

6.0 - Data Search Tutorials

Tutorials by level of difficulty and topic:

- [Beginner: Ways To Query the TESS Input Catalog \(TIC\) and Candidate Target List \(CTL\)](#)
- [Beginner: Reading and Using TESS Data Products](#)
- [Beginner: Using MAST TESS Search Interfaces](#)
- [Intermediate: Science-Case-Driven Searches of TESS Data Product](#)

Beginner: Ways To Query the TESS Input Catalog (TIC) and Candidate Target List (CTL)

Beginner - Search the TIC centered on HD 209458.

Walkthroughs: [Browser-Based](#) | [Using API](#)

Search the TIC centered on HD 209458 to find all dwarfs in the catalogs.
Tools Used:

- Portal: Catalog Cone Search
- MAST Name Resolver
- Portal: Post-search Filtering
- Portal: Export Search Results Grid

Beginner - Search the exoCTL centered on K2 Campaign 2.

Walkthroughs: [Browser-Based](#)

Search the exoCTL centered on the K2 Campaign 2 field.
Tools Used:

- Portal: Catalog Cone Search
- Portal: Export Search Results Grid

Beginner - Find high proper motion M dwarfs in the southern hemisphere from the TIC.

Walkthroughs: [Browser-Based](#)

Search for high proper motion M dwarfs in the southern hemisphere from the TIC.
Tools Used:

- Portal: Advanced Search

Beginner - Export a Portal table in the Goddard Mission Office format.

Walkthroughs: [Browser-Based](#)

Select a subset of output columns to export from a Portal search results table.
Tools Used:

- Portal: Edit Columns
- Portal: Export Search Results Grid

Beginner - Find southern hemisphere K dwarfs.

Walkthroughs [Browser-Based](#)

Find all southern hemisphere K dwarf stars based on TIC temperature.
Tools Used:

- CasJobs SQL Query Interface

Beginner: Reading and Using TESS Data Products

Beginner: Read And Display A Calibrated Full Frame Image (FFI)

Walkthroughs: [Using API](#)

Load and display a TESS full frame image, using the world coordinate system information to convert pixel to celestial coordinates in the plot.

Beginner: Read And Display A Target Pixel (TP) File and Aperture

Walkthroughs: [Using API](#)

Load and plot the contents of a TESS target pixel file. Display the flux values of the collected pixels from a single cadence. Identify the pixels used in the photometric aperture.

Beginner: Read and Plot A Light Curve File

Walkthroughs: [Using API](#)

Load and plot the contents of a TESS light curve file. Plot the flux timeseries contained with the file, and display the pixels used in the photometric aperture.

Beginner: Read and Plot A Data Validation Time Series File

Walkthroughs: [Using API](#)

Load and plot the contents of a TESS data validation timeseries file. Plot the detrended flux timeseries contained within the file.

Beginner: Tour Light Curve and Target Pixel File Contents

Walkthroughs: [Using API](#)

Walk through the basic contents of the TESS 2-minute cadence, time-series files (light curve files and target pixel files.)

Beginner: Using MAST TESS Search Interfaces

Beginner - Searching For And Retrieving TESS Mission Products

Walkthroughs: [Browser-Based](#)

Shows how to use the MAST Portal and/or astroquery.mast to search for TESS mission products, including pre- and post-search filtering, how to use the download basket, and how to specify for certain types of products when requesting a download.

Tools Used:

- astroquery
- Portal: Pre-search Filtering
- Portal: Post-search Filtering
- Portal: Download Basket

Beginner - Downloading Data Validation Products Through Astroquery

Walkthroughs: [Using API](#)

Shows how to download Data Validation (DV) products through astroquery.mast for a given object, and then shows how to display some of the contents.

Tools Used:

- astroquery

Beginner - Get Data Products For A Guest Investigator Proposal.

Walkthroughs: [Browser-Based](#) | [Using API](#)

Use advanced search in the Portal to find and download all data products for a given Guest Investigator Proposal ID.

Tools Used:

- Pre-constructed bulk download scripts (browser-based)
- Portal: Advanced Search (astroquery)

Beginner - Download All Full Frame Images By Sector.

Walkthroughs: [Browser-Based](#)

Use the pre-constructed bulk download scripts to retrieve large numbers of full frame images from MAST using cURL commands.

Tools Used:

- Pre-constructed bulk download scripts.

Beginner - TESSCut (API: with URL Requests).

Walkthroughs: [Browser-Based](#) | [Using API](#)

A review of how to use TESSCut through the URL using the requests library in Python.

Tools Used:

- TESSCut GUI (browser-based)
- TESSCut (through URL requests)

Beginner - TESSCut (API: with Astroquery).

Walkthroughs: [Browser-Based](#) | [Using API](#)

A review of how to use TESSCut in Astroquery to make a cutout of Full Frame Images.

Tools Used:

- TESSCut GUI (browser-based)
- TESSCut (Astroquery version)

Beginner - Introduction To exo.MAST.

Walkthroughs: [Browser-Based](#) | [Using API](#)

An introduction to exploring known planets and planet candidates (including TESS Threshold Crossing Events, TCEs) using the exo.MAST portal.

Tools Used:

- exo.mast

Beginner - TAP Service.

Walkthroughs: [Using API](#)

How to use TAP services to get a footprint from a specific Sector+camera+chip TESS FFI and then do a search for TESS mission data products that fall within exactly that footprint on the sky.

Tools Used:

- TAP

Intermediate: Science-Case-Driven Searches of TESS Data Products

Intermediate - Explore the TESS Pixel Response Function

Walkthroughs: [Using API](#)

Work with the FITS formatted TESS PRFs to extract an image that represents a single star located at a specified location on the detector. TESS PRF models provide the inter-pixel response and the across-detector shape of a single star as it travels through the optics and falls on the detector.