



SEPTEMBER 2016

MAST NEWSLETTER

THE LATEST UPDATES FROM THE BARBARA A. MIKULSKI ARCHIVE FOR SPACE TELESCOPE

STSCI

HIGH LEVEL SCIENCE PRODUCTS: THE GOODS-S/CDF-S HUBBLE LEGACY FIELD

THE HUBBLE LEGACY FIELDS PROJECT HAS RELEASED A COMBINED DATASET OF MORE THAN 7000 HST IMAGES OF THE GOODS-S/CDF-S REGION.

SEPTEMBER 1, 2016



GOODS-S Hubble Legacy Field

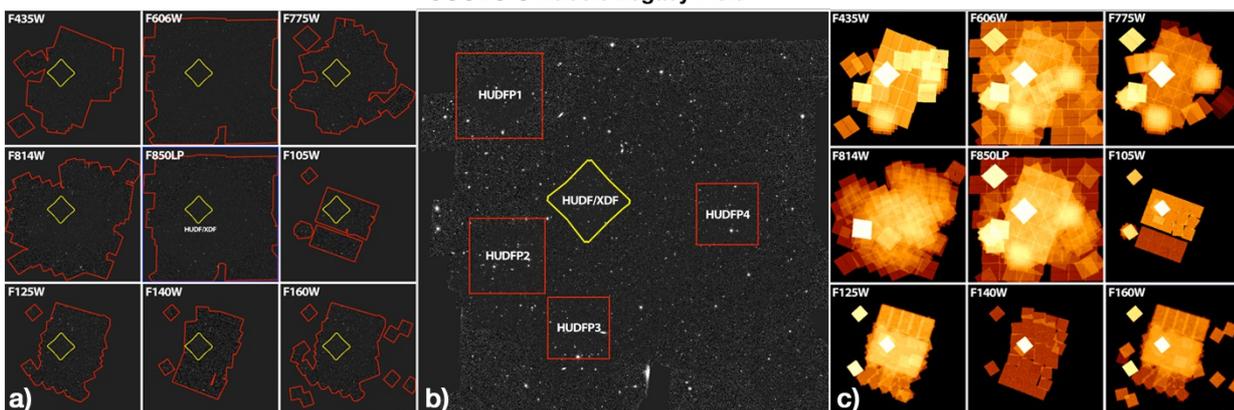


Figure 1: The Hubble Legacy Field GOODS-S (HLF-GOODS-S). a) Images from the nine ACS/WFC and

WFC3/IR filters from the HLF-GOODS-S dataset. b) The five deep regions within HLF-GOODS-S (HUDF parallels in red and the HUDF/XDF in yellow). c) Exposure time maps illustrating the over 7000 exposures that comprise the HLF-GOODS-S dataset. High resolution versions of these images can be found on the [MAST HLF webpage](#) and on <http://firstgalaxies.org/hlf>.

Nearly 2400 orbits of Hubble imaging data has been taken over the GOODS-S/CDF-S region by the Advanced Camera for Surveys (ACS/WFC) and the Wide Field Camera 3 (WFC3/IR) since the ACS was launched in 2002. A total of 30 HST programs have taken ACS and WFC3/IR imaging data on this region. While the major datasets like GOODS-S ([Giavalisco et al. 2004](#)), ERS and CANDELS ([Koekemoer et al. 2011](#)) have been made available individually as High Level Science Products (HLSPs) in MAST, the data from numerous other programs has not been readily available, nor has that data been combined with these major datasets into a single photometrically and astrometrically-uniform dataset. A first major combination of disparate ACS and WFC3/IR datasets in this region was made in 2013 on the HUDF following the completion of the HUDF12 program. Over a decade of images were combined into the HUDF/XDF and submitted to MAST as a High Level Science Product ([Illingworth, Magee et al. 2013](#)). The lack of a combined dataset on the whole GOODS-S/CDF-S region has been unfortunate given the HST resources that have been expended on this area and its central role in so many studies of distant galaxies.

Given this, an archival program (AR-13252) was submitted and approved to carry out the full combination of all the datasets on the GOODS-S/CDF-S region. Since this dataset combines all images in the HST archive on this region to date, the archival proposal identified the data product under the global name "Hubble Legacy Field," with the designation HLF-GOODS-S for this whole field. The HLF-GOODS-S includes all the data from the GOODS-South, CANDELS-S, ERS, ECDF-S, HUDF, HUDF parallels, and numerous other programs with the ACS/WFC optical filters (F435W, F606W, F775W, F814W and F850LP) and the WFC3/IR infrared filters (F105W, F125W, F140W and F160W). This dataset includes 4 very deep regions (HUDFP1-4) in addition to the HUDF/XDF. Footprints of the HLF-GOODS-S region are shown in Figure 1.

The total data incorporated in the HLF-GOODS-S is 5.7 Msec in 7079 exposures from 2387 orbits. This is ~70% of a HST full cycle! For more information about the HLF-GOODS-S High Level Science Products, visit the MAST webpage at <https://archive.stsci.edu/prepds/hlf/>, and also see [Illingworth, Magee et al. 2016](#).

HUBBLE SOURCE CATALOG VERSION 2 SCHEDULED FOR SEPTEMBER 2016 RELEASE

**THE NEW CATALOG WILL INCLUDE NEARLY 300 MILLION SOURCE DETECTIONS
DERIVED FROM THE HUBBLE LEGACY ARCHIVE IMAGING DATA.**

SEPTEMBER 1, 2016



The Hubble Source Catalog (HSC) is designed to optimize science from the Hubble Space Telescope by combining the tens of thousands of visit-based source lists in the Hubble Legacy Archive into a single master catalog. Version 2 of the Hubble Source Catalog is scheduled to be released in late September 2016. The primary improvements are inclusion of deeper and more recent ACS source lists from the Hubble Legacy Archive version 9.1, and spectroscopic cross matching with FOS, GHRS, and COS. The number of sources will roughly triple, with about 300 million detections.

The HSC Version 1 database will still be available via various interfaces, but users may want to keep in mind that a new improved version is coming soon. The structure of the database is similar enough that, in most cases, it should be straightforward to repeat queries after Version 2 becomes available.

The HSC Version 1 data can be accessed in a number of ways – including through the MAST Data Discovery Portal and CasJobs – as described on the HSC website. A number of detailed use cases are also available to help you get started. If you have questions or feedback about the HSC, please let us know by emailing archive@stsci.edu or posting on the MAST Forum.

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STREAMLINING DATA DISCOVERY: TRANSITIONING THE HLA INTERFACE TO THE MAST PORTAL

THE HUBBLE LEGACY ARCHIVE SEARCH INTERFACE WILL BE RETIRED IN LATE
2017.

SEPTEMBER 1, 2016



A primary aim of the MAST project is to enable data discovery through innovative search interfaces. As part of this effort, we are working to consolidate much of our search functionality into a more streamlined approach, making maintenance easier and bring new functionality to our existing interfaces.

MAST plans to retire the [Hubble Legacy Archive \(HLA\)](#) interface sometime in late 2017. Efforts are ongoing to migrate the existing HLA website functionality into the [MAST Data Discovery Portal](#). You will not lose the HLA functionality you have learned to love over the years, but it will look a little different. We will be providing guided tutorials to help HLA users transition.

We emphasize that, although the search interface will be changing, the HLA Project itself will continue. We will continue to make enhanced HST products such as combined Level 2 data (using Astrodrizzle, exposures with the same filter, same camera, and within the same visit are combined), as well as Source Extractor and DAOphot source lists for many of the HST instruments. We will also be making Super Mosaics to be released in 2017, and an upcoming newsletter article will provide additional details.

As always, we welcome any comments, questions or concerns. If you want to make sure your favorite part of the HLA gets moved into the MAST Portal, please tell us about it by emailing us at archive@stsci.edu, or posting on the [MAST Forum](#).

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HIGH LEVEL SCIENCE PRODUCTS: THE HST ADVANCED SPECTRAL LIBRARY PROJECT (ASTRAL)

AN ARCHIVAL ATLAS OF HST/STIS ULTRAVIOLET SPECTRA OF ICONIC BRIGHT
COOL AND HOT STARS FROM THE ASTRAL PROJECT SUPPORTS THE STUDY OF A
WIDE RANGE OF ASTROPHYSICAL TOPICS.

SEPTEMBER 1, 2016



ASTRAL is a combination of Large Treasury Projects carried out in Cycles 18 and 21 (376 total orbits). The effort involved dozens of investigators from all over the world. The objective was to collect full-coverage ultraviolet (1150-3150 Angstrom) spectra of representative – in some cases iconic - bright cool (F-M) and hot (O-A) stars, at the highest spectral resolution and signal-to-noise feasible with a high-performance Space Telescope Imaging Spectrograph (STIS). These UV “atlases” are intended to seamlessly link into broad-coverage optical/infrared spectra of the same objects taken with state-of-the-art instruments on ground-based telescopes. Our focus on stars was motivated by the fundamental role they play in Galactic ecology: as chemical factories, hosts of planetary systems, and for lighting up the universe in general. The UV is highly prized partly because it illuminates high-energy processes - such as the massive winds of hot stars or the million-degree coronal outer envelopes of cool stars - but also because it harbors resonance transitions of the key light elements, H, C, N, O, and

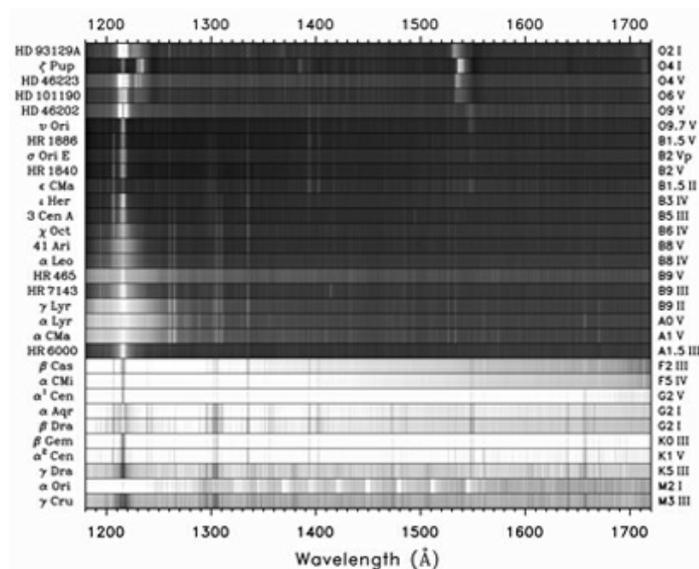


Figure 1: Schematic, low-resolution far-UV segments of the ASTRAL targets. The spectra are rendered in negative: darker equals higher intensities. The bright photospheric, absorption-line dominated hot stars (O-A) give way to widespread chromospheric emission lines among the cooler types (F-M). Note also the broad absorption bands of the CO A-X system in Alpha Ori (evenly spaced light features 1350-1550 Angstroms), from a cold circumstellar molecular shell.

the important heavier metals, Si, Mg, and Fe. High spectral resolution is equally prized, for example, to separate close blends where one component might be a cosmogenically important rare isotope; or, to extract kinematic information from line Doppler shifts, ranging from the extreme mass outflows of OB supergiants, to circumstellar disks of T Tauri stars, or the coronal cooling downdrafts of sunlike dwarfs. Broad wavelength coverage is crucial as well, to support the widest possible range of investigations. Figures 1 and 2 show representative spectra of ASTRAL targets.

In total, there were 31 ASTRAL targets: 10 cool and 21 hot stars. About 12 orbits were allocated per object, although usually more for the cool stars, which are fainter in the UV. In some cases fewer orbits were allocated for the UV-brightest hot stars, which also required special neutral density filters to avoid detector overlight limits. Multiple visits to a target were designed to provide redundant time domain snapshots, and mitigate instrumental effects such as camera fixed pattern noise. The spectra were specially post-processed to improve wavelength scale precision, as well as to coherently stitch together the many different grating settings needed to cover the full UV range for each object. Details and caveats concerning the observing strategy and post-processing protocols can be found on the ASTRAL site (<http://casa.colorado.edu/~ayres/ASTRAL/>, or the MAST HLSP page [here](#)), which provides a portal to the high-level datasets. ASTRAL is intended to support diverse astrophysical explorations for many years to come. To be sure, it might be decades before the next generation, high-resolution UV spectrometer is flown, so it is vital to carry out archive-minded projects like ASTRAL now, while we still have access to a remarkable instrument like STIS.

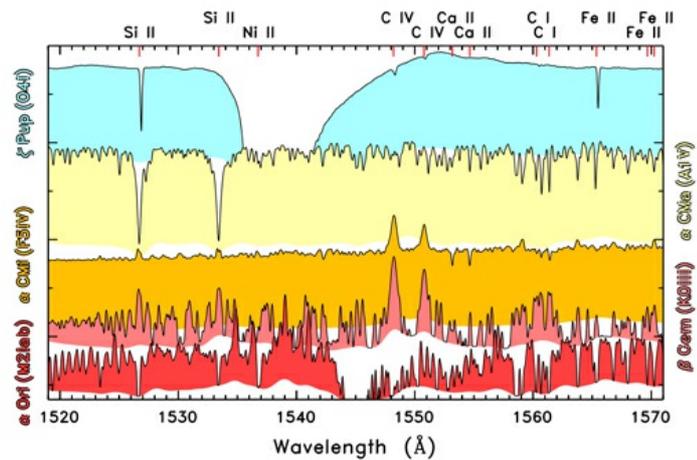


Figure 2: High-resolution tracings of representative hot and cool stars in the narrow interval around the important high-temperature C IV 1548,50 Angstrom resonance doublet. The ordinate is a logarithmic relative flux density scale. The shading extends to the 1-sigma noise floor for each tracing. One sees a broad, strongly blueshifted P-Cygni profile of C IV in the windy O supergiant Zeta Pup; narrow sub-coronal emission features in the F subgiant Alpha CMi (Procyon) and K giant Beta Gem; and complete replacement by a strong absorption bandhead of circumstellar CO in red supergiant Alpha Ori (Betelgeuse). Alpha CMa (Sirius) also lacks C IV, and instead displays strong photospheric resonance absorption by ionized silicon (1526,33 Angstroms).

REPROCESSED KEPLER Q0-Q17 SHORT CADENCE DATA AVAILABLE AT MAST

KEPLER DATA RELEASE 25 NOW INCLUDES THE REPROCESSED SHORT CADENCE DATA. ALONG WITH THE DR25 LONG CADENCE DATA, THESE ARE THE THE FINAL REPROCESSING RUNS OF THE KEPLER MISSION.

SEPTEMBER 1, 2016



MAST has recently completed the ingest of the final reprocessing of the Kepler Q0-Q17 short cadence data. The new target pixel, lightcurve, and full frame image files can be obtained through the [Kepler data archive at MAST](#). This release (DR25) corrects both the scrambled collateral smear issue reported in the [Global Erratum for Kepler Q0-Q17 & K2 C0-C5 Short-Cadence Data](#) and Dynablack calibration problem reported in the [Data Release 24 Notes Q0-Q17 Erratum](#).

The Kepler Q0-Q17 long cadence data (DR25) have been available through MAST since mid-January 2016. Taken together, the long and short cadence DR25 data represent the final reprocessing runs of the Kepler mission.

Details about the long and short cadence reprocessing can be found in the updated [Data Release Notes 25](#). Questions about how to search the Kepler archive using the [various MAST search interfaces](#) can be sent to archive@stsci.edu or posted in the Kepler and K2 section of the [MAST Forum](#).

INSIDE THE ARCHIVE: HOW TO USE THE SPECTRAL PLOTTER IN THE MAST PORTAL

LEARN HOW TO WORK WITH SPECTRAL DATA DIRECTLY IN THE MAST PORTAL.

SEPTEMBER 1, 2016



The MAST Discovery Portal allows users to search for data across all of MAST’s supported missions and the Virtual Observatory. Beyond granting access to these data, a number of tools enable users to view the data before downloading it to their machines, including scatter plots, catalog overlays, image cutouts, spectral plots, and light curves. This article will explain how to use the spectral plotter to measure an equivalent width of a spectral line from an extracted, 1-dimensional spectrum. The spectral plotter includes many more features, including the ability to apply Doppler shifts, apply smoothing, and add wavelength indicators to mark features of interest.

First, we will conduct a search to find the spectrum we’ll use in our example. We’ll be using a spectrum of the T Tauri star LkCa 4. First, make sure the “Select a Collection” box is set to “All MAST Observations” (this is set by default). Search for “LkCa 4” in the target search box at the top of the Portal interface. Next, we will use the filters on the left side to narrow our search results. Select the filters for “Product Type” = “spectrum”, and “Instruments” to “STIS FUV/MAMA”. (You may need to press the “Show More” button in that area of the filters panel to find it.) After filtering, you should have only a single remaining row in the search results.

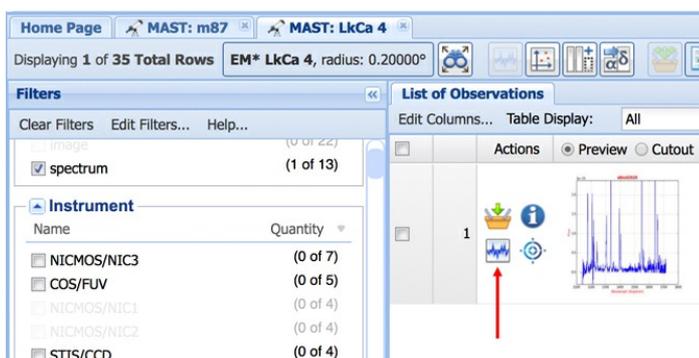


Fig 1: MAST Portal search results showing the location of the spectral plotter icon.

Next, display the spectrum by clicking on the spectral plotter button (Fig 1) located next to the preview image. After loading the spectrum, you can zoom by left-clicking and dragging on the plot, or by specifying exact boundaries under the “Range” panel on the left side of the Spectral Plotter Window. You can return to the default zoom by

double-left-clicking on the plot. For this exercise, we will be looking at the Si IV doublet at 1394 and 1403 Angstroms. On the left panel, set the wavelength range to be {1380.0, 1420.0} and the flux range to be {0.0, 1.7} (Fig. 2).

Now that we are zoomed in on our spectral feature of interest, we can measure an equivalent width. On the left panel, click on the “Fitting” section, and then select on “Enable Fitting”. Left click on the plot where you want to start the fit, then left click on the plot where you want to end the fit. Nominally this will be on the left and right side of a spectral feature. You will then see the result of your fit parameters updated in the “Fitting” section, including the total flux of the line, the average continuum flux, the flux weighted center of the line, and the equivalent width. You will also notice a black vertical indicator at the flux-weighted center of the line, and a grey, horizontal line that connects the start and end point of your fit (Fig. 3).

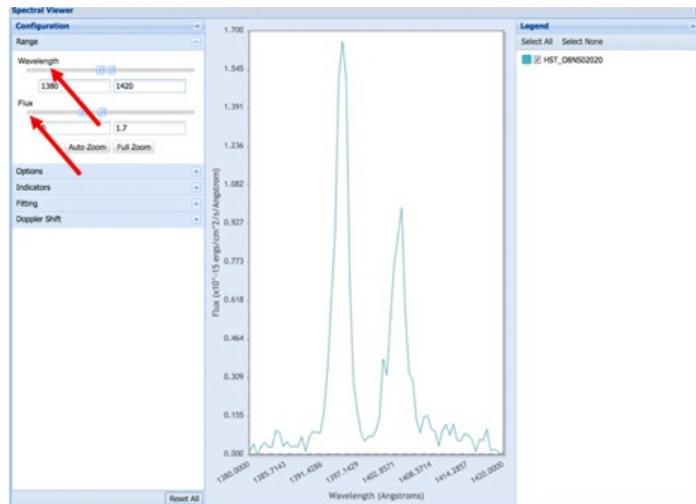


Fig 2: Adjusting the display range of the wavelength and flux.

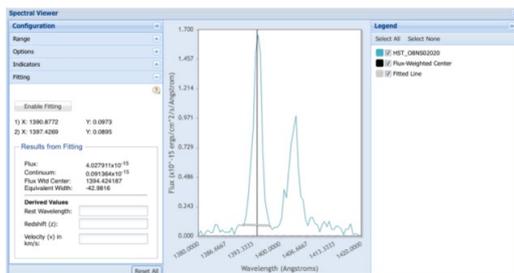
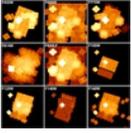


Fig 3: Results of an example spectral line fit.

The display of these two lines can be toggled on and off on the right panel. After you have a flux-weighted center of a line from a fit, you can calculate the redshift, velocity, or rest wavelength by entering one of the three values in the “Derived Values” section.

Have requests or suggestions for more options? Send them our way by emailing archive@stsci.edu or post on the MAST Forum.

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HUBBLE SOURCE CATALOG VERSION 2 SCHEDULED FOR SEPTEMBER 2016 RELEASE

BRAD WHITMORE



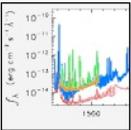
STREAMLINING DATA DISCOVERY: TRANSITIONING THE HLA INTERFACE TO THE MAST PORTAL

LEE QUICK



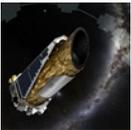
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SCOTT FLEMING



ABOUT

This newsletter is a MAST publication produced by Jonathan Hargis, on behalf of the entire MAST staff, who welcome your comments and suggestions.

The Mikulski Archive for Space Telescopes (MAST) is a NASA funded project to support and provide to the astronomical community a variety of astronomical data archives, with the primary focus on scientifically related data sets in the optical, ultraviolet, and near-infrared parts of the spectrum. MAST is located at the Space Telescope Science Institute (STScI).

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