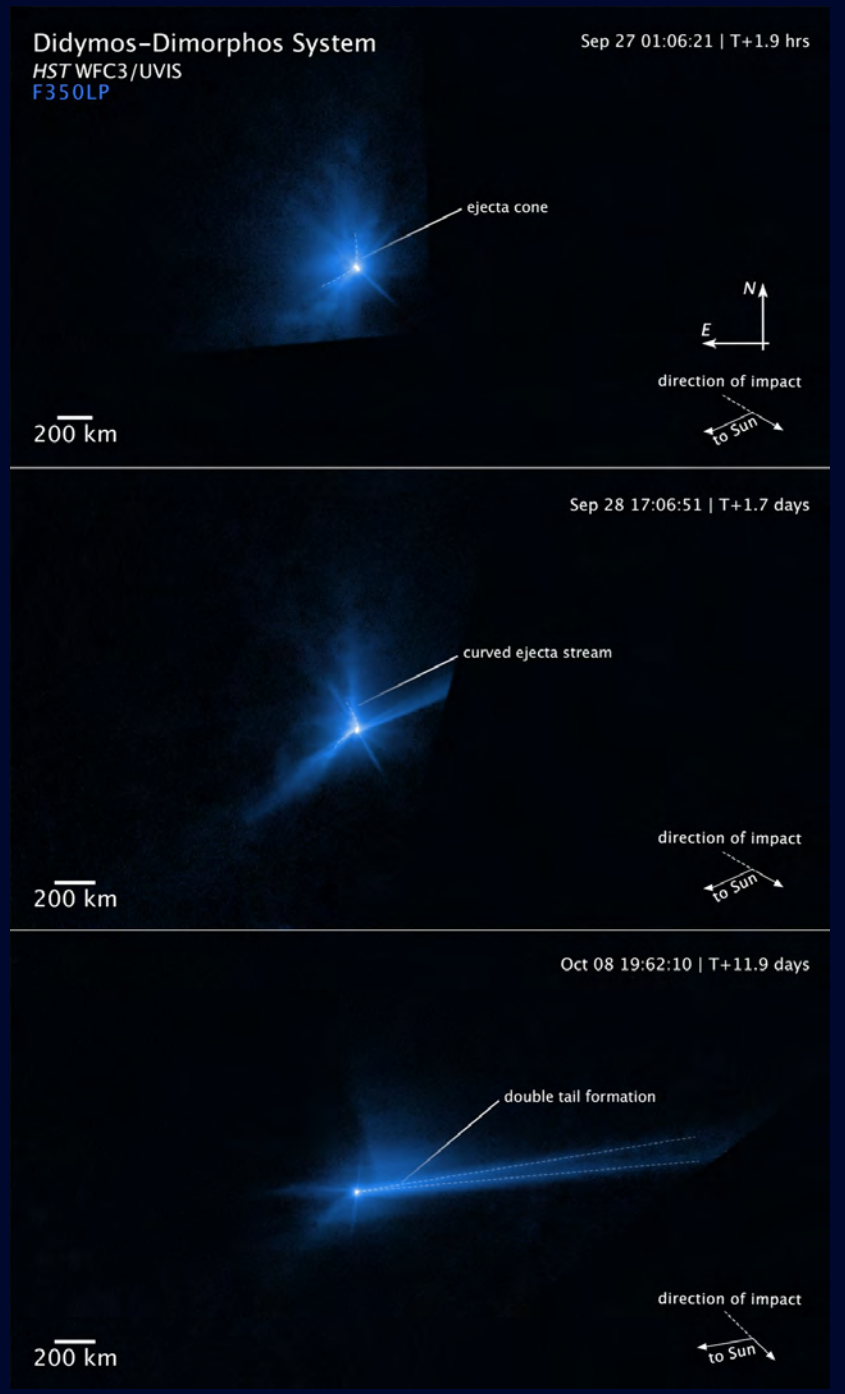
01 Mar 2023

Like a sports photographer at an auto-racing event, NASA's Hubble Space Telescope captured a series of photos of asteroid Dimorphos when it was deliberately hit by a 1,200-pound NASA spacecraft called DART on September 26, 2022.

The primary objective of DART, which stands for Double Asteroid Redirection Test, was to test our ability to alter the asteroid's trajectory as it orbits its larger companion asteroid, Didymos. Though neither Didymos nor Dimorphos poses any threat to Earth, data from the mission will help inform researchers how to potentially divert an asteroid's path away from Earth, if ever necessary. The DART experiment also provided fresh insights into planetary collisions that may have been common in the early solar system.

Hubble's time-lapse movie of the aftermath of DART's collision reveals surprising and remarkable, hour-by-hour changes as dust and chunks of debris were flung into space. Smashing head on into the asteroid at 13,000 miles per hour, the DART impactor blasted over 1,000 tons of dust and rock off of the asteroid.

Science Credit: NASA, ESA, STScI, Jian-Yang Li (PSI)



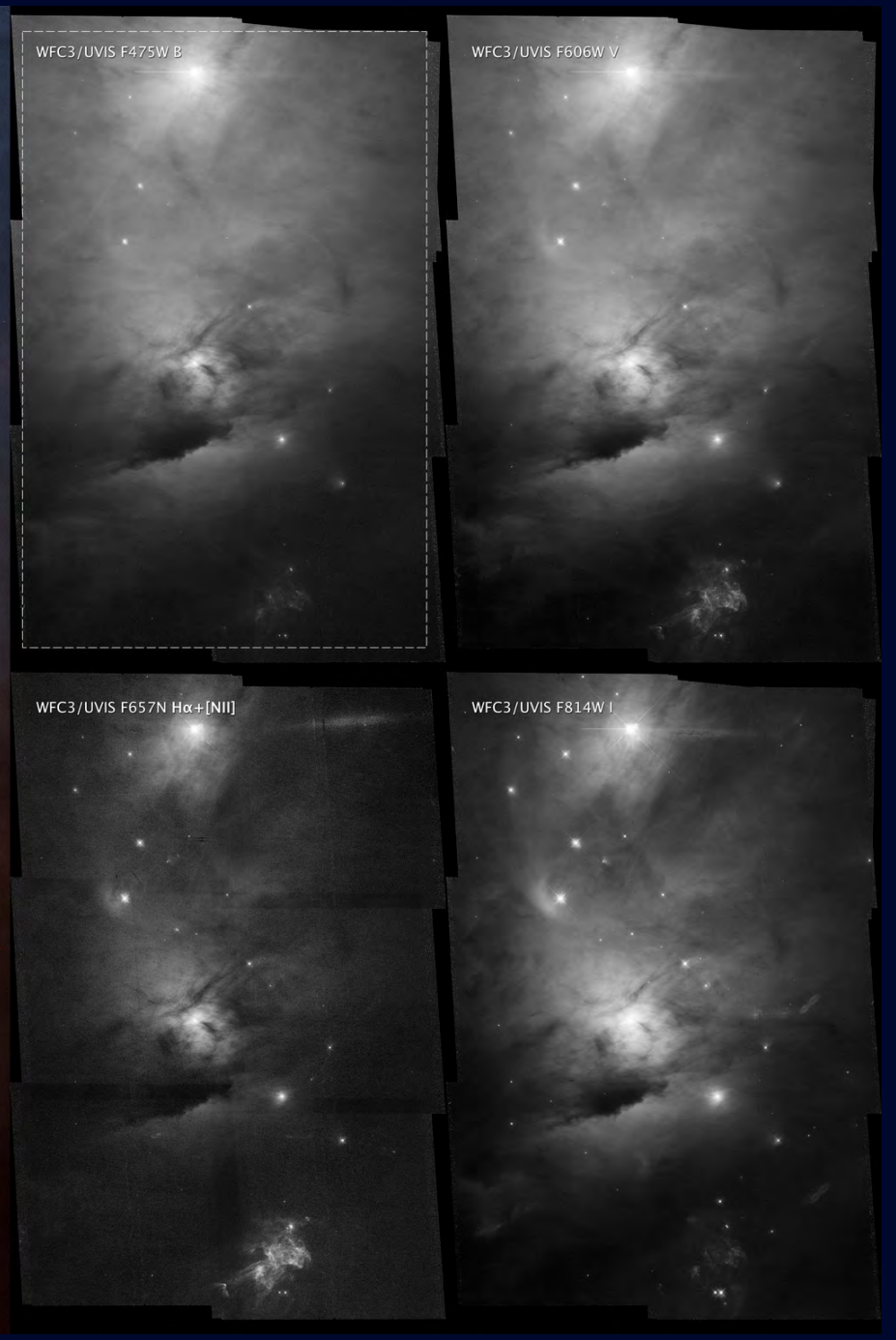
HST 33rd Anniversary Image

20 Apr 2023

Astronomers are celebrating NASA's Hubble Space Telescope's 33rd launch anniversary with an ethereal photo of a nearby star-forming region, NGC 1333. The nebula is in the Perseus molecular cloud, and located approximately 960 light-years away.

Hubble's colorful view, showcased through its unique capability to obtain images from ultraviolet to near-infrared light, unveils an effervescent cauldron of glowing gasses and pitch-black dust stirred up and blown around by several hundred newly forming stars embedded within the dark cloud.

Science: NASA, ESA, STScI
Image processing: V. Bajaj, J. DePasquale, and J. Mack (STScI)



CROSS-SECTION OF THE EARTH AND THE EXOPLANET KEPLER-138 D

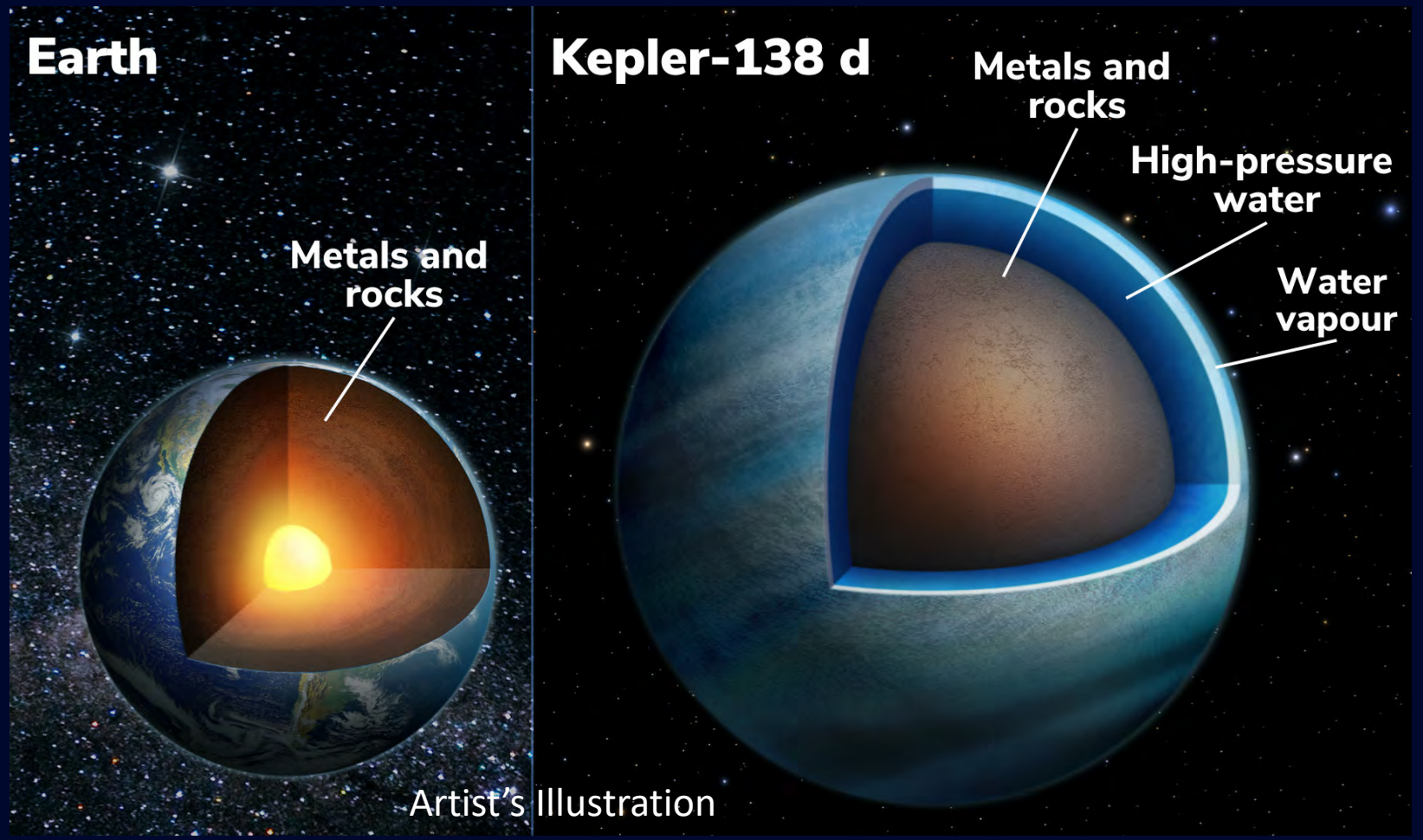
15 Dec 2022

A team led by researchers at the University of Montreal has found evidence that two exoplanets orbiting a red dwarf star are "water worlds," where water makes up a large fraction of the entire planet. These worlds, located in a planetary system 218 light-years away in the constellation Lyra, are unlike any planet found in our solar system.

Piaulet and colleagues observed exoplanets Kepler-138 c and Kepler-138 d with NASA's HST/WFC3 and the retired Spitzer space telescopes and discovered that the planets could be composed largely of water. These two planets and a smaller planetary companion closer to the star, Kepler-138 b, had been discovered previously by NASA's Kepler Space Telescope. The new study found evidence for a fourth planet as well.

At right: an artist's illustration showing a cross-section of the Earth (left panel) and the exoplanet Kepler-138 d (right panel).

Illustration: B. Gougeon (University of Montreal)



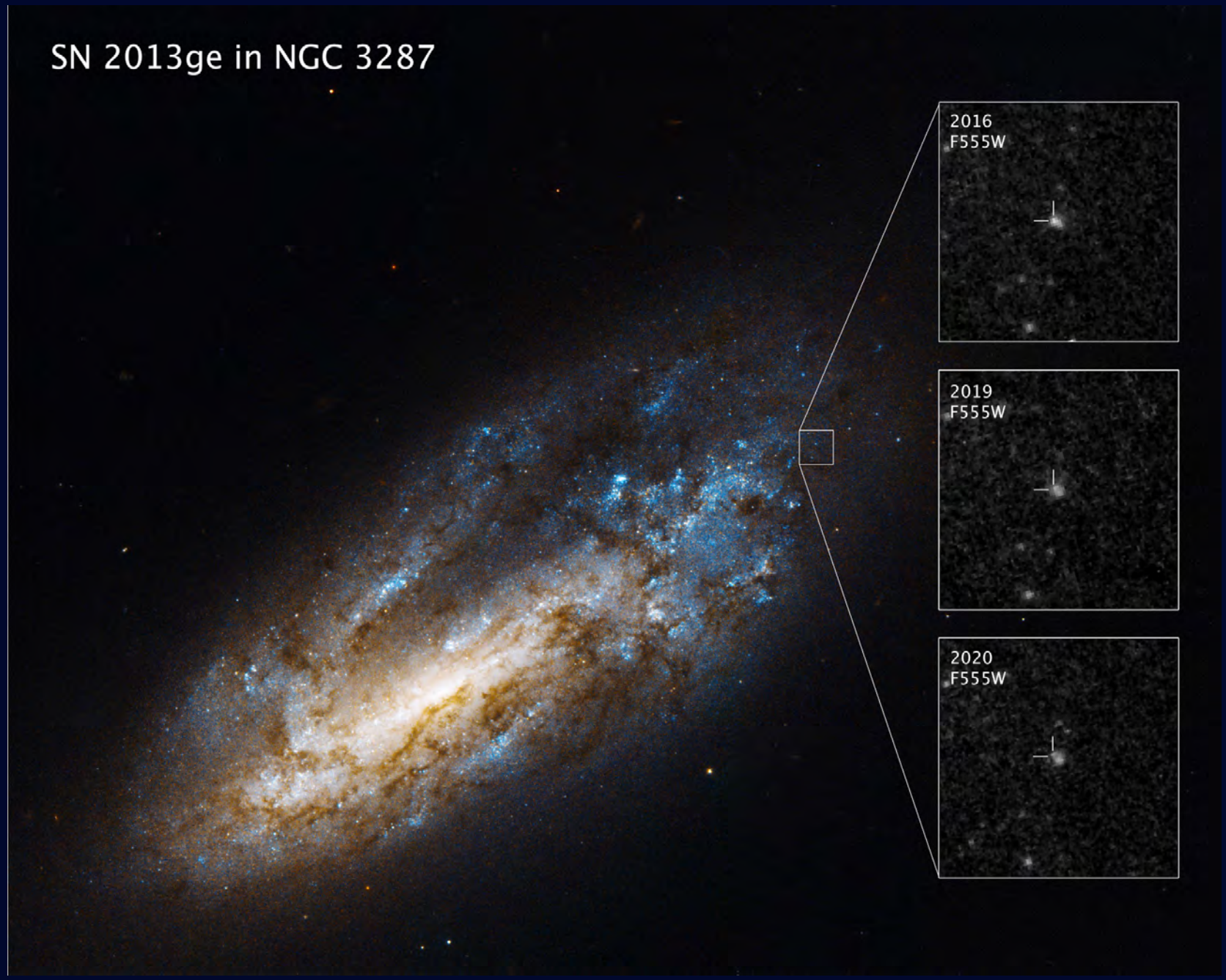
SN 2013GE in NGC 3287

05 May 2022

HST images of galaxy NGC 3287 show supernova 2013ge fading over time, revealing the steady source of ultraviolet light astronomers have identified as its binary companion star.

In some supernova cases, astronomers find no trace of the former star's outermost layer of hydrogen. What happened to the hydrogen? Suspicions that companion stars are responsible—siphoning away their partners' outer shell before their death—are supported by HST's identification of a surviving companion star on the scene of supernova 2013ge. The discovery also lends support to the theory that the majority of massive stars form and evolve as binary systems.

Credits
Science: NASA, ESA, O. Fox
Image processing: J. DePasquale (STScI)



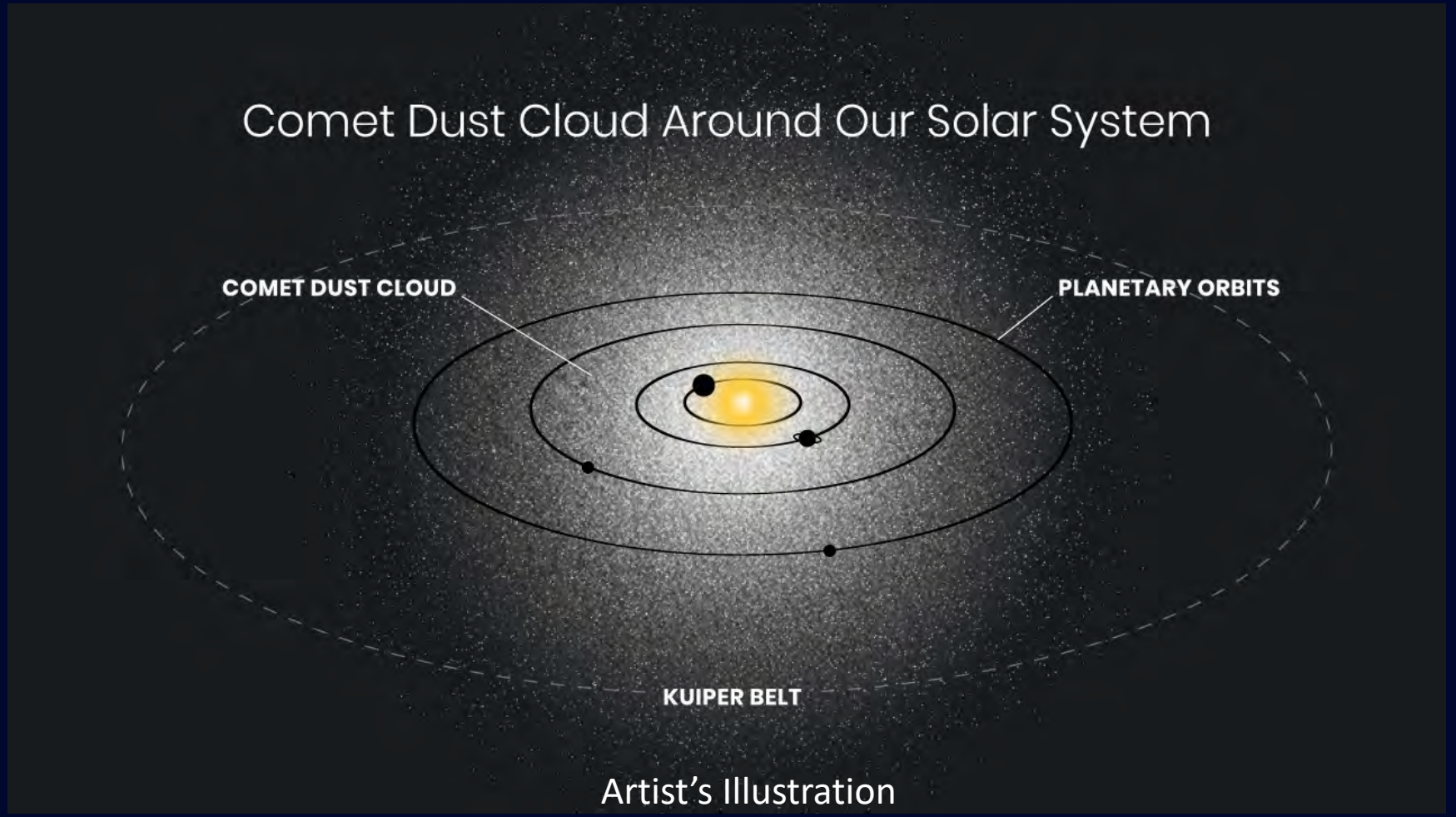
HST detects ghostly glow surrounding our solar system

08 Dec 2022

Astronomers analyzed more than 200,000 images from NASA's HST to look for any residual background glow in the sky, in an ambitious project called SKYSURF. After subtracting the glow from planets, stars, galaxies, and from dust in the plane of our solar system, the researchers found an exceedingly tiny excess of light, equivalent to the steady glow of 10 fireflies spread across the entire sky.

One possible explanation for the residual glow is that our inner solar system contains a tenuous sphere of dust from comets that are falling into the solar system from all directions, and that the glow is sunlight reflecting off this dust (see illustration at right). If real, this dust shell could be a new addition to the known architecture of the solar system.

Science: T. Carleton and R. Windhorst (ASU)
Image credit: NASA, ESA, Andi James (STScI)



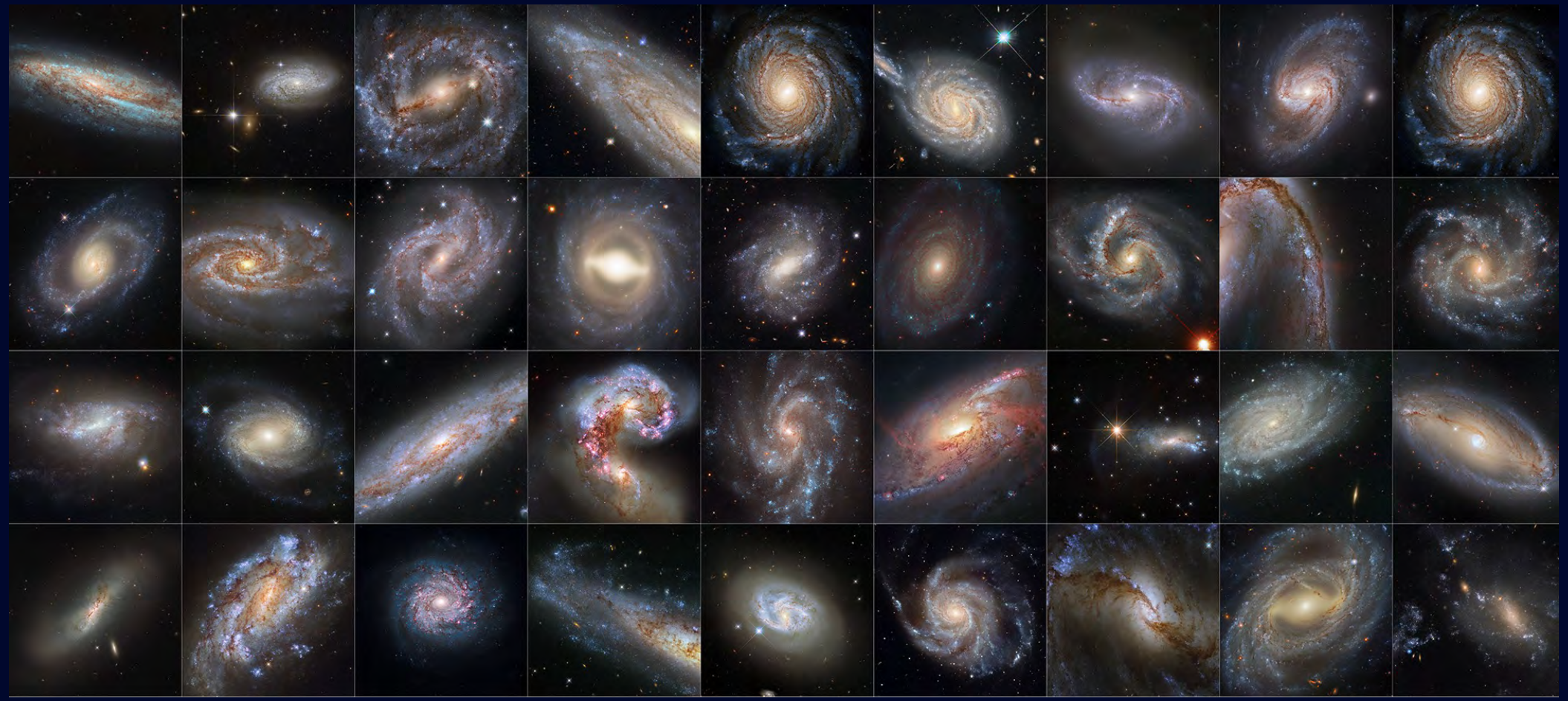
Artist’s Illustration

Supernova Host Galaxies

19 May 2022

This collection of 36 images from NASA's HST features galaxies that are hosts to both Cepheid variables and supernovae. These two phenomena are both crucial tools used by astronomers to determine astronomical distance, and have been used to refine our measurement of the Hubble constant, the expansion rate of the universe.

Credits - Release: NASA, ESA, STScI, *Science:* A. Riess (STScI)



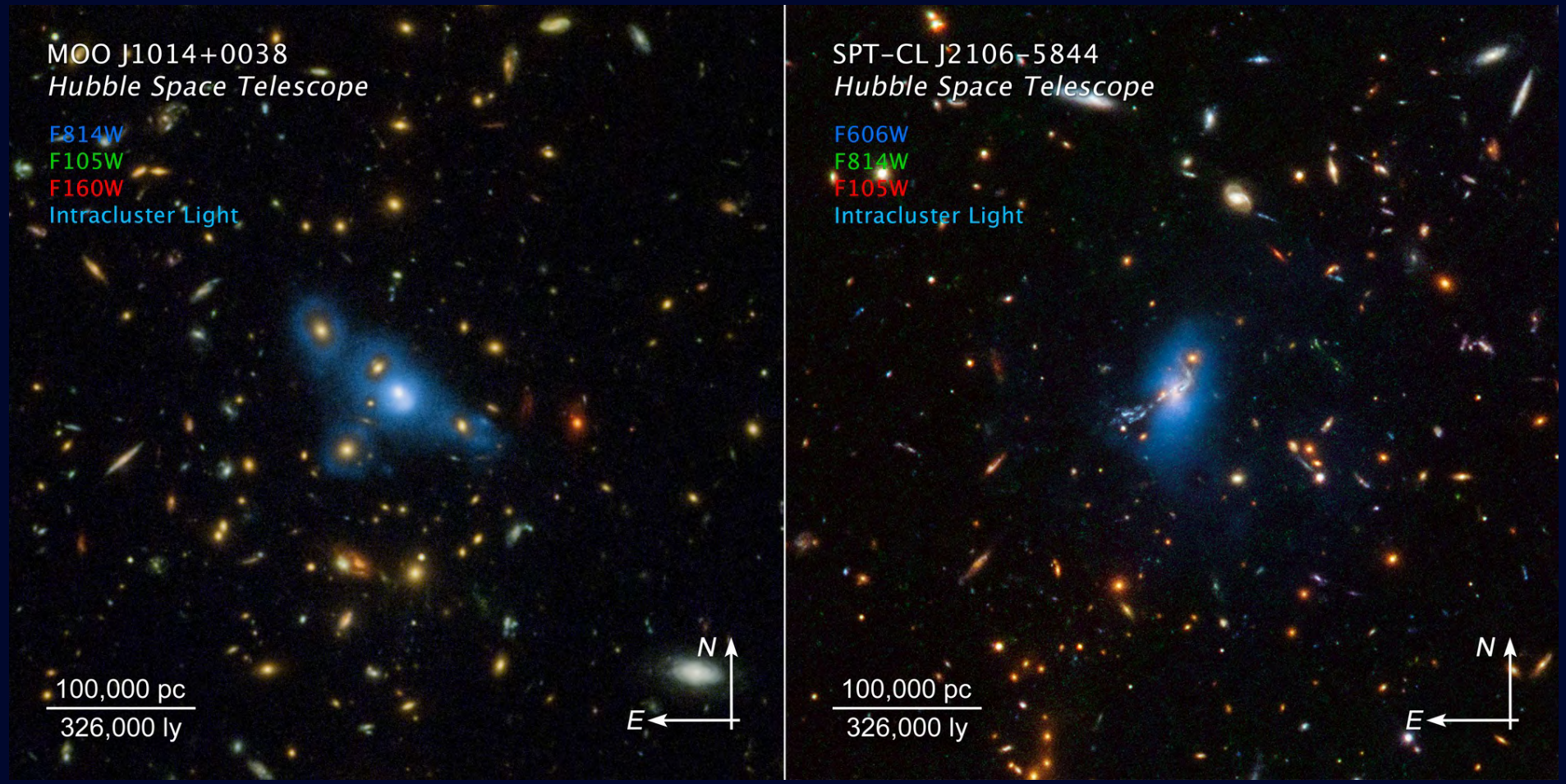
Ghost light among galaxies

04 Jan 2023

In giant clusters of hundreds or thousands of galaxies, innumerable stars wander among the galaxies like lost souls, emitting a ghostly haze of light. These stars are not gravitationally tied to any one galaxy in a cluster.

A recent infrared survey from NASA's HST suggest that these stars have been wandering around for billions of years, and are not a product of more recent dynamical activity inside a galaxy cluster that would strip them out of normal galaxies.

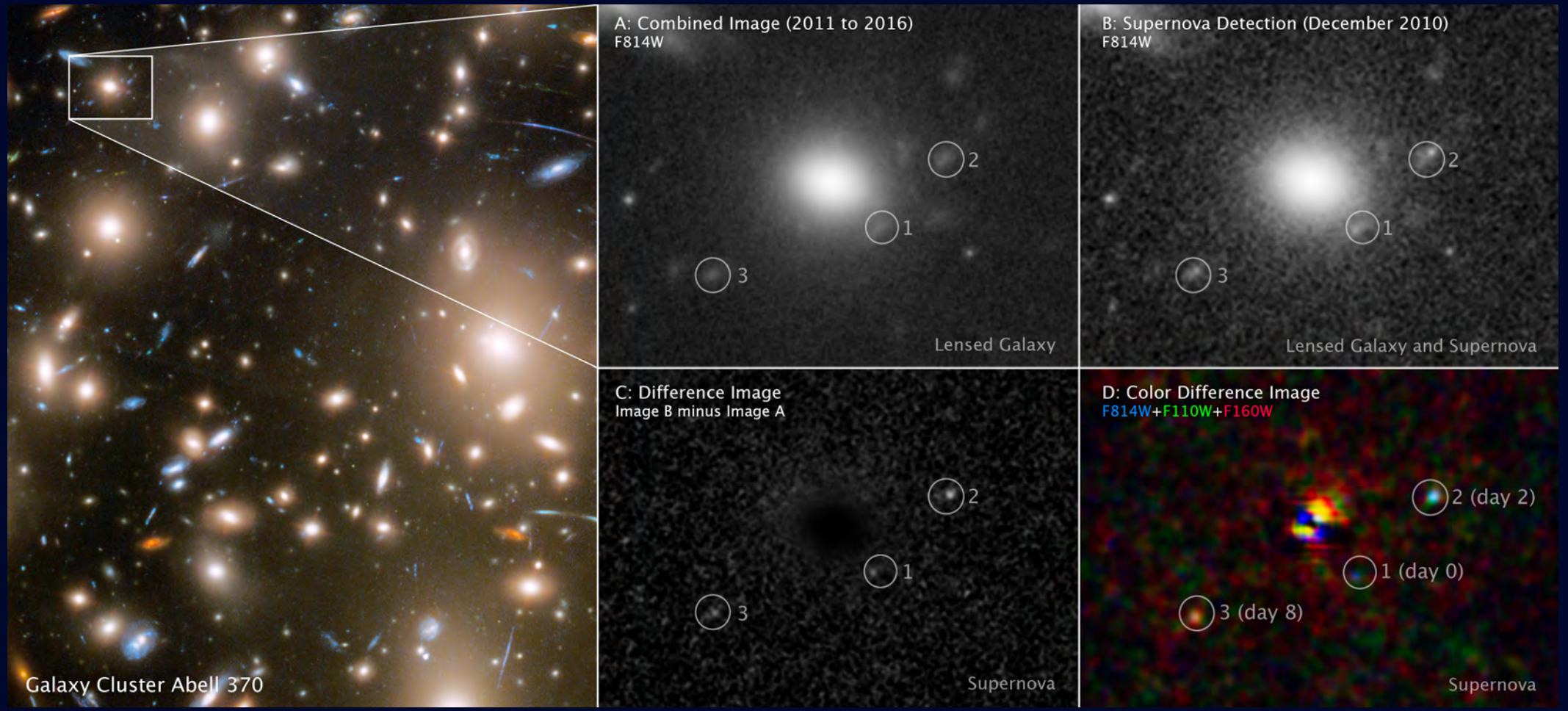
Science: NASA, ESA, STScI, James Jee (Yonsei University)
Image processing: J. DePasquale (STScI)



LENSED SUPERNOVA IN ABELL 370

9 Nov 2022

Thanks to gravitational lensing, three different moments in a far-off supernova explosion were captured in a single snapshot by NASA's Hubble Space Telescope, the first detailed look at a supernova so early in the universe's history. *Image credit:* NASA, ESA. *Science contact*: W. Chen and P. Kelly (University of Minnesota)



Dual Quasars

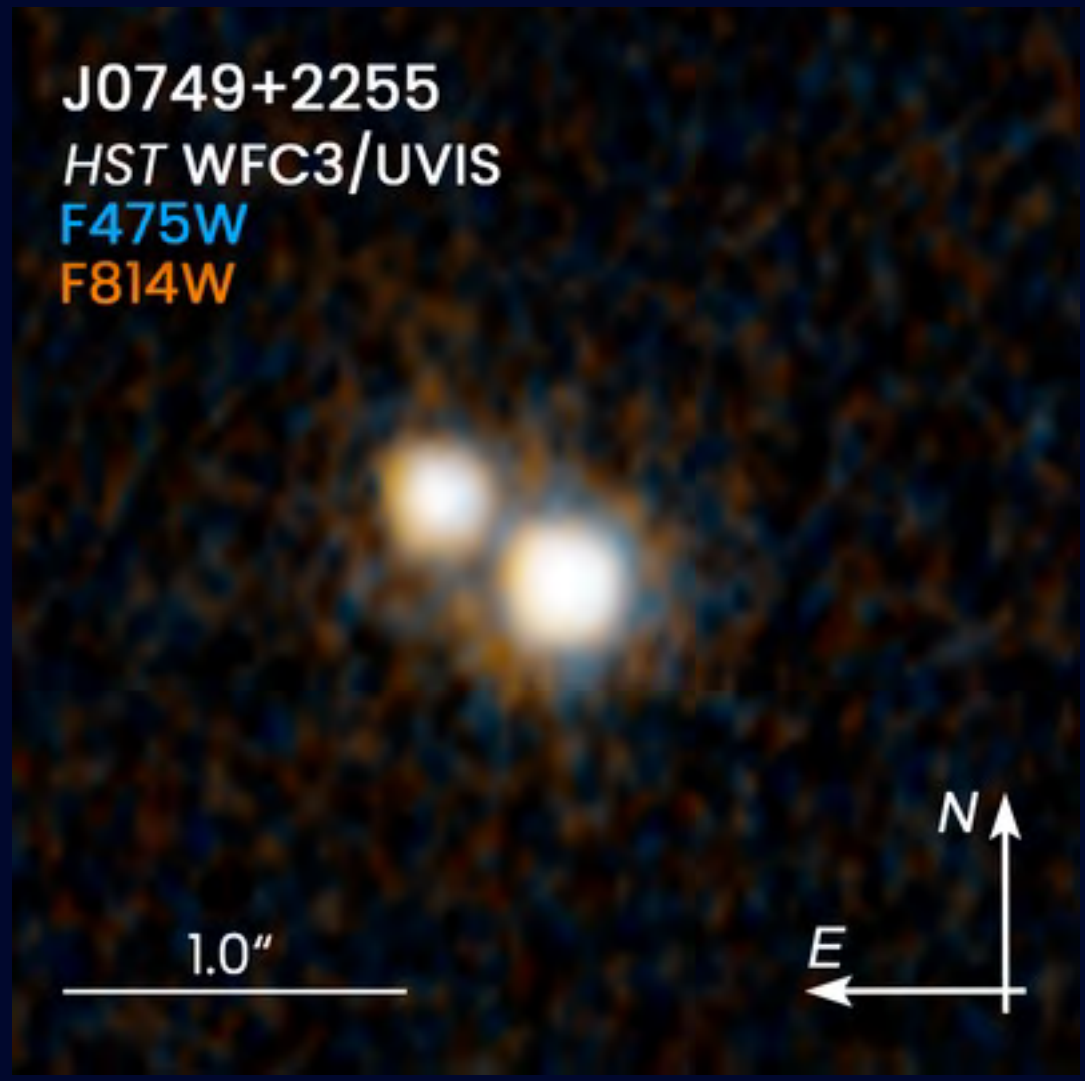
05 Apr 2023

The early universe was a rambunctious place where galaxies often bumped into each other and even merged together. Using NASA's Hubble Space Telescope and other space and ground-based observatories, astronomers investigating these developments have made an unexpected and rare discovery: a pair of gravitationally bound quasars, both blazing away inside two merging galaxies. They existed when the universe was just 3 billion years old.

Quasars are bright objects powered by voracious, supermassive black holes blasting out ferocious fountains of energy as they engorge themselves on gas, dust, and anything else within their gravitational grasp.

"We don't see a lot of double quasars at this early time in the universe. And that's why this discovery is so exciting," said graduate student Yu-Ching Chen of the University of Illinois at Urbana-Champaign, lead author of this study.

Science: NASA, ESA. Yu-Ching Chen (UIUC), Hsiang-Chih Hwang (IAS), Nadia Zakamska (JHU), Yue Shen (UIUC)

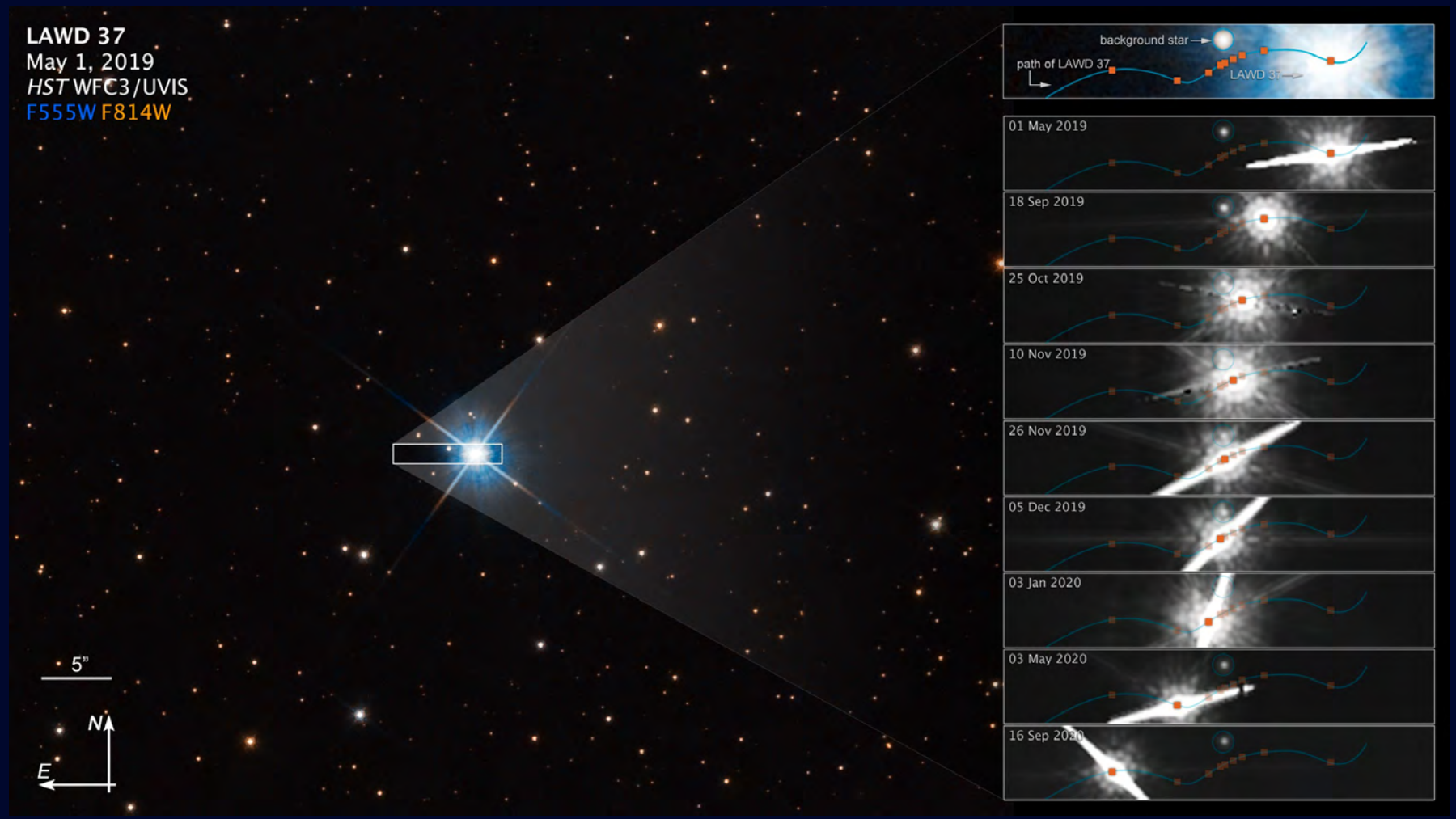


HST measures deflection of starlight by a foreground object

02 Feb 2023

Astronomers using NASA's HST have for the first time directly measured the mass of a single, isolated white dwarf (LAWD 37), the surviving core of a burned-out Sun-like star. Researchers found that the white dwarf is 56 percent the mass of our Sun, in agreement with earlier theoretical predictions.

LAWD 37 is in the center of the large image. The inset boxes plot how the dwarf passed in front of a background star in 2019. The wavy blue line traces the dwarf's apparent motion across the sky as seen from Earth. Though the dwarf is following a straight trajectory, the motion of Earth orbiting the Sun imparts an apparent sinusoidal offset due to parallax. (The star is only 15 light-years away, and therefore is moving at a faster rate against the stellar background.)



Science: NASA, ESA, P. McGill (UC Santa Cruz, IoA), K. Sahu (STScI)
Image processing: J. DePasquale

Hubble Documentation and Help Desk

HST User Documentation website (HDox) including Call for Proposals, Phase 2 Proposal Instructions, and instrument Handbooks
hst-docs.stsci.edu

HST Help Desk web portal: hsthelp.stsci.edu