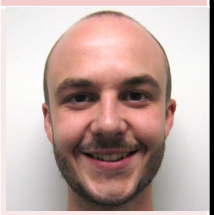
SCIENCE OPERATION FY2023

Tae-Soo Pyo
Subaru Telescope

NIGHT OBSERVATION SUPPORT STAFF

New

7 SA							
							
	Aoki, Kentaro	Arai, Akira	Fujiyoshi,Takuya	Passegger, Vera Maria	Takagi, Yuhei	Tanaka, Ichi	Terai, Tsuyoshi
7 Operators							
	Cunningham, Sean	Dailey, Erin	Letawsky, Michael	Laverty, Jonathan	Neugarten, Andrew	Schumacher, Larissa	Walk, Aidan

2023 AND S24A

- Cancelation of the observations from September (9/15) to January (S23B)
- PFS Commissioning Observations (S24A final phase)
- HSC Queue mode: Weather factor (since S24A)
- No imbalance in Gemini TE (since S24A)
- Starting Support Student PI programs (since S23B)
- Opening NIR WFS for IRCS/SCExAO (since S24A)
- Opening MOS mode for MOIRCS service observation (since S24A)

OPENING NIR WFS SINCE S24A

- Near-IR Wavefront Sensor w/ IRCS+AO, SCExAO and REACH
- **NIR natural guide stars** (-3 < H < 9-13 mag) for the area without NGS in R-band due to heavy interstellar extinction
- **Dichroics availability for each mode**

Dichroics	SCExAO/ CHARIS				SCExAO/ VAMPIRES	SCExAO/ MEC		SCExAO/ REACH	IRCS							
	lo-res	hi-res			imaging	spectro-imaging		spectro	Imaging (20mas)				echelle spectro			
	J+H+K	J	H	K	I	Y	Y+J	Y+J+H	Y	J	H	K	zJ	J	H	K
K-band	Yes*	No	No	Yes	No	No	No	No	No	No	No	Yes	No	No	No	Yes
YJH50	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
YJH90	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vis-HK	Yes†	No	No	Yes	Yes	No	No	Yes‡	No	No	Yes	Yes	No	No	Yes	Yes

* No J and H-band. † No J-band. ‡ No Y- and J-band.

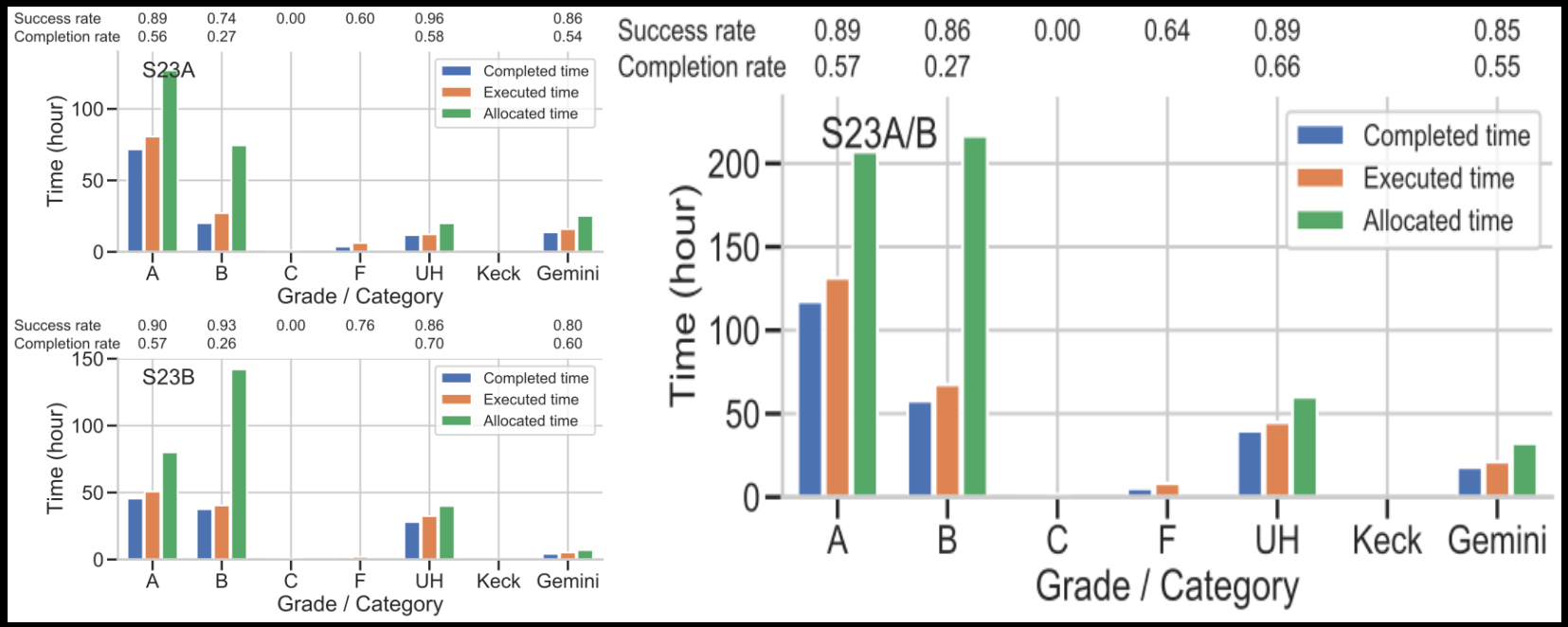
- (https://www.naoj.org/Projects/SCEXAO/scexaoWEB/nearIRWFS/index.html)

MOS FOR MOIRCS SERVICE MODE SINCE S24A

- The idea is to **promote publication of the old MOIRCS data**. If the old data can be published by adding just small amount of additional data (e.g., for calibration or some data that help securing the confidence of the old data), we would help!
- **There must be the MOS masks cut and used before already**.
  → PI **must contact the primary SA before** submission to check 1)availability of the MOS Mask, 2) validity of justification for Service.

  → Up to 2 masks, no use long slit, no changing the design and grism
- To avoid conflict with DA(dual-anonymous) system, the SA will give you an **Acceptance ID** to you. **PI must put the ID on the Technical Justification** part. Thus, PI doesn't need to describe the previous proposal ID in the proposal.

HSC QUEUE MODE: S23A & B



S23A: 3 runs (14n March + 14n May + 14n June), Lost 50% of June run due to HSC vacuum problem, Total 19% (8/42) lost.
S23B: 3 runs (17n Aug + 15n Sep + 10n Jan), Lost 40% of Sep and 100% in Jan due to telescope incident, Total 38% (16/42) lost. Higher success rate (> 90%)

HSC QUEUE MODE: WEATHER FACTOR (30%)

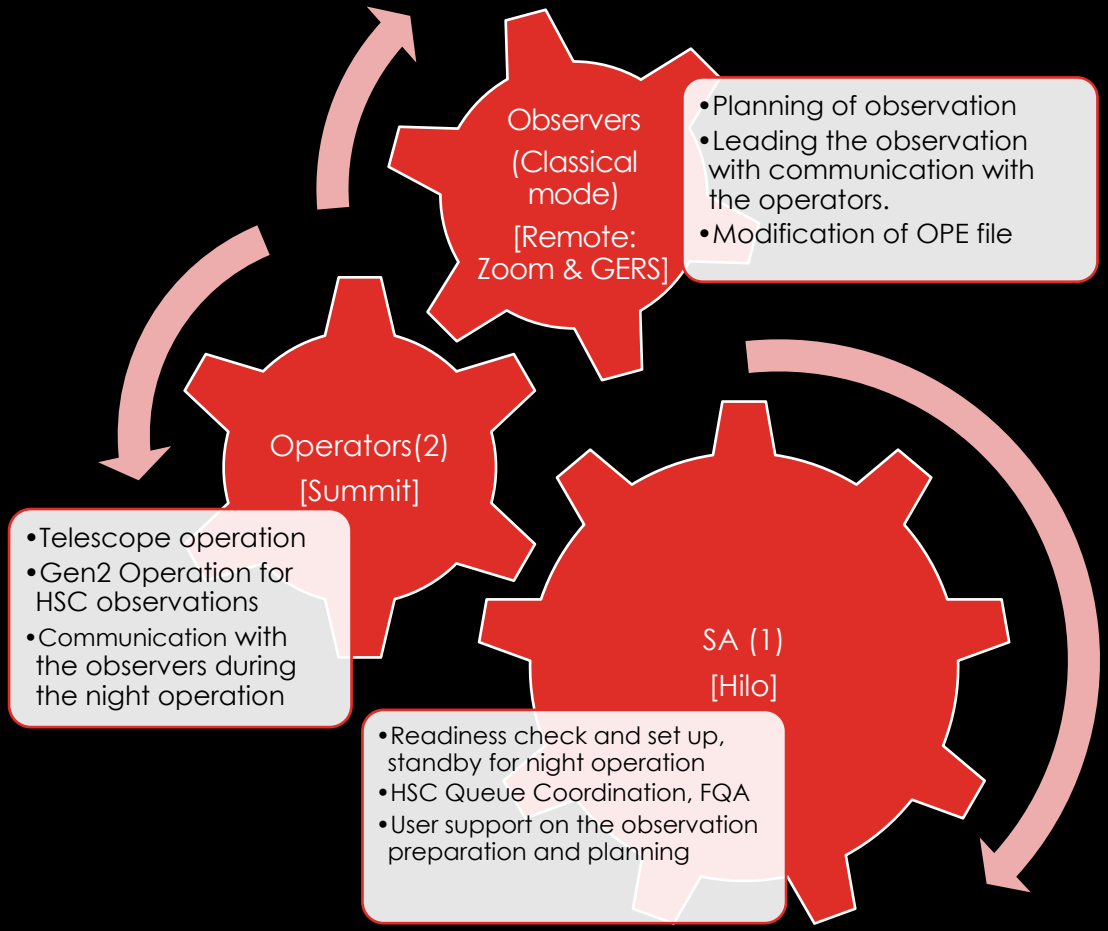
- The completion rates of HSC queue mode programs closely affected by the probability of weather factor.

  → HSC Queue mode programs will get additional allocation time considering the weather factor for higher completion rate [SAC Decision].

- Users do not need to include weather factor in the estimation of the required observing time in the proposal.
- The maximum of the observing time for HSC queue mode
  - Normal program <= 3.5 nights (cf. total 5 n)
  - Intensive program <= 28 nights (cf. total 40 n)
    - Each semester <= 14 nights (cf. total 20 n)

HILO REMOTE OPERATIONS OF HSC AND MORE (S24AB) [PLAN]

- Strengthening the operator's role in the night operation
- Enhance SA's role in QC, planning, FQA
- [To observers], Please send the observation plan before the observation



ALL SKY CAMERA & SODA

Subaru Telescope Optical Allsky Camera

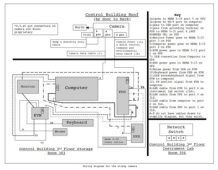
Andrew Neugarten[1], Ichi Tanaka[1], Larissa Schumacher[1]
with special thanks to Matt Wahl[2], Rita Morris[2], and Mike Lemmen[1]

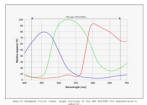
Subaru's Allsky camera, an Omea-5C purchased from Alcor-System[1] in late 2020, and installed in 2021, is designed to observe 360° in color in the optical wavelengths.
It is used for environmental monitoring during current onsite observations, and is intended to do so for future remote observations as well. Additionally, it is incorporated into public outreach.
The camera, cables, and camera software are part of the Alcor-System package.
The camera mount, control computer, and the internal and external websites are provided and maintained in house by operations, scientific, and engineering staff.

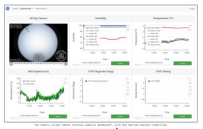
The Omea-5C fisheye lens, filter (λ: 420nm - 680nm), camera (5k Sony CMOS sensor with 1.6e⁻ to 3.0e⁻ readout noise) and related components are contained in a watertight anodized aluminium casing with a BK-7 glass dome that has a MgF_2AR coating on the inside.
It is attached to a mount designed and created in-house to fit existing roof structures and be north aligned. An in-house designed weather protection box and cable tubing were added to the underside of the mount due to the extreme weather conditions on Maunakea (below freezing temperatures and winds up to 70 m/s). The camera is mounted on the east roof of the Subaru Control Building, while the control computer and related equipment are installed inside the control building.

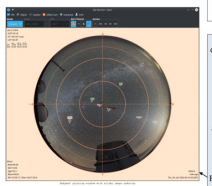
Due to the camera's cooling capacity, we loose less than 1 hot pixel per frame and therefore the usage of dark frames is not required.

Currently the Alcor-System Skywatch software is used for image acquisition. The development of in-house software is planned to provide greater flexibility in acquisition and compatibility with Unix-like systems.



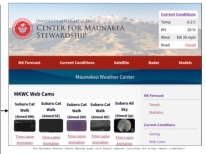




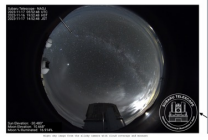


The Allsky website was written and is maintained in-house. It contains a loop of the most recent images (adjustable from 1 to 24 frames), as well as plots for the humidity, temperature, and wind speed at Subaru and the sky attenuation and seeing from the CFHT weather tower[2]. This allows for compact real-time monitoring of environmental conditions. The dashboard is currently internal only, but a simplified external version will be provided to the public in the future.

Subaru also transfers the latest Allsky image to the Maunakea Weather Center Web Cams page, to be accessed as a single frame or time-lapse. This allows the greater Maunakea astronomy community, safety staff, and the public to monitor weather conditions.



Hskymon is the Subaru Telescope sky monitor for celestial objects and program targets. It has been configured to use our allsky image as the background for the overlay. This allows for better sky condition monitoring than the previous CFHT mid-IR allsky image due to location differences.



The Alcor-System software provides a 24 hour noon-to-noon time-lapse, which is currently manually shortened to an evening to morning time-lapse and uploaded to the ' 管理人 _SubaruTel_StarCamAdmin' YouTube account. There are plans to make both these steps automated, in combination with our in-house software.

During the night, the Allsky camera is used predominantly to monitor cloud cover and sky conditions. It is also used during the day to evaluate conditions if the weather is forecasted to worsen.

A New Observation Downtime Analytics System

Andrew Neugarten
Subaru Telescope, Hilo, Hawai'i

Introduction

We present Subaru Observational Downtime Analytics (SODA), a new system for the automatic daily analysis of troubles reported in the observational night logs at the Subaru Telescope. We discuss using SODA to provide both graphical and tabular summaries of troubles that have occurred, including the subsystem responsible for the downtime and the specific faults that occurred, for various date ranges and binning options. The trouble analysis for semester S23A is also presented. We discuss the usage of this system to assist in the transition to fully remote observations at the Subaru Telescope and for other purposes.

Trouble Classification

When an unexpected behavior which may result in observational downtime is encountered, it is logged as a trouble. Troubles are categorized by the specific subsystem that they result from and are recorded in the observational log along with the steps taken to attempt to resolve the trouble and then length of any resulting downtime. The various trouble classifications are presented in Table 1.

Subsystem	Description
Weather	Inclement weather.
Telescope	Telescope malfunction.
Instrument	Instrument malfunction.
SOSS	Observational Control Software (Gen2) malfunction.
Operation	Human error.
Other	Miscellaneous troubles.

Table 1: Trouble categories.

SODA Applications

Operation from Hilo at Subaru Telescope (OHia) is a project at the Subaru telescope that aims to create a safer and more stable observation system in preparation for remote observations. SODA has been used by members of this project in order to determine the most common faults that require a presence at the summit to resolve. This data from SODA can help determine which system repairs/ redesigns need to be prioritized.

SODA Dashboard

The SODA dashboard, presented in Figure 1, is the interface that most SODA users will interact with.

Figure 1: SODA's Dashboard interface. **A:** Parameters used to generate dashboard widgets. **B:** Pie chart displaying total uptime and downtime by subsystem for given date range. **C:** Interactive histogram displaying downtime by subsystem by binning criteria. **D:** Interactive selection tool to modify x-axis scale and range. **E:** Histogram displaying most frequent faults. **F:** Interactive selection tool to modify x-axis scale and range. **G:** Interactive table displaying all faults which are currently selected in table E. **H:** The text of all night log entries in the date range that are identified as a trouble. A button to copy the text to the clipboard is provided. **I:** A plot displaying all nights where a physical presence at the summit was required to resolve at least one trouble. **J:** selection tool to modify x-axis scale and range.

Technical Details

SODA is a web application written primarily in Python using the Flask micro-framework. The application is served by an Apache 2 HTTP server with mod_wsgi.

The observational night logs are automatically parsed at a fixed time daily and the relevant data are stored in a local MariaDB database on the SODA server for quick retrieval. Interactive plots using the data are generated using the Bokeh framework. The SODA application is only accessible from within the Subaru Intranet.

In addition to allowing users the ability to quickly visualize the data with interactive plots and tables, SODA also allows users to download data as a JSON, CSV, Microsoft Excel, ASCII text, or HTML file.

S23A Downtime Summary

Subsystem	Time	Percent of Projected Obs. Time
Weather	545h 54m	30.68%
Telescope	25h 54m	1.46%
Instrument	17h 50m	1.00%
SOSS	4h 27m	0.25%
Operation	42m	0.04%
Other	51h 33m	2.90%
Total Downtime	646h 20m	36.33%
Total Uptime	1132h 50m	63.67%

Table 2: Downtime by subsystem, total downtime, and total uptime. All percentages are calculated by dividing the subsystem by the expected observational time. All percentages are rounded to two decimal places.

Acknowledgments

We would like to thank Mr. Kiaina Schubert of the Subaru Telescope Computer and Data Management Division for creating the virtual machine in which we run SODA as well as maintaining the physical hardware on which the virtual machine is run. We would also like to thank Mr. Tom Winegar of the Subaru Telescope Computer and Data Management Division for granting access to the night log database.