EPDS ARCHIVE AND DATA MANAGEMENT

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NExScI Role in EPDS

- NExScI is the NASA Exoplanet Science Institute and is the science operations and analysis center for NASA's Exoplanet Exploration Program
- As stated in the call, NExScI is expected to have responsibility for data processing and archiving after commissioning
- We have developed and are operating the following archives:
  - KOA – Keck Observatory Archive
  - LBTI Archive (no public data yet)
  - NASA Exoplanet Archive

EPDS archive

- All science data will be in the archive and will go public after a 12 month proprietary period
  - Includes GTO time
  - Engineering and commissioning data will be evaluated for format compliance and usability before being placed in archive
- Selected team will produce raw (Level 0) data
- Selected team will provide a pipeline to generate internally calibrated (Level 1) data
  - Includes bad pixel removal, dark and background subtraction, wavelength calibration, and flat fielding
- Archive will also include ancillary data (e.g. weather)
  - Coordinated with NOAO

Proposal requirements on data issues

- Step 1 and 2 proposals do not need to describe interface in detail (per call)
- NExScI will coordinate with selected teams during Instrument Concept Study to ensure submitted data pipeline plans meet requirements and work is properly scoped
- NExScI and NOAO will work with team selected for full implementation to develop data management plan (DMP) covering
  - Data transfer mechanisms and responsibilities
  - Level 0 format (FITS) and contents
  - Level 1 format (FITS) and contents
  - Pipeline requirements

Why discuss data content now?

- Although Step 1/2 proposals do not require pipeline and data details, our experience is that the final product is better when the data issues are considered early
  - If keywords have to be added during commissioning, early data is less useful or even impossible to properly understand and archive

Level 0 data header contents

- Header contents must include all information necessary to understand what data was taken and **to drive pipeline processing**
- Note that some of this information will have to be gathered from the telescope
- Telescope description
  - Location, date, telescope, image rotators
- Instrument state (anything set by observer should be recorded)
  - Filters, focus
- Observation parameters
  - Integration time, source name, sky coordinates, airmass

Level 0 (continued)

- Calibration type
  - dark, flat
- Calibration source information
  - Lamp type, settings
- Detector information
  - Gain, bias, readout mode

- KOA Examples:
  - HIRES http://www2.keck.hawaii.edu/koa/public/keywords/koa_keywords.php
  - NIRSPEC http://www2.keck.hawaii.edu/koa/public/keywords/NirspecKeywords.php

Archive-added keywords

- The archive will also add keywords to allow for additional data searches
  - Program ID and PI information
  - Basic weather information (if available)
  - Added for both Level 0 and 1

Basic pipeline requirements

- Must produce instrument calibrated data using only files from the Level 0 archive
  - No configuration/instrument information should be stored elsewhere
  - Relevant calibration data identified through keywords and heuristics
- Should require minimal human intervention to process a full night of data
- Must have a scriptable mode, i.e. not GUI only
- Must provide some data quality metrics
  - Discuss as part of DMP definition

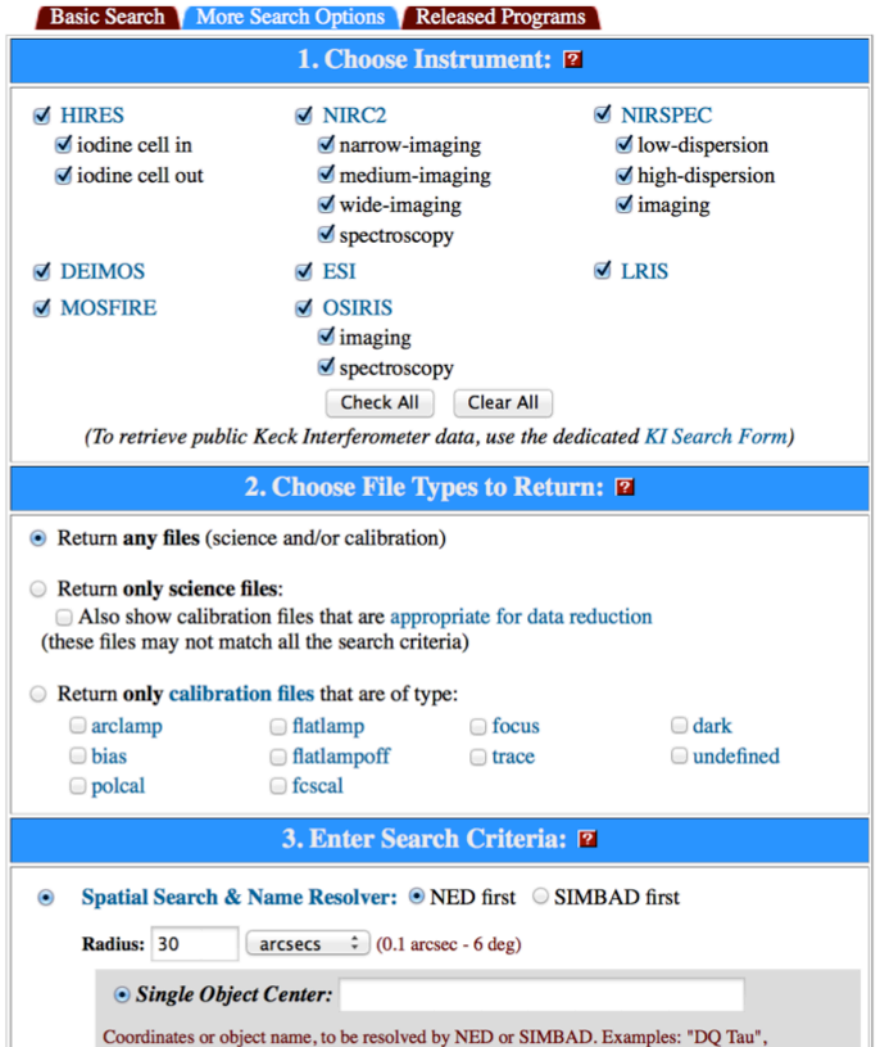
Level 1 example keywords

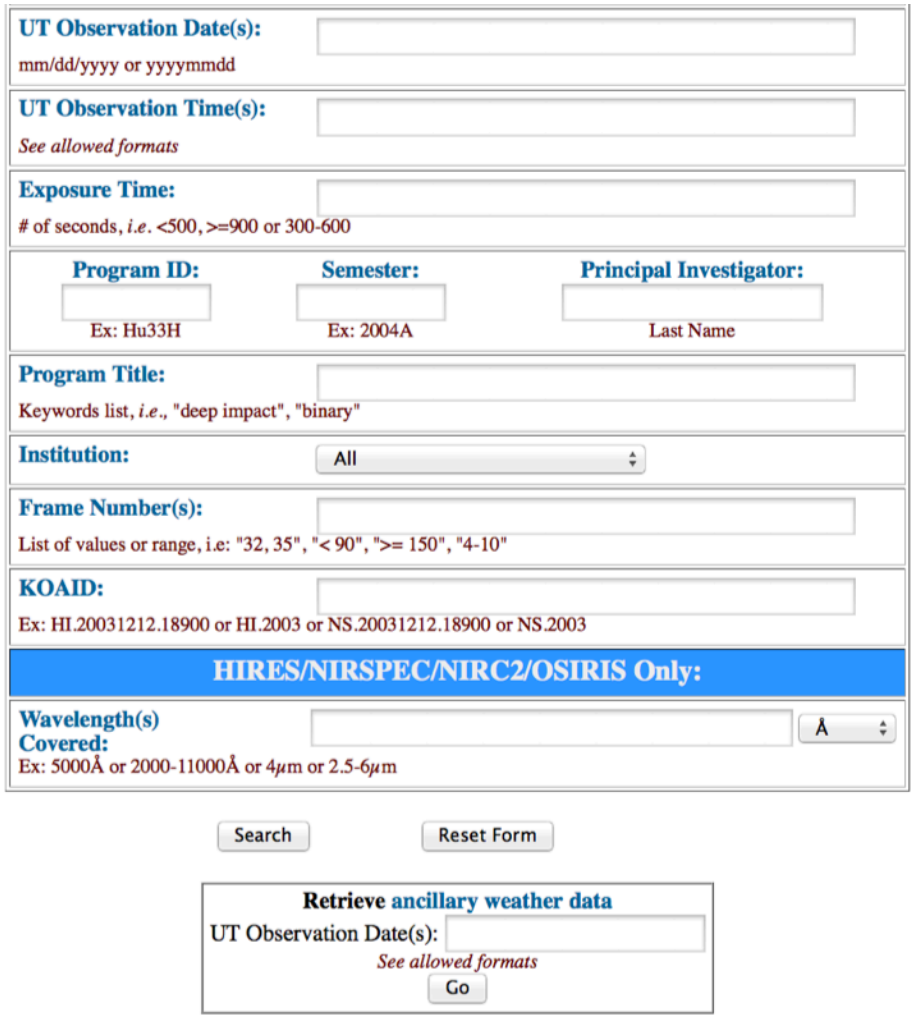
- Same telescope, instrument, source keywords as Level 0
- Processing keywords
  - Pipeline settings
  - Calibration files used
  - Derived wavelength calibration
  - Warnings or errors found during processing
- Data quality metrics (if available)

Archive interface

- User-specified, web-based searches on metadata, including
  - Source name and position
  - Program name
  - Observation date
  - Wavelength range
  - Instrument mode, exposure time, calibration type
- Level 0 data results
  - Science and calibration file lists
    - Relevant calibration files identified with same heuristics as pipeline
  - Files can be downloaded individually or as complete set meeting search criteria
  - Links to CCD data visualizations
- See koa.ipac.caltech.edu to try out searches on your own

KOA advanced search interface

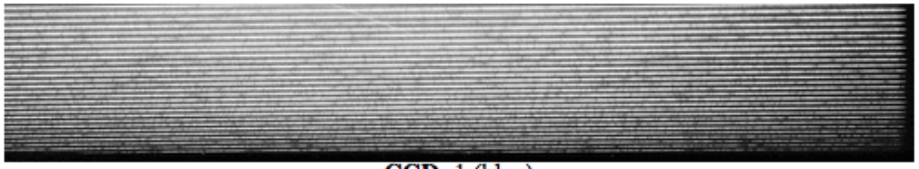




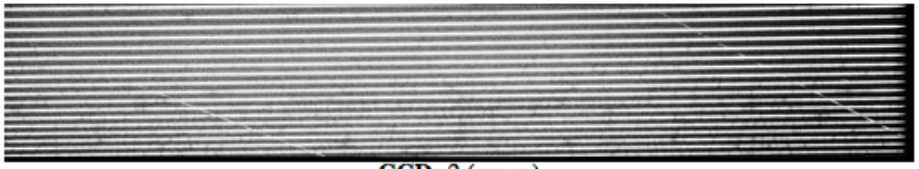
Example Level 0 visualization

- Example from KOA: HIRES data on 51 Peg

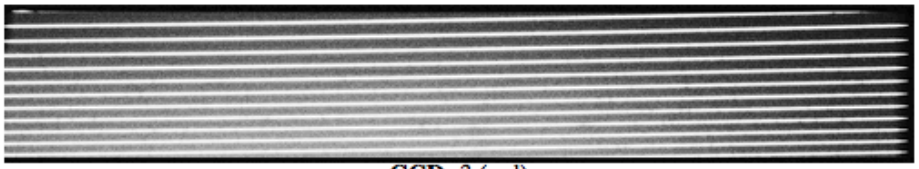
Available Quicklook JPEG Previews for KOAID: HI.20040819.42748.fits



CCD: 1 (blue)
(HDU 01)



CCD: 2 (green)
(HDU 02)



CCD: 3 (red)
(HDU 03)

Archive interface – Level 1 data

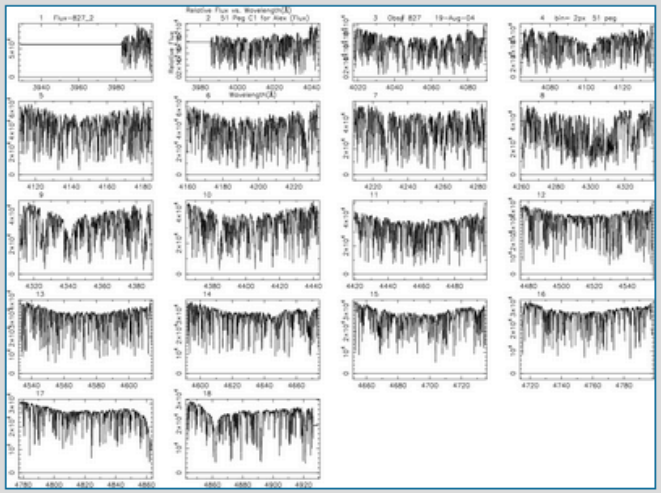
- Search returns file list and links to visualization of spectra
- Includes data metrics from Level 1 processing

CCD 2 (green)

Extracted Spectra Grades [Help]

Order #:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Grade:	Pass Plot	Pass Plot	Pass Plot	Pass Plot	Pass Plot	Pass Plot	Pass Plot	Pass Plot	Pass Plot	Pass Plot	Pass Plot	Pass Plot	Pass Plot	Pass Plot	Pass Plot	Pass Plot	Pass Plot	Pass Plot

Flux:



Signal to Noise: