Science Steering Committee Meeting

Staff Astronomer and Adaptive Optics Presentations

Virtual Meeting via Zoom

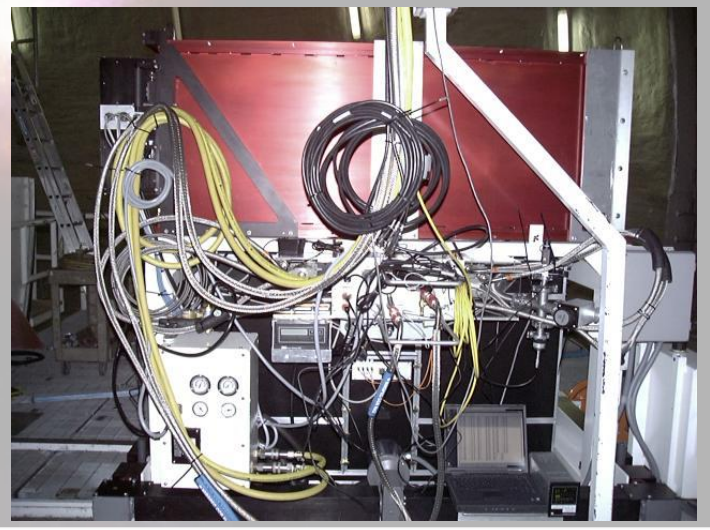
November 11, 2020

Instrument Reports

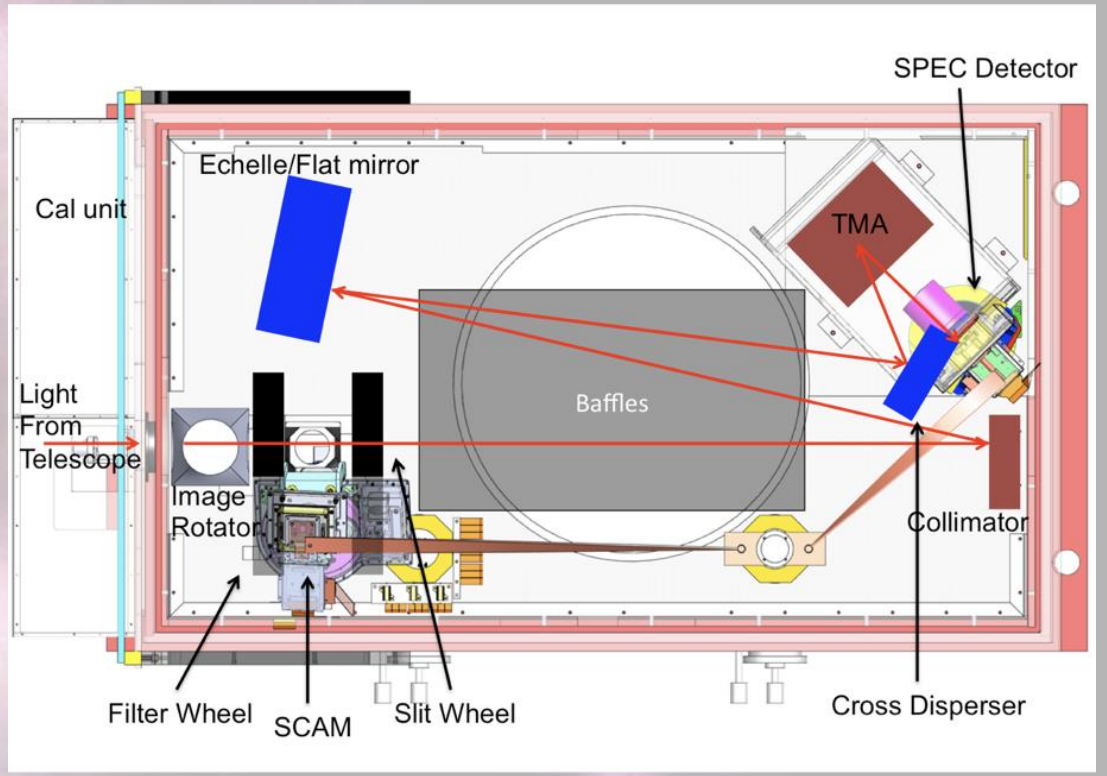
Group 3
NIRSPEC, MOSFIRE, NIRES, Remote Observing

NIRSPEC

G. Doppmann



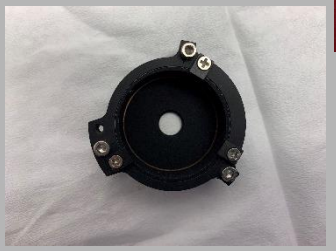
- High Resolution (R ~25,000) Cross Dispersed Near-IR Echelle Spectrometer on Keck II
- Y, J, H, K, L, & M bands
- Low & High Resolution Modes
- AO-fed mode (direct or via Fiber Injection)
- Upgraded in 2018:
  - New Detectors (SPEC & SCAM)
  - Updated Electronics
  - Increased Mechanical & Thermal stability



NIRSPEC Risk Matrix

Likelihood of Occurrence	**Very Likely >70% within year**	Low pressure dewar sensor failure				
	Probable >35% within year		Water Ice buildup inside dewar			
	Possible >5% within year					CCR Cold Head Failure
	Unlikely <5% within year					Echelle Grating Mechanism failure
	Very unlikely <1% within year					Cross Disperser mechanism failure
		Negligible: Little to no impact on Observation	**Minor: Observation Compromised**	**Moderate: Observation Interrupted**	**Serious: Instrument Down one Night**	**Major: Instrument Down Indefinitely**
		Risk Severity, Impact				

Work Completed



Instrument Warmed and Opened (Feb. 2020):

- Rotator Worm gear replaced (20 years of wear)
- New Pupil Stop added to Filter Wheel (NIRSPEC/FIU project)
- Spare CaF_2 Dewar Window replaced older one (hygroscopic optic)
- SPEC detector housing made more light-tight to reduce elevated thermal counts
- Water Removed with Annual warm and pump service (annual service)

Frequency of Bad or Missed Telescope Nods Reduced:

- Mitigated in software using isolated telescope offset commands

Additional Work Completed (Aug. 2020)

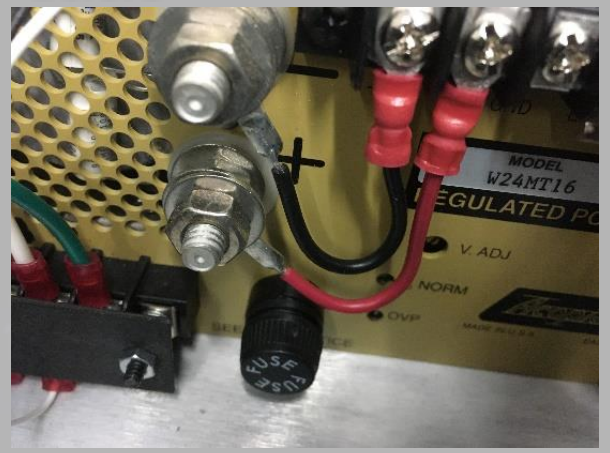
Issue:

- Occasional Failure of Galil Motion Controller (drives internal stages)
- Traced to high current draw cases, i.e. Rotator and/or Echelle grating
- Mitigated with power cycling, and re-initialization of all mechanisms
- Calibration frames no longer valid

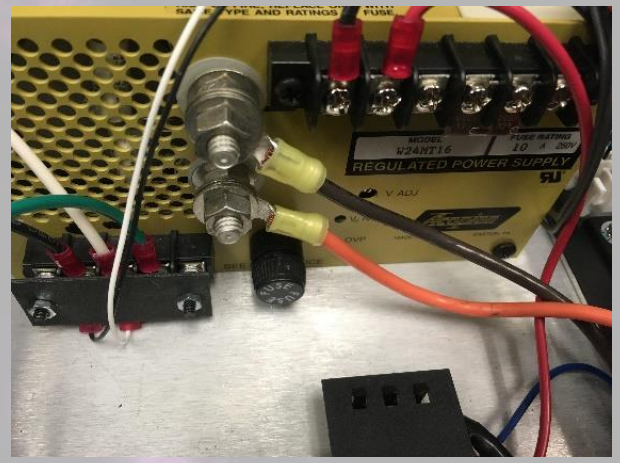
Resolution:

- Replaced Wiring with Thicker Gauge
- Galil Power supply re-wired through terminal block
- Better contact to mechanism control with new connector
  - Increased Reliability of Internal Mechanism Control

Before



After



Upcoming Service Work: Feb. 2021

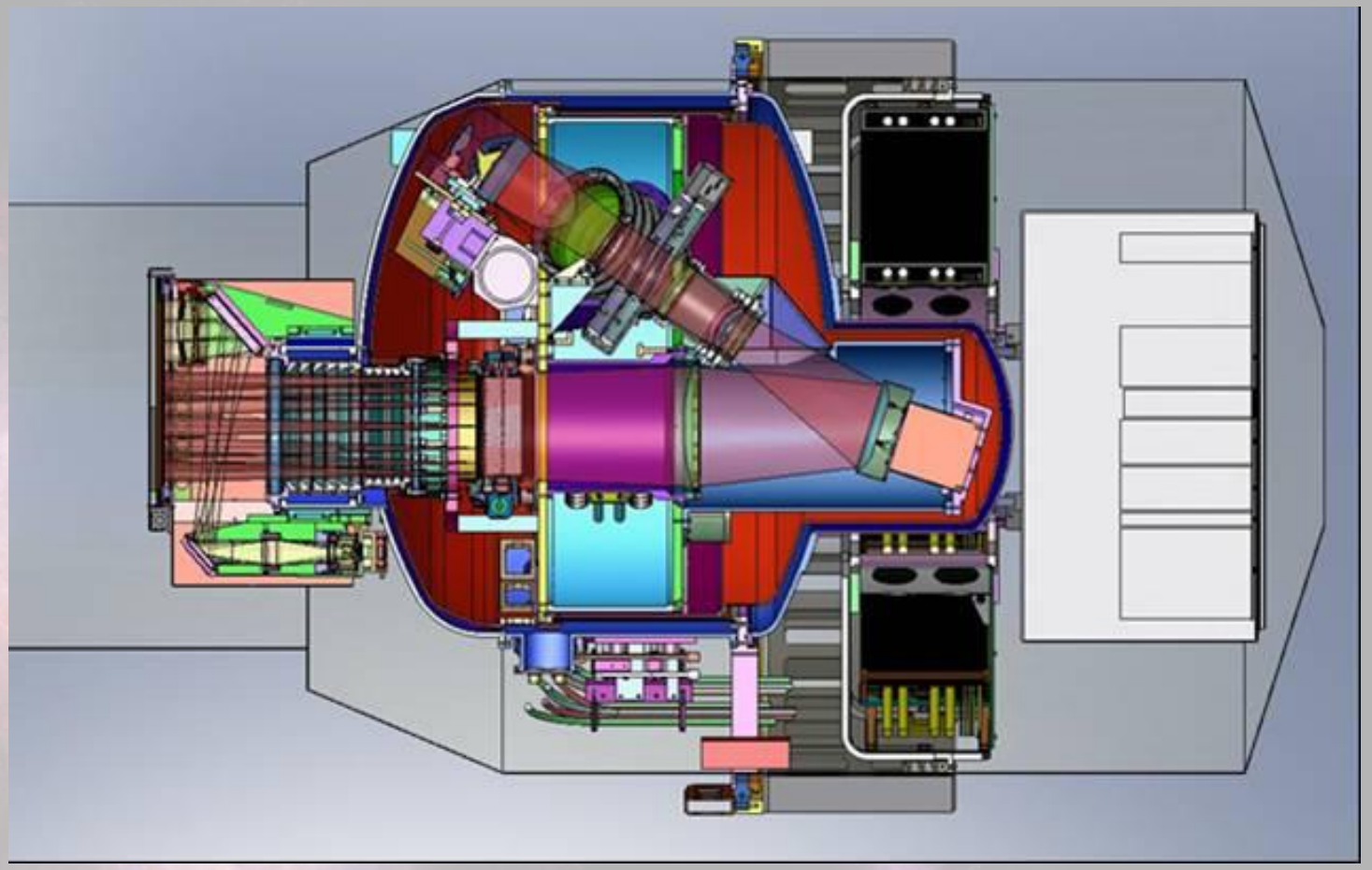
- Replace both CCR cold heads (350 and 1050 stages)
- Replace failed inverted magnetron pressure sensor (for monitoring operational dewar pressure)
- Extended Warm pumping (to remove accumulated water inside dewar – annual)

On-going Work

- Effort to reduce Readout Overheads with coadds for SPEC and SCAM (Current KVSP project)
- SCAM guiding capability: Not presently reliable with current state of detector

MOSFIRE

- Medium resolution IR spectrograph and imager
- MOS or long slit spectroscopy
- 6.1’ FoV
- Covers one band (Y, J, H, K) in a single observation



Cryogenics

- Cryo system: 3 CCRs
- Does not require summit access (if power stays up)
- Has survived two long interruptions of summit access in last 18 months (TMT protests and COVID shutdown)

Updates Since Last Year

- Guider repair complete. Replaced CCD in guider to restore full FoV.

- Spares situation has improved:
  - Spare Macu board modified by summit staff. Tested and verified.
  - Spare FCS controller acquired. Needs to be have zero points set (daytime operation).

MOSFIRE Risk Matrix

Likelihood of Occurrence		Negligible: Little to no impact on Observation	Minor: Observation Compromised	Moderate: Observation Interrupted	Serious: Instrument Down one Night	Major: Instrument Down Indefinitely
	Very Likely >70% within year			• CSU Fatal Error		
	Probable >35% within year					
	Possible >5% within year		• FCS Controller		• Guide chip • MACU board • Solaris server • Detector computer	
	Unlikely <5% within year				• CCR Failure	
	Very unlikely <1% within year					• Catastrophic CSU Failure
		Risk Severity, Impact				

NIRES Status

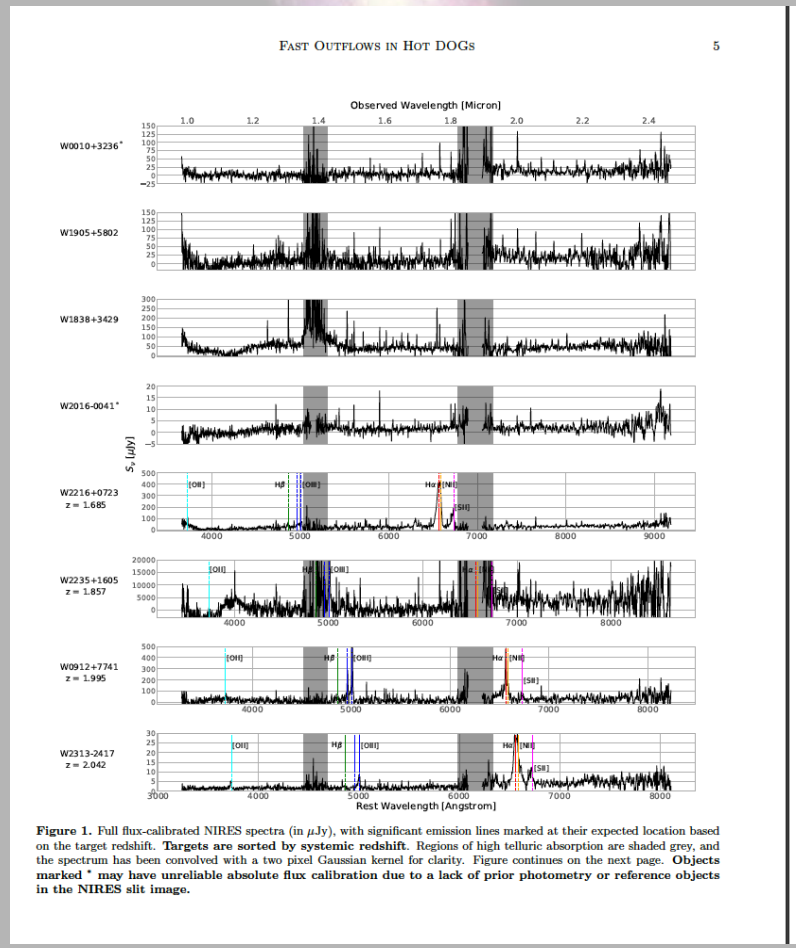
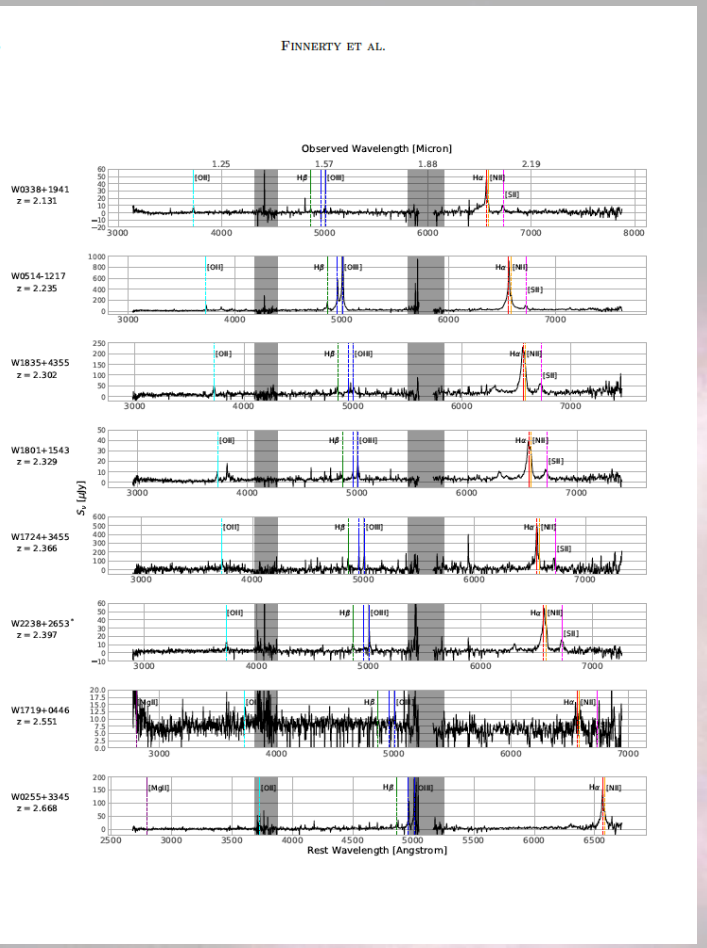
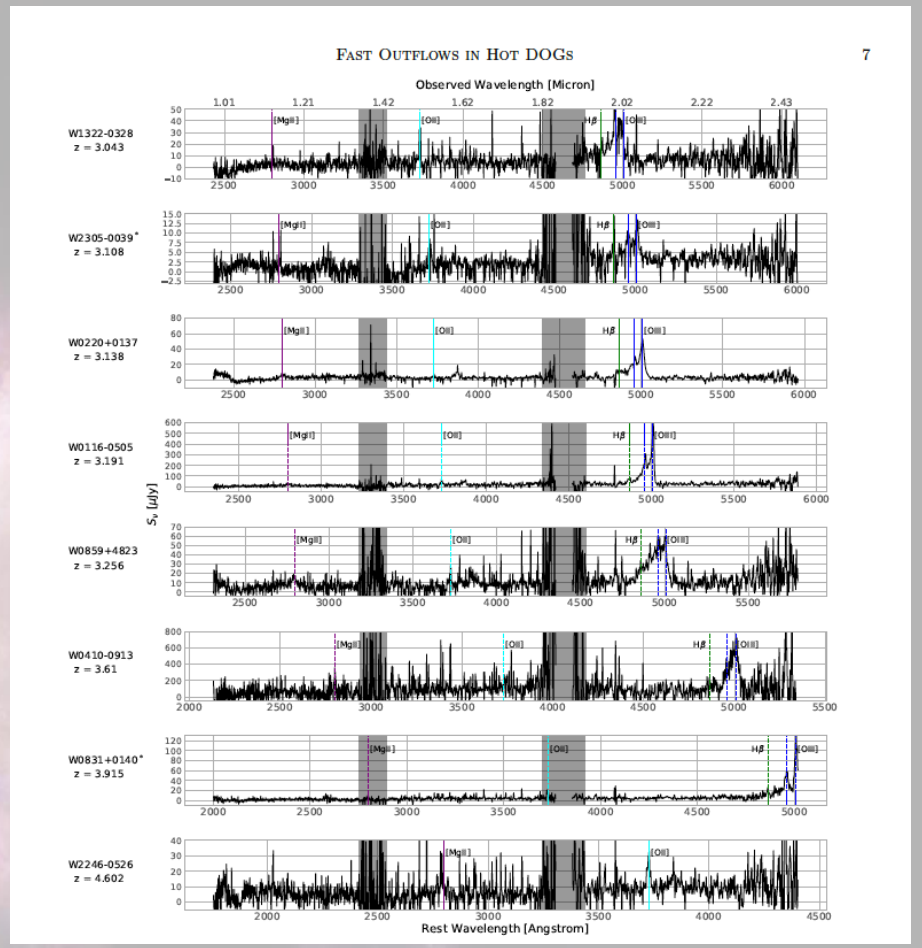


Figure 1. Full flux-calibrated NIRES spectra (in μJy), with significant emission lines marked at their expected location based on the target redshift. **Targets are sorted by systemic redshift**. Regions of high telluric absorption are shaded grey, and the spectrum has been convolved with a two pixel Gaussian kernel for clarity. Figure continues on the next page. **Objects marked * may have unreliable absolute flux calibration due to a lack of prior photometry or reference objects in the NIRES slit image.**





Work Done

Task	Description	Status
Slit-viewing-camera guiding	This mode was successfully tested. We are in the process of making this mode operational	ongoing
Slit-guider flexure	The flexure has been measured (maximum delta < 1”). We are implementing a correction for this.	ongoing
Pipeline	Ongoing work with Pypeit team to have a real time quick sky-subtracted display	ongoing

NIRES

Likelihood of Occurrence	**Very Likely >70% within year**					
	Probable >35% within year		Optical guider shutter			
	Possible >5% within year					
	Unlikely <5% within year		Piezo actuator		ARC boards (22, 46, 64) Instrument servers	
	Very unlikely <1% within year					
		Negligible: Little to no impact on Observation	**Minor: Observation Compromised**	**Moderate: Observation Interrupted**	**Serious: Instrument Down one Night**	**Major: Instrument Down Indefinitely**
		Risk Severity, Impact				

Issues

Task	Description	Status
Flexure Compensation System	Control the FCS (slit – science detector) mechanism.	ongoing
Optical guider	The shutter is beyond its lifetime	To be replaced

Remote Observing


Mercury
Venus
Earth
Mars
Jupiter
Saturn
Uranus
Neptune

Changes Since Last Year

- Pre-COVID
  - New software for launching VNCs is now complete
  - Testing of new videoconference hardware for Keck (summit and HQ remote ops rooms) stalled due to COVID

Updates Post-COVID

- At home (aka Pajama Mode) observing implemented in response to COVID.
- Uses new Remote Observing software which underwent rapid development.
- Uses new database for managing SSH keys. Over 400 keys in our system
- Implemented a new ticketing system for users to get help with Remote Observing (250+ tickets and counting)
- Use of ISDN lines has been dropped.

In Progress and Future Plans

- For planning purposes, I am assuming some form of at home observing will exist for the 21A semester and probably after.
- Security Changes:
  - Zoom has forced us to implement a Zoom password: 1993
  - We will be doing more frequent firewall password changes
  - We have a new method for distributing secure info to observers.
  - Will be incorporating it in v2.0 of Remote Observing software.
  - Observers will be able to upload their own SSH key
  - SSH keys will be enabled/disabled based on the telescope schedule, so make sure you are listed as an observer!

Remote Observing Risk Matrix

Likelihood of Occurrence		Negligible: Little to no impact on Observation	Minor: Observation Compromised	Moderate: Observation Interrupted	Serious: Instrument Down one Night	Major: Instrument Down Indefinitely
	Very Likely >70% within year			• Network interruption at observer		
	Probable >35% within year					
	Possible >5% within year	• Zoom service changes		• Network interruption at observatory • Keck polycom failure		
	Unlikely <5% within year					• Security incident due to remote observing
	Very unlikely <1% within year					
		Risk Severity, Impact				

Keck Observatory Archive

WMKO Team:
Matthew Brown, Jeff Mader, Josh Riley, Luca Rizzi

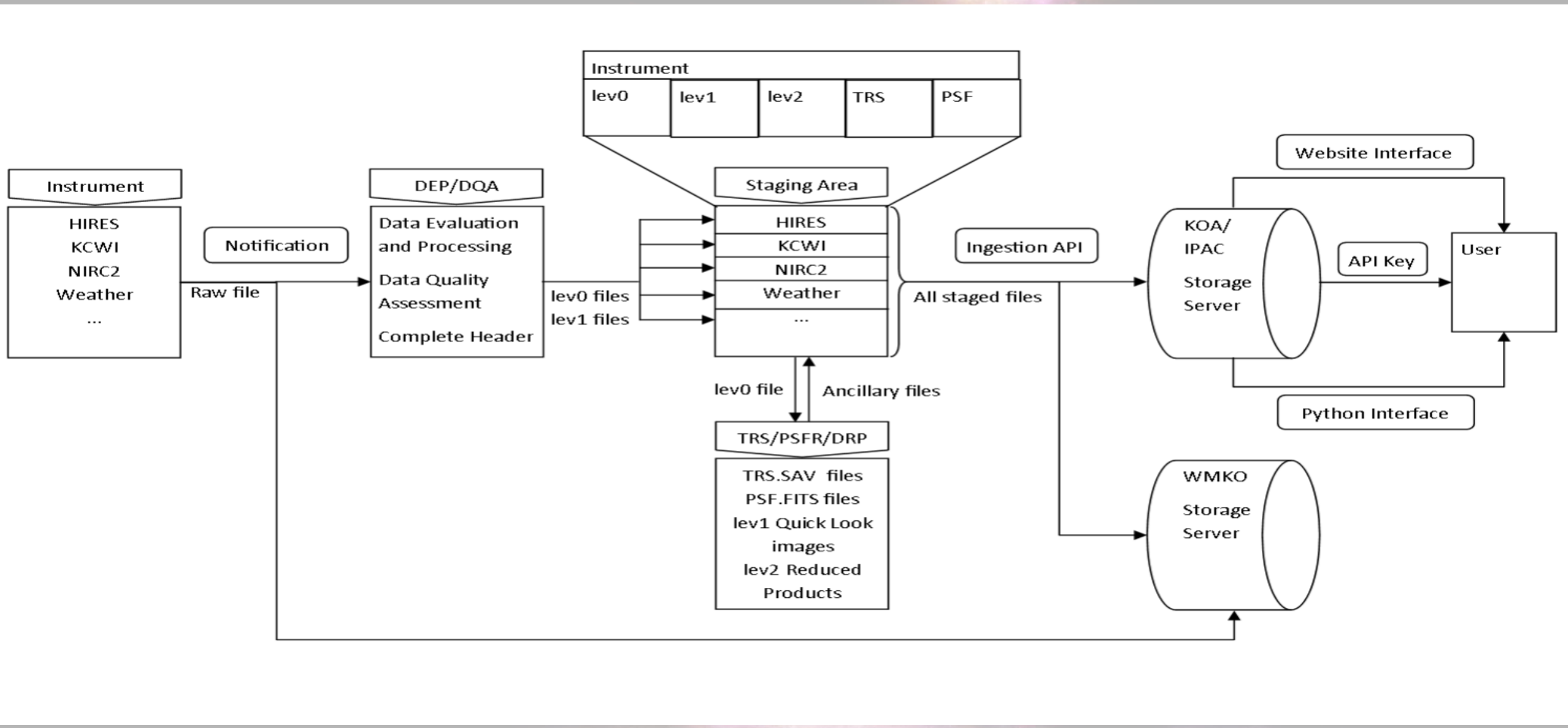
IPAC Team:
Bruce Berriman, Chris Gelino, Mihseh Kong, Anastasia Laity, Meca Lynn, Melanie Swain

Projects

- DEIMOS/ESI full keyword releases (06/08/20, 12/12/19)
- pyDEP conversion (IDL to Python) for all instrument data processing (06/08/20)
- CentOS migration for operations
- pyKOA release for HIRES data access (10/14/20 - FY21)
- Table Access Protocol
- AAS video tutorials (06/17/20)
- NIRSPEC Europa gaseous plumes contributed data set (Paganini, 04/15/20)
- NIRC2 TRS data archiving and UI access (03/30/20)

- ingestionAPI implementation for software communication and removal of procmail
- KOA user group (membership finalized, Chairs are working towards a starting date)
- Real-time ingestion design started
- KODIAQ v3 contributed data set (Lehner/O'Meara)

No unscheduled projects or projects not compatible with current plan


Instrument
lev0
lev1
lev2
TRS
PSF
Website Interface
Instrument
HIRES
KCWI
NIRC2
Weather
...
Notification
Raw file
DEP/DQA
Data Evaluation and Processing
Data Quality Assessment
Complete Header
lev0 files
lev1 files
Staging Area
HIRES
KCWI
NIRC2
Weather
...
Ingestion API
All staged files
KOA/ IPAC
Storage Server
API Key
User
lev0 file
Ancillary files
TRS/PSFR/DRP
TRS.SAV files
PSF.FITS files
lev1 Quick Look images
lev2 Reduced Products
Python Interface
WMKO
Storage Server