A Database of Companion Search Non-Detections For Nearby Stars

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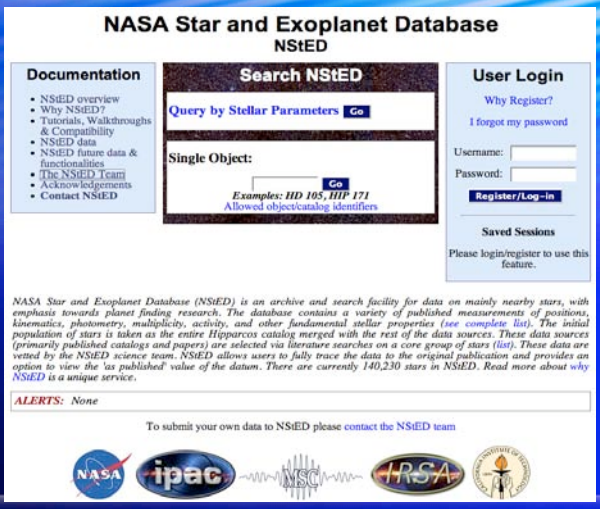
The *NASA Star and Exoplanet Database (NStED)*

STATUS:
Over 140,000 stars searchable according to:

- Position
- Kinematics
- Multiplicity
- Activity Indicators
- Spectral Type
- Photometry in 12 wavelengths
- Resolved Disks
- Resolved Substellar Companions
- Metallicity
- Rotation
- Variability
- RV Planets
- Luminosity
- Effective Temperature
- IR Excess

The high contrast database portion is currently under construction.

http://nsted.ipac.caltech.edu



See poster at this conference.

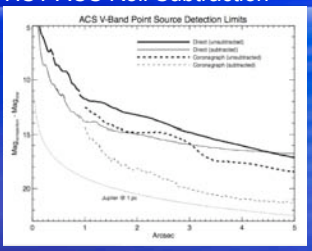
High-Contrast Non-Detection Database Guiding Principles

- Non-detections are often not published, but they can be as important as detections. There is a need for non-detection data to be made available to the astronomy community. Such data will provide guidance in target selection for future planet search surveys as well as allowing for large-scale archival population studies.
- The NStED dabase, with its focus on comprehensive information on nearby stars and exoplanets, makes an ideal avenue to disseminate this information.
- Observers often use different methods to calculate high-contrast sensitivities. There is a need to provide a more uniform "data-driven" method to compare different surveys' sensitivities.
- Sensitivity calculations and data submission must be relatively painless and straightforward to get observers to participate.
- Original authors must be properly credited for all outputted data.

Joe Carson *Spirit of Lyot 2007*

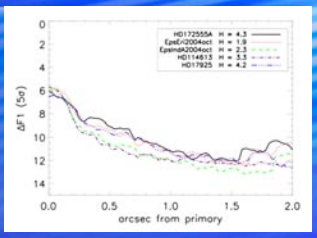
Sensitivity Curves - a range of telescopes, instruments, observing techniques, and algorithms.

HST ACS Roll Subtraction



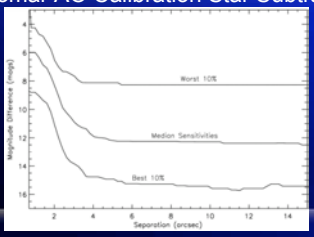
Krist 2004

VLT NACO Simultaneous Differential Imaging



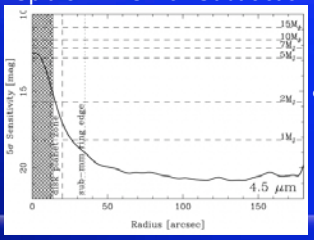
Biller et al. 2007

Palomar AO Calibration Star Subtraction



Carson et al. 2005

Spitzer IRAC Roll Subtraction



Marengo et al. 2006

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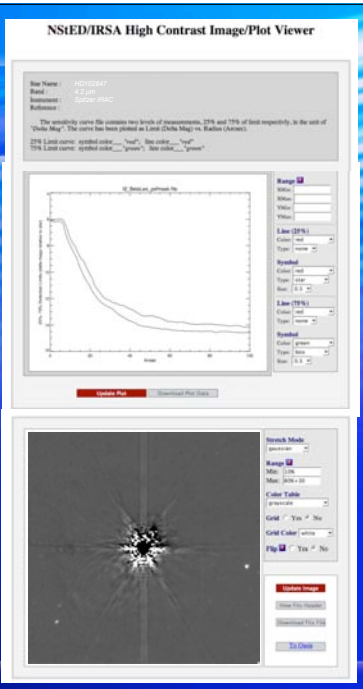
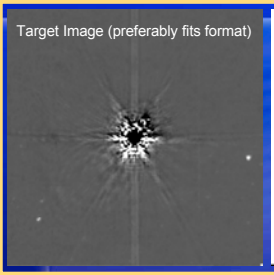
Point Source Sensitivity Curves

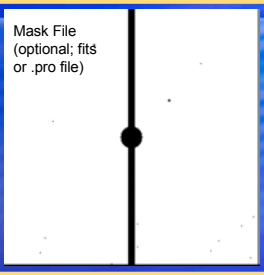
- Database will hold sensitivity curves at multiple wavelengths: most likely H/K from ground AO, J from HST, M band from Spitzer/LBT/JWST.
- Survey contributors apply an IDL script to their data sets to generate high-contrast curves; current inputs include a fits image file, a calibration flux value, and a PSF sharpness or aperture parameter.
- Azimuthal-dependent noise is determined via a boxed root mean square method where the box size approximates an optimal photometric aperture size.
- Radial sensitivity curves outputted for best 75% and best 25% of search areas.
- Sensitivity curve algorithms have been tested with PSF planting on ground-based AO and HST NICMOS data sets.



Sensitivity curves are generated by the survey author using the *IDL* script *limits.pro* (written by J. Krist).

Inputs



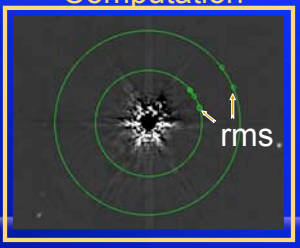


USER PARAMETERS

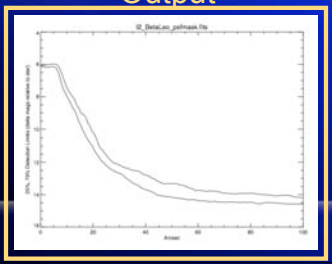
Central Star Approximate Pixel Coordinates.
PSF Sharpness Value or Optimal Photometric Aperture

Flux Counts (ADU) of the Non-occulted, Non-saturated Parent Star
Minimum Meaningful Search Radius (pixels)
Maximum Meaningful Search Radius (pixels)

Computation



Output



We Need Your High-Contrast Non-Detection Data! - Keck, Lick, VLT, Gemini, Subaru, MMT, HST, Spitzer, and others.

We are accepting feedback on sensitivity algorithms until the end of this month (June). After that we'd like to release a final version of the sensitivity script and ramp up submissions.

Please email Joseph.Carson@jpl.nasa.gov if you would like a copy of the sensitivity script, documentation, or information on submitting your data files.

Thank you to those who have already tested the sensitivity algorithms on your datasets! Pat Lowrance (HST data), Angelle Tanner (Palomar AO data), John Krist (HST data), myself (Palomar AO & Spitzer data) and others.