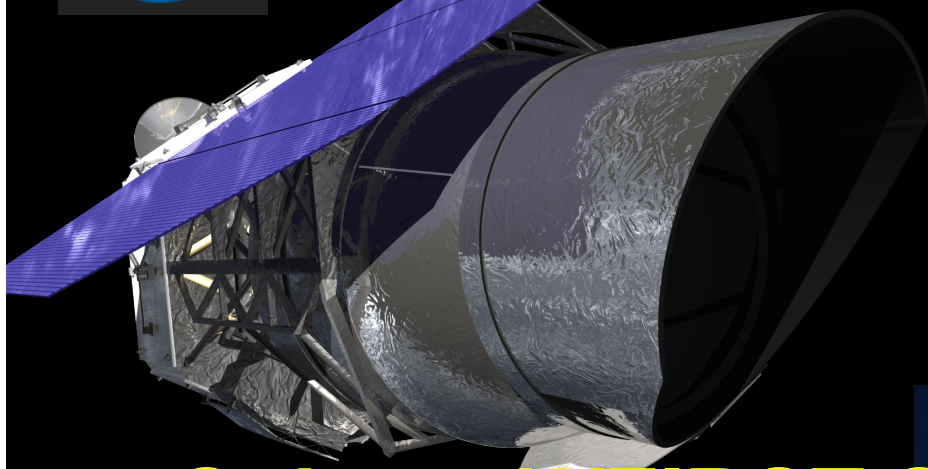




WFIRST-AFTA
Wide-Field and Deep Survey Telescope



Subaru-WFIRST Synergistic Observations

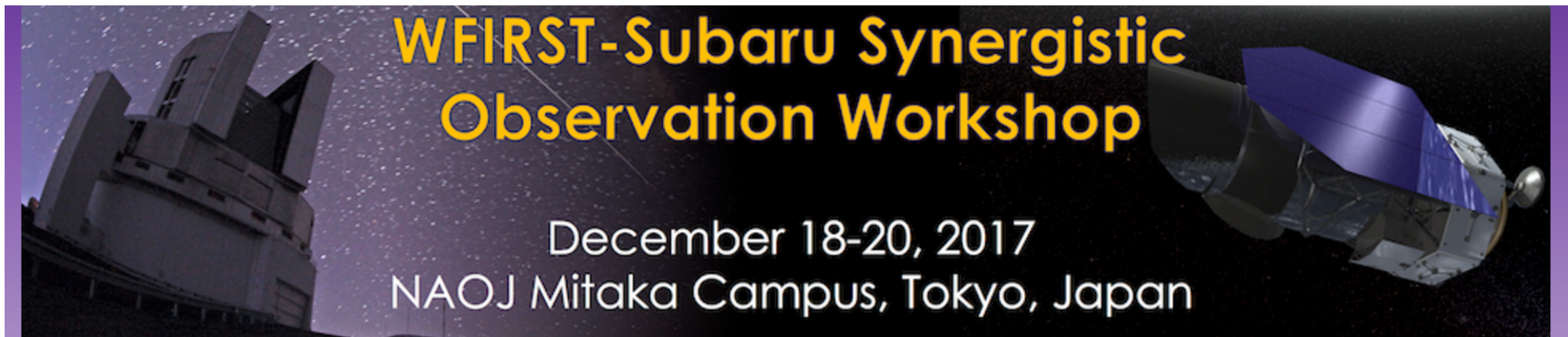
**Toru Yamada (ISAS/JAXA) on behalf of
Japanese WFIRST WG***
(* under ISAS Space Science Advisory Committee)



WFIRST-Subaru Synergistic Observations Workshop

December 18-20, 2017

http://www.ir.isas.jaxa.jp/WFIRST_Subaru/index.html



Menu

Home

Important Dates

Venue

Programme

Announcements

Registration

Participants

First announcement — save the date

WFIRST-Subaru Synergistic Observation Workshop

to be held from **December 18 - 20, 2017**

at

Large Seminar Room, NAOJ, Mitaka, Tokyo, Japan

Potential Japanese Contribution “Package” for WFIRST

1. Subaru-WFIRST Coordinated/Synergistic Observations
2. Potential Contribution to Coronagraph Instrument
Polarimetry capability
w/ Polarimetry Compensation Unit
3. Ka-band Data Downlink Station in Japan
4. Ground-based microlensing observations:
 - MOA dataset for development of the pipeline
 - pre/concurrent observations with a new 1.8m telescope
(PRIME: a dedicated telescope for microlensing)

Polarimetry Capability for CGI

■ Polarimetry Unit (Imaging Polarimetry)

■ **Development** of Polarization Compensator correcting polarization-differential wavefront aberration (PDWA)

Adding accurate polarimetry capability

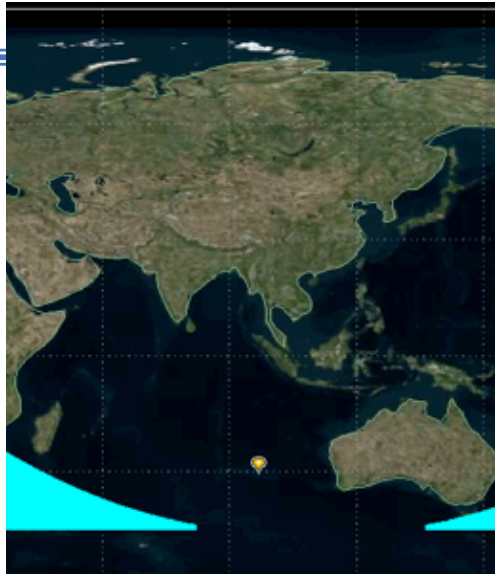
- important science cases for planets and disks
- achieving higher contrast

Development of Polarization Compensator

N. Murakami, et al.

- **Broadband high-contrast polarimetry observations**
- **Problem:**
 - Instrumental polarization causes polarization-differential wavefront aberration (**PDWA**)
 - DM cannot correct different X- and Y-polarized WFs simultaneously
- **Polarization-compensating system**
 - Birefringent plates:** reduce the PDWA to make the X- and Y-polarized WFs be identical
 - Non-birefringent plates:** correct (flatten) the distorted WFs

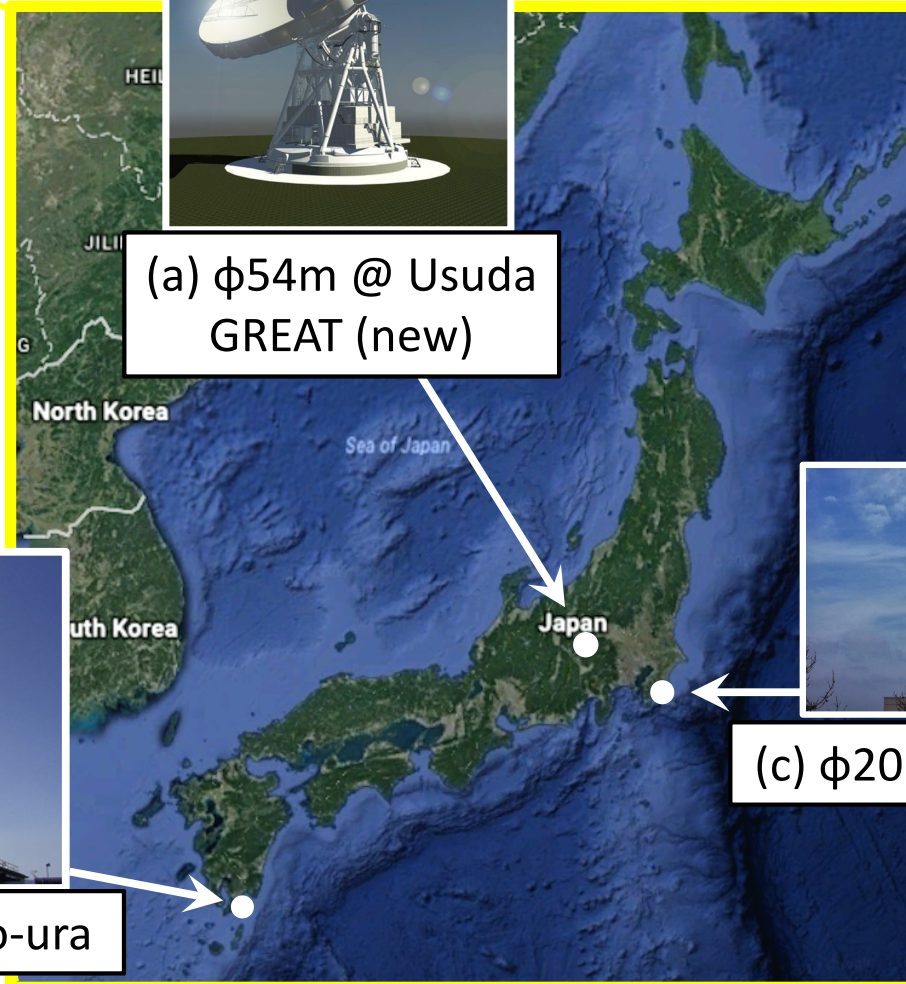
Ground Station Option for Ka-band (26.5 GHz) in Japan



(a) $\phi 54\text{m}$ @ Usuda
GREAT (new)



(b) $\phi 34\text{m}$ @ Uchino-ura



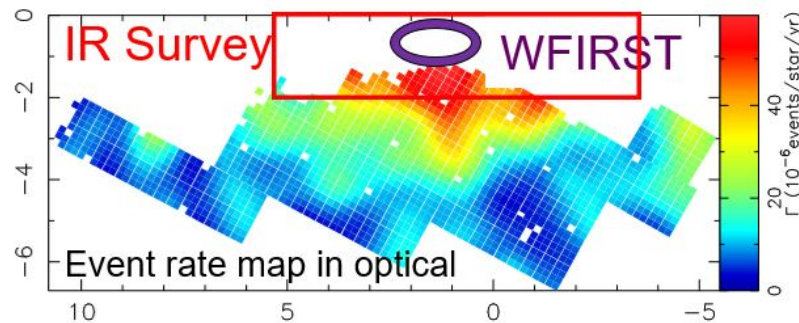
(c) $\phi 20\text{m}$ @ Katsu-ura

Ura means a kind of seashore like inlet

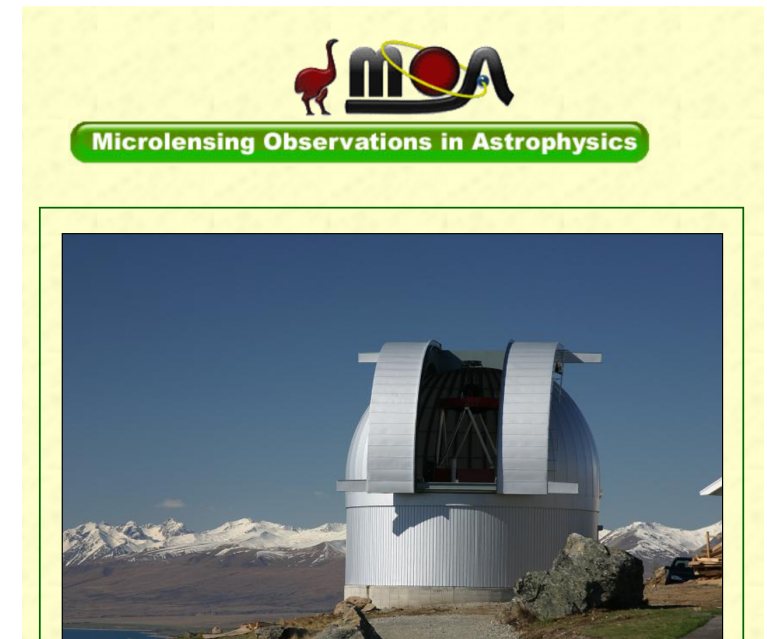
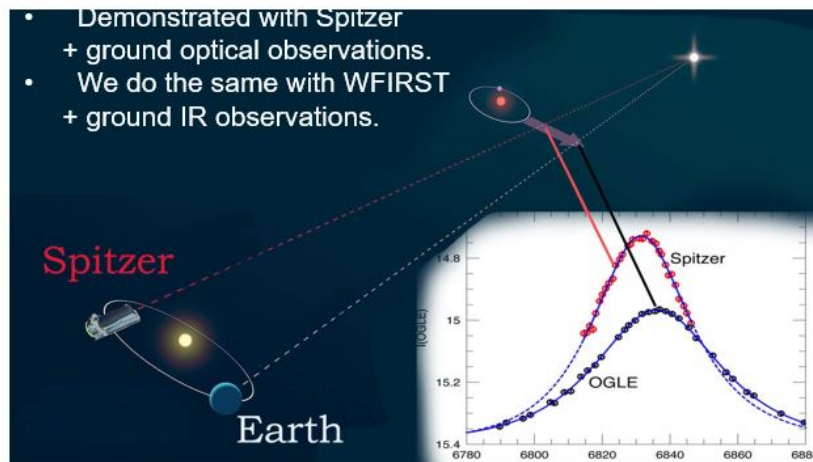
Ground-based microlensing observations:

- MOA dataset for development of the pipeline

1. Precursor observations for optimizing WFIRST microlensing survey field



2. Concurrent observations with WFIRST for lens mass determination via Ground-Space parallax

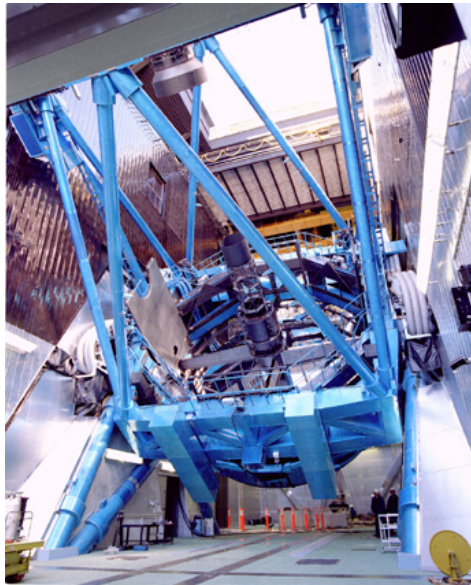


Current Status (1)

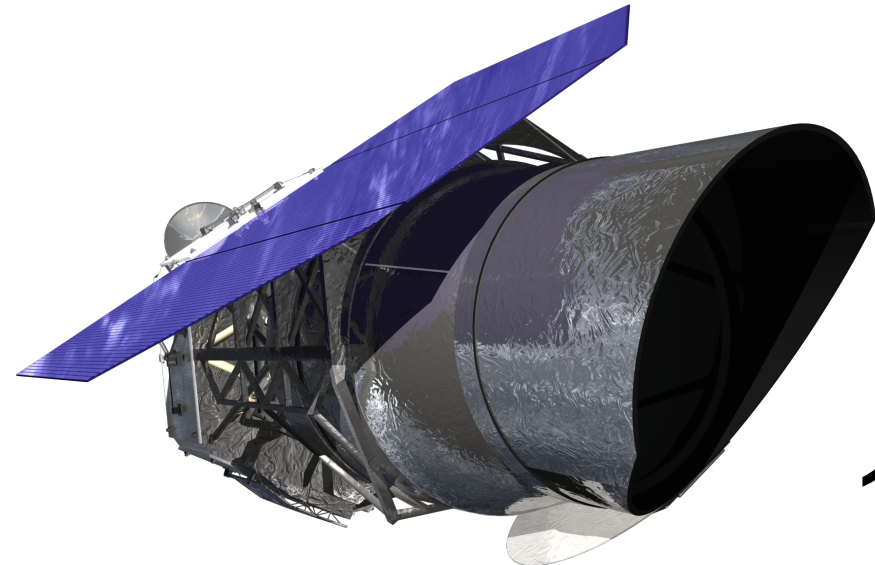
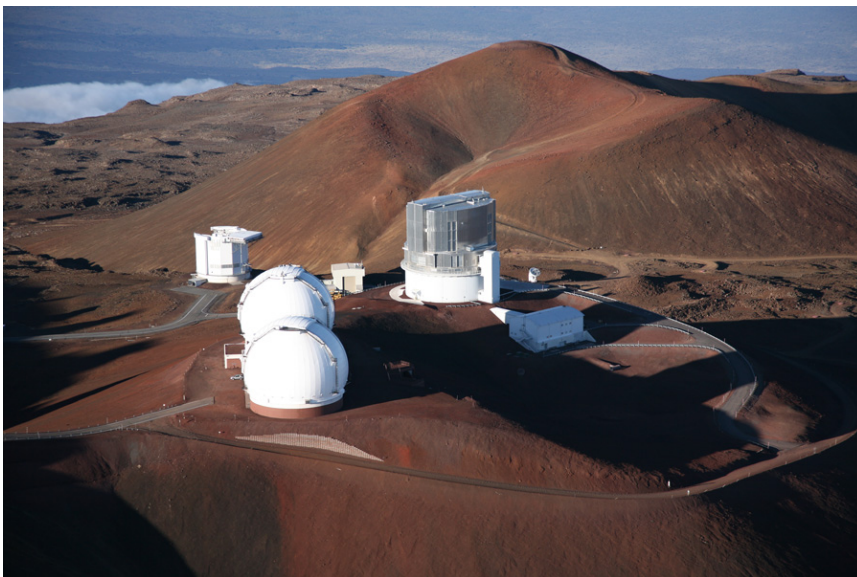
- ✓ Subaru/WFIRST synergistic observations
 - NAOJ agreed to commit ~100 Subaru nights at around 2025 for the Subaru/WFIRST synergistic observations.
 - NAOJ is ready to send the Letter of Commitment to JAXA, which will be directly cc-ed to NASA
 - Subaru/WFIRST Workshop in Tokyo Dec 18-20, 2017
- ✓ ‘MOA-Project’ microlensing data sharing
 - MOA project agreed to commit sharing the full microlensing survey data with the WFIRST team

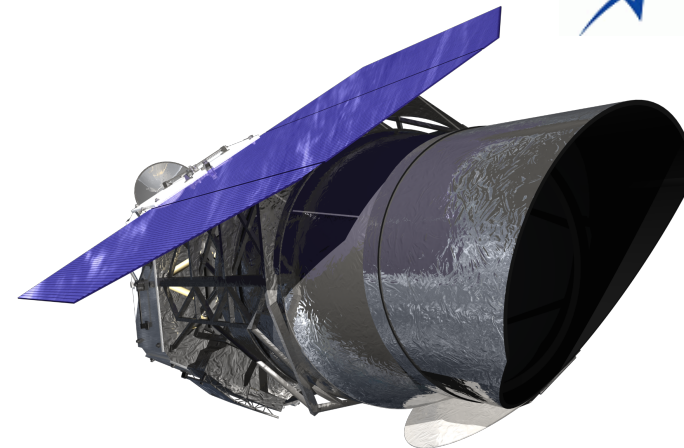
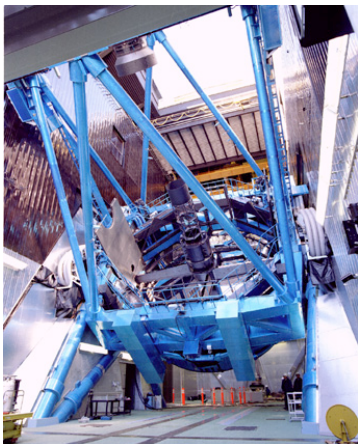
Current Status (2)

- ✓ Ka-band Ground-Station
 - No current Ka-band facility of JAXA
 - JAXA can provide Ka-band data downlink capability (and S-band communications) for WFIRST, by upgrading either Usuda new 54m antenna (2020-) or the Uchino-ura (USC) 34m antenna
 - Discussion with NASA WFIRST team for planning
- Polarimetry imaging capability for the Coronagraph Instrument is under study with the NASA JPL team
- Plan for the new microlensing-dedicated 1.8m telescope is under discussion

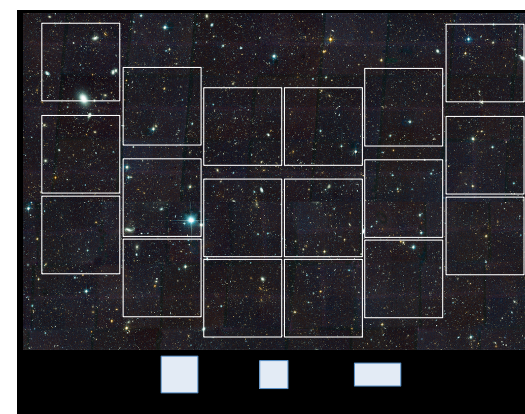


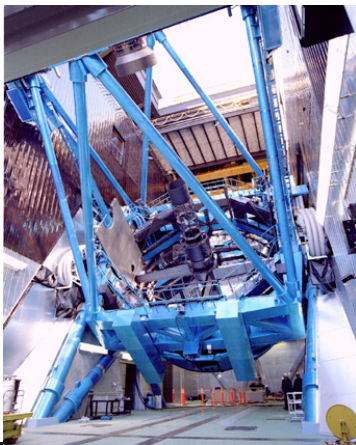
- Northern Hemisphere (\leftrightarrow LSST)
- Optical Wavelength (NIR for WFIRST)
- Wide-field Imager
(Hyper Supreme Cam; HSC)
- Wide-field Spectrograph, 2020~
(Prime Focus Spectrograph; PFS)



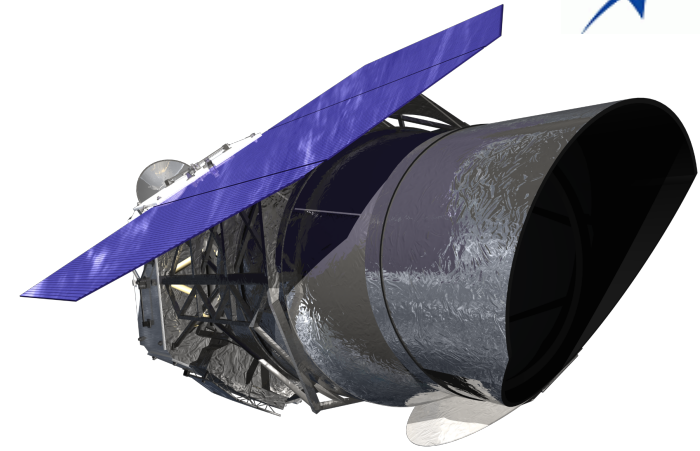
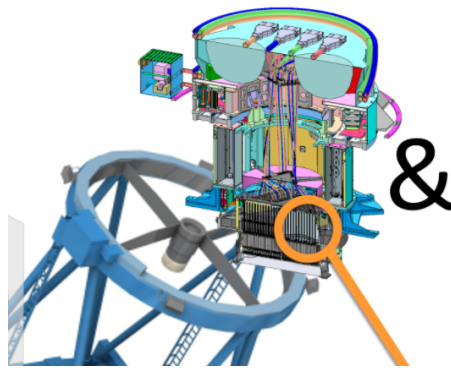


Field of View of Subaru HSC
($\phi=1.5\text{deg}$)





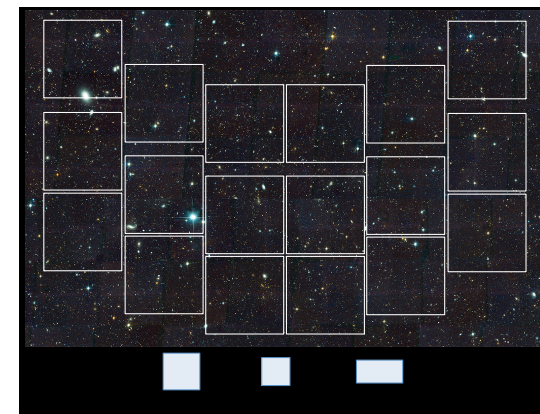
Prime Focus Instrument



Fiber Positioner "Cobra"



Subaru PFS
Spectrograph
 $\Phi 1.3\text{deg}$
2400 fibers





Subaru/WFIRST Synergistic Observations

Science Synergy of Subaru and WFIRST

Some voices..

- E.g., Subaru PFS deep and systematic spectroscopy can provides the redshift distribution of the galaxies to calibrate WFIRST cosmology analysis.
- E.g., Redshift for Supernova hosts
- E.g., Subaru HSC and PFS can provides optical broad-band and narrow-band imaging and spectroscopic information for the WFIRST “Deep Survey”
- Feeding targets to TMT at north





WFIRST-Subaru Synergistic Observation Workshop

December 18-20, 2017
NAOJ Mitaka Campus, Tokyo, Japan



Menu
Home
Important Dates
Venue
Programme
Announcements
Registration

First announcement — save the date

WFIRST-Subaru Synergistic Observation Workshop

to be held from **December 18 - 20, 2017**

at

Large Seminar Room, NAOJ, Mitaka, Tokyo, Japan

Subaru Synergistic Observations

- Subaru users show great interest in the synergistic observations with WFIRST
 - Subaru Telescope can reserve a certain number of nights (~100 TBD) at ~2025 for the Subaru-WFIRST synergetic program, *if it is supported by the Subaru community*.
-
- **Letter of Intent** from Nobuo Arimoto, Director of Subaru Telescope to ISAS/JAXA Director General Saku Tsuneta, which is CC-ed to Dr. Paul Hertz of NASA , Sept, 2016
 - **Good support in the GOPIRA symposium (Sept 27,2016)**
GOPIRA=group of optical and infrared astronomers

■ Letter of Intent from Nobuo Arimoto, Director of Subaru Telescope
to ISAS/JAXA Director General Saku Tsuneta,
CC-ed to Dr. Paul Hertz of NASA .

Subaru Advisory committee supported

■ Subaru Community Discussions

- 2015.12 Presentation at Subaru Advisory Committee (SAC)
- 2016.1 Subaru Users' Meeting (w/Jason Rhodes)
- 2016.2 [Presentation at Pasadena Meeting](#)
- 2016.4 SAC workshop for synergy with Space Mission in 2020's
(mainly, WFIRST, and Euclid + TESS)
- 2016.5 report for the workshop / SAC news letter 62
- 2016.6 [Presentation at WFIRST FSWG #2](#)
- 2016.7 Update at Subaru Advisory Committee (SAC)
- 2016.9 Supported at the GOPIRA Symposium
- 2016.10 SAC news letter 67 strong support for the commitment

■ Details for the Workshop

- 2016.6 Subaru-WFIRST synergy whitepapers (Japan)
- 2017.6 Discussions in WFIRST FSWG#2
 - ➔ Proposal for the workshop in Japan, in December
- 2017.7 Workshop announced to GOPIRA
- 2017.10 Japanese Discussions #1
- 2017.11 Japanese Discussions #2
- 2017.12 Workshop on Dec18-20

Purpose of Subaru-WFIRST Workshop

- As for the Japanese contribution to WFIRST, NAOJ, Subaru Telescope, and Subaru and Opt/IR community have agreed to commit for **~100 nights at around 2025** of Subaru Telescope for WFIRST-Subaru Synergistic Observations.

Purpose of Subaru-WFIRST Workshop

- The purpose of this workshop is therefore to survey the requirements from both WFIRST and Subaru side in Surveys and GO various science fields.

Purpose of Subaru-WFIRST Workshop

- WS provides the first opportunity for WFIRST and Subaru communities and the representative scientists to discuss and identify the most valuable way to use of the committed nights.

Purpose of Subaru-WFIRST Workshop

- This is also the first important opportunities for Japanese researchers to learn and consider the science with WFIRST.

Some Important Notes for Subaru-WFIRST time

- When the 100 nights will be scheduled
It is difficult to assign a large number of nights before 2024 (as PFS Strategic Program runs 2019-2024+).
We may assume 100 nights will be scheduled over a few years, possibly over the 4 years, the nominal program of WFIRST
- A fraction can be used before ~2025 ?
- Coordination with Subaru Open Use
 - constraints from the observatory (see Yoshida san's talk)
- Balance of dark/grey nights
- Possibility to consider much larger number of nights

Some Important Notes for Subaru-WFIRST time

➤ Steering

Subaru-WFIRST Time Steering Board should be set

- WFIRST WG rep, Subaru Committee rep,
Subaru Telescope rep., JAXA rep
- Project Scientists, SWG/SIT reps.

(discussion on the 3rd day)