SSC REPORT

February 14,15
Caltech

Jean Brodie and Judy Cohen
SSC co-chairs

Attending:

Judy Cohen
Jean Brodie
Shri Kulkarni
Claire Max
Hilton Lewis
Mike Liu
Geronimo Villanueva
Aaron Barth
Lynne Hillenbrand
Evan Kirby
Chas Beichmann
Mario Perez
Andrea Ghez
Tom Greene
Karl Glazebrook (via telephone)
Wen-Fai Fong (via telephone)

Observatory Report: Director's highlights

- Keck Science Fest featuring science of support astronomers held in December with over 50 attendees.
- Kip Thorne public talk held with 755 attendees
- Large donation received, providing funds needed to complete KCRM
- New WMKO operations agreement between Caltech and UC
- Keck communications and outreach efforts increased:
  - Improve perception, awareness, engagement
  - Astronomy is important, Hawaii science matters, Maunakea is valued, WMKO is a science and technology leader, positive economic impact
  - Communicate via press releases, media interviews, website, social media
- KCWI LN fill incident has been investigated and corrective actions have been implemented. KCWI is fine and operational.

Project Status Updates: Telescopes

- Temporary shutdown of K1 in August 2018 for 5 nights, plus 2 nights engineering
  - Repair of 20 degree section of grout
  - Recoating secondary during shutdown
- Telescope optics
  - 25 primary mirror segments repaired, expect all complete by end of 2019
  - K2 PCS camera upgrade complete, K1 PCS planned to complete by end of FY
  - Primary coatings degrade by 1.2%/year
  - Secondary mirrors:
  - K1 & 2 last coated in 2011 and 2012. Planning for K1 recoat during August shutdown.
- KI deployable tertiary is coated and on the summit. First light in April.
- Telescope Control System Upgrade in full-time use on KII since Oct. Will implement KI TCSU in February with handover review in March.

Instrument Project Status

- NIRES operating since Feb 1. 30 science nights in 2018A
  - First observers report good data quality
  - Minor remaining operational issues being addressed
  - Full facilitization (guider & DRP) expected by end of 2018B semester

- OSIRIS Imager upgrade is progressing
  - Hardware installed and optics verified on-sky.
  - Focus offset found between imager and spectrograph. Will use as-is through Galactic Center season and then fix in 2018B

- LRIS Shutter upgrade underway; expected completion this fiscal year

- NIRSPEC upgrade underway. Will be opened / serviced in late 2018 and again in Feb 2019. Operational for December comet observations
  - SPEC detector is ready, SCAM optics ordered

AO Projects Status

- DDRs completed for pyramid wavefront sensor (PWFS) & fiber injection unit (FIU)
- Expect PWFS & FIU to be installed in 2018, before or after Galactic Center observing season
- PDRs completed for fiber extraction unit & coronagraph
- Real-time AO controller project is underway
- TRICK near-IR TT sensor is partially complete but not yet efficient enough for science operations. Improvements are underway.
- AO optics optimization is underway and making progress
- Continued increase in Keck AO publications

Five-Year Plan

- Unattended night operations project (UNO) PD phase delayed to FY19
- Seismic upgrade reinserted in plan
  - Plan for 500-year earthquake
  - Project starts in FY20, will only commence if cost-benefit analysis is favorable
- Infrastructure obsolescence upgrades

WMKO will commission an external study of facility renewal needs

  - Many upgrades addressed by UNO

Projects In The 5-Year Plan

Operations	**Instrument and AO Upgrades**	**New Instruments**
Routine operations	AO/Instrument IDL code base upgrade	AO RTC
Keck Observatory Archive	Instrument Studies	Data Reduction Pipeline development
2017 Operations Review Initiatives	K1 Deployable Tertiary	Fiber Injection Module for NIRSPEC
	K2 AO Wavefront Sensor	Fiber injection Unit Coronograph Mode
Infrastructure	K2 Deployable Tertiary	KAPA MSIP
ACS nodebox upgrade	NIRC2 Upgrade	KCRM
Decommission: IF and DCS hardware	NIRSPEC upgrade	Keck Planet Finder
K2 Shutter windscreen	PCS Mechanical Refurbishment	KRAKENS
Routine infrastructure renewal	Phasing camera upgrades	Near IR PRV MRI
Segment Repair	PSF Reconstruction	NIRES
Seismic Upgrades		Phase A Studies: GLAO/Near IR PRV
Spare Secondary	**Cost Savings**	
Unattended night ops (UNO)	Summit photovoltaic system	

KPF PDR report

- PDR recommended minimal changes, foresaw no complications to completing DDR
- KPF and ESPRESSO will be the only instruments that (a) are on large, existing telescopes, (b) can attain <0.5 m/s precision, (c) use proven RV measurement technique
- DRP is built into design with 5.8 FTE allocated
- At the Board's request the SSC is organizing a workshop to review the PRV landscape
- Review will be co-chaired by one UC and one CIT faculty member

Morning Twilight Observing

- Some observers “quit early”, either because the sky is too bright, or because their observing sequences are long, and not enough time remains until the sky is too bright.
- Recent pilot program in which OAs acquired data on Neptune @ Hband and Io @ Mband, typically 20 minutes total time per observation in morning twilight.
- Participation by the PI and the OA is optional; OAs generally enthusiastic.
- WMKO proposes to adopt one such twilight program per (major) partner, i.e., UC/CIT/NASA/UH with execution in partner proportions = 1/3 : 1/3 : 1/6 : 1/6.
- Prefer long-term monitoring programs, so observing is systematic for OAs. Allowed instruments: NGS-AO, NIRES, possibly others when K1DM3 is available. Calibration is generally not possible.
- Program will need scripts, Responsibility for providing these lies with the PI’s. WMKO is taking a low cost approach (pilot program was work of a Keck Scholar).
- Development of these will help with TDA planning tools, data management, etc.
- SSC is very appreciative of the interest of OAs in maximizing science. However, we remain conscious of increased workload concerns on OAs. No SA time involved.
- WMKO will continue current trial period through 2018A and with local TACs, develop a long term plan depending on the success of the trial in producing valuable science.

Time Domain Astronomy

- K1DM3 policy questions to consider for future semesters
  - Under what conditions will instrument change be permitted?
  - What constraints should there be for the inaugural semester, 2018B?
  - Should the 1-hour limitation be increased? SSC recommends that the 1-hour limit stay for the moment.
- Concern for work load on day crew (instrument readiness) and SAs
- LIGO run O3 is expected to be September 2018-May 2019 with 3-9 anticipated events, followed by a 9 month break until the next run
- WMKO requests those allocated ToOs contact the observatory with specific details of their requirements

Time Domain Astronomy

Electromagnetic/Gravitational Wave ToOs

- Encourage maximizing observing opportunities by pooling resources (ToO triggers) across partnerships
- All teams awarded ToOs should participate in a face-to-face one-day meeting, convened by SSC, to discuss developing a collaborative strategy
- The meeting recommendations will be reported to SSC in June
- PIs will not be bound by these recommendations

Optimum number of programs per night

The SSC is very concerned about the high workload of the SAs.

A big contributing factor is the increasing number of programs per night.

At present there are up to 4 different programs per night. While 4 program nights are rare, 3 program nights are more common.

The SSC recommends that a limit of 2 programs per night be set for the coming semester 2018B, which will be re-evaluated after the 2018B scheduling is completed and the full implications are clearer.

It is incumbent on the partners to incorporate quarter night allocations into a full night's allocation, if desired.

Data Reduction Pipelines

Due to size, scope & resources, DRP effort at WMKO should include defining protocols and DRP language and architectures, working with DRP developers in the community to incorporate these into their pipelines. If these goals are met, WMKO will be better able ultimately to take over responsibility for these pipelines.

Data Reduction Pipelines

SSC asks that WMKO hosts a website listing of all available pipelines with contact details for their developers where permission has been obtained.

Observing infrastructure:

Working to ensure data collection is done properly, to facilitate current/future pipeline development: complete metadata, automated calibrations, instrument configuration tool, etc.

Current focus is on new instrumentation, esp. KCWI

Existing pipelines:

supported by Keck: MOSFIRE, KCWI, OSIRIS

developed externally: LRIS/DEIMOS (Prochaska & Hennawi)

supported/developed by KOA: NIRSPEC, HIRES (PRV mode)

unchanging, no current support: HIRES

just beginning: NIRES

Observing infrastructure:

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Data Reduction Pipelines (con't)

Development of new pipelines is governed by DRWG documents to ensure compatibility with future common infrastructure.
DRWG = Prochaska, Hennawi, 2 from KOA, 3 from WMKO (Jeff Mader, Rizzi, Walawander), 2 software engineers from Swinburne.
People in the community developing pipeline should be encouraged to join.
SSC recommends a one-day DRP workshop attached to the next KSM and a website listing of the DRWG recommendations.

Long-term "gold" model:

Scientific programmer just hired: mostly for KOA, but significant fraction of his time is allocated for current pipelines

HIRES PRV pipeline

Existing code from Howard group is being adapted by KOA, via a Python wrapper to existing IDL code, to be released in 2019A.
Proper operation of the code requires observers to follow a specific observing procedure, which will be documented.

White papers

Ground-Layer Adaptive Optics (GLAO)

- Developing simulations, estimating S/N and testing for consistency – using empirical PSF parameters from Imaka (UH88) as input parameters.
- VLT Adaptive Secondary Mirror (ASM) commissioning successful.
- GLAO team is now exploring mechanical options and locations for the wavefront sensor (WFS).
- The feasibility of instruments benefitting from GLAO is being investigated, primarily for LRIS, MOSFIRE and DEIMOS.
- Instrument studies: status report to be

Keck-Subaru time exchange

Huge imbalance in interest: Subaru's demand for Keck has 11:1 oversubscription, while Keck's demand for Subaru is undersubscribed.

Partial nights with Hyper-SuprimeCam (HSC) now possible, via participation in Subaru observing queue.

Even with access to the queue, Keck demand seems unlikely to increase significantly.

Some possibilities for increase in the future

SCExAO/CHARIS

IRD spectrometer

Prime Focus Spectrograph (PFS = 2400 fiber moderate resolution spectrograph), coming in late 2020. (PFS team guaranteed time program will be 300-360 nights over 5 years.)

SSC recommendation is for WMKO director to convey potential interest in PFS to Subaru director.

Action Items

1) Facilitate the organization of the science review for KPF.
2) Arrange a LIGO/GW meeting of people involved in the identification GW optical counterparts to attempt to facilitate collaboration.
3) Distribute note on new model for instrument development including initial white paper and potential Phase 2 with more larger funding based on up-select from white paper phase or equivalent documented progress.
4) Communicate to the Keck community the trial program with NGS on Keck 2 of morning twilight observing, maximum one project per partner to be approved by local TAC. No extra on-sky calibrations, one object per night, all scripts and tools to be written and tested by successful proposers. This opportunity will be available in 2018B.
5) Request that Keck schedulers attempt to have all laser checkouts only at the beginning of the night.
6) Improve audio experience for remote attendees.
7) Ensure that metadata on fits files of all multiobject slitmasks include the object coordinates.