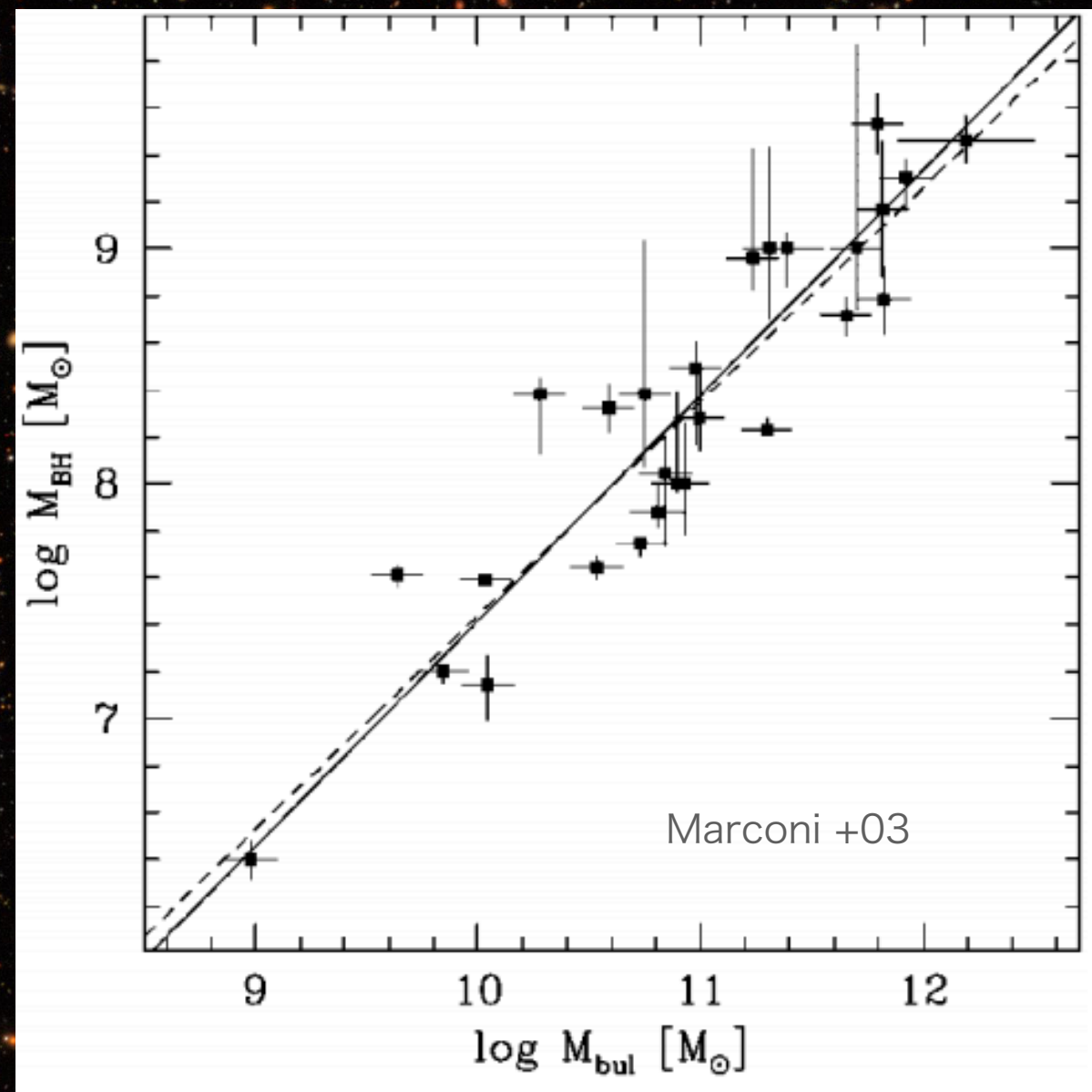


The impact of on-site observing experience on the early-career phase

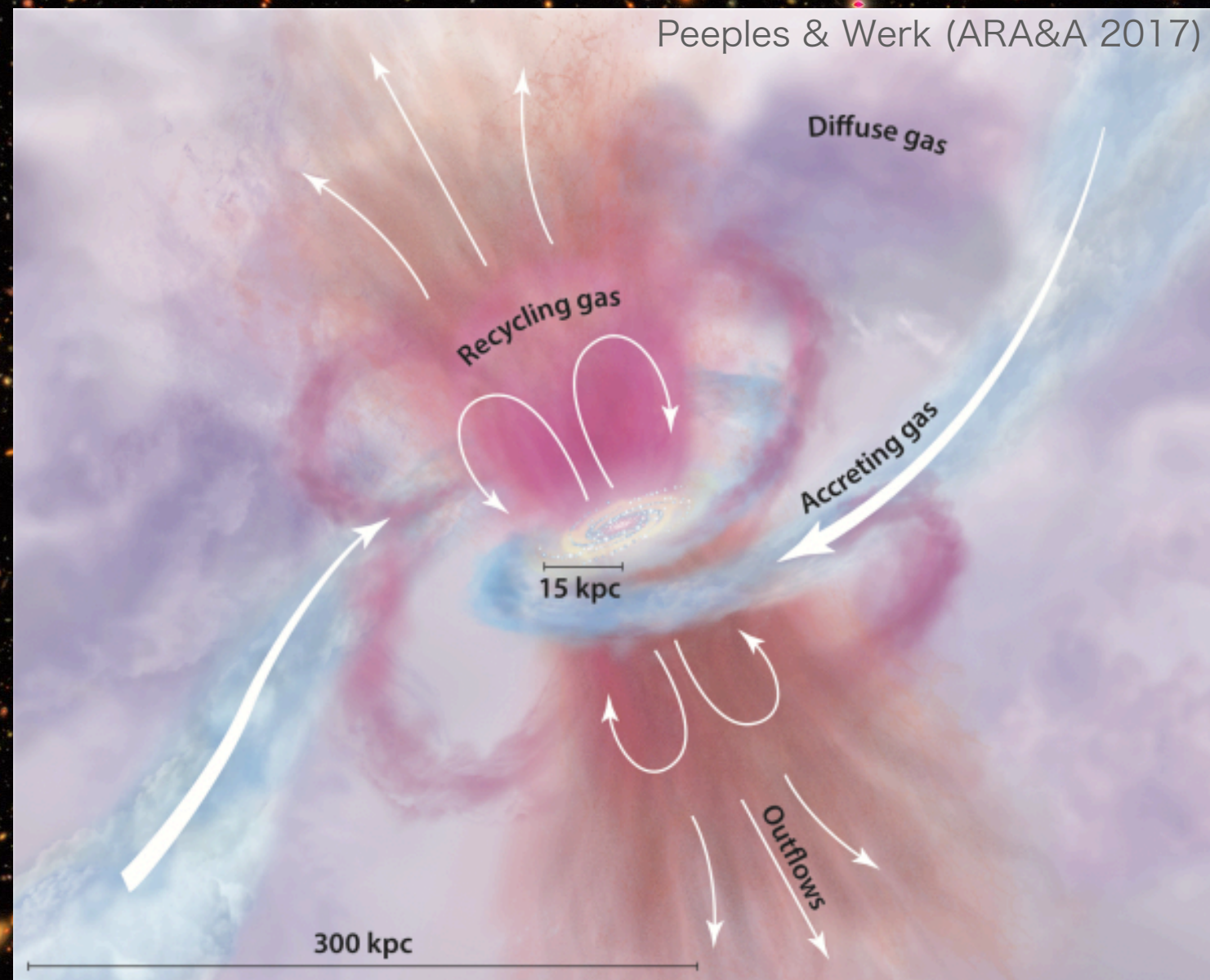
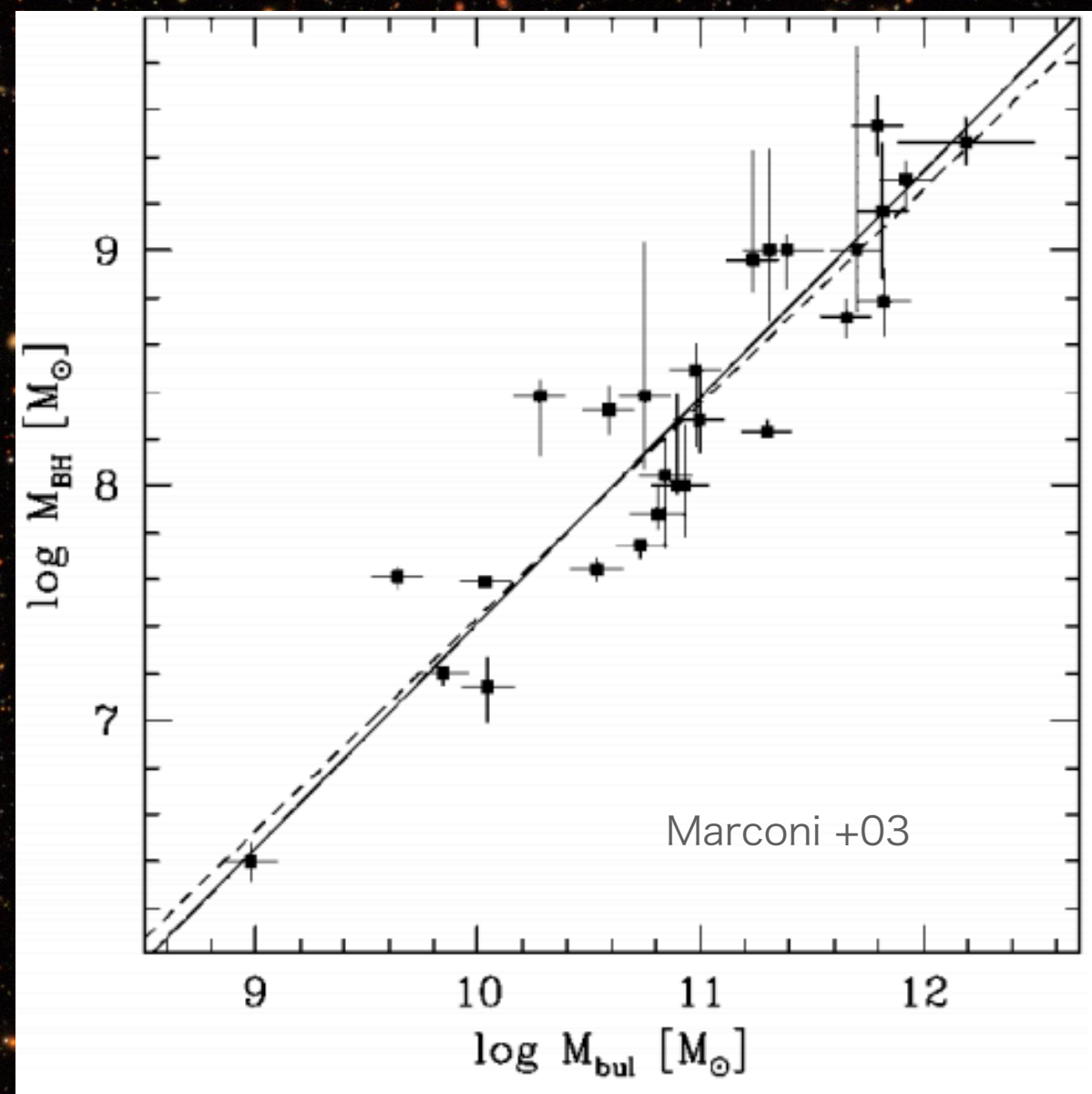
- The BAL fraction of high- z and low-luminosity quasars-

Ayumi Takahashi (Kanagawa Univ.)

SMBH-host connection

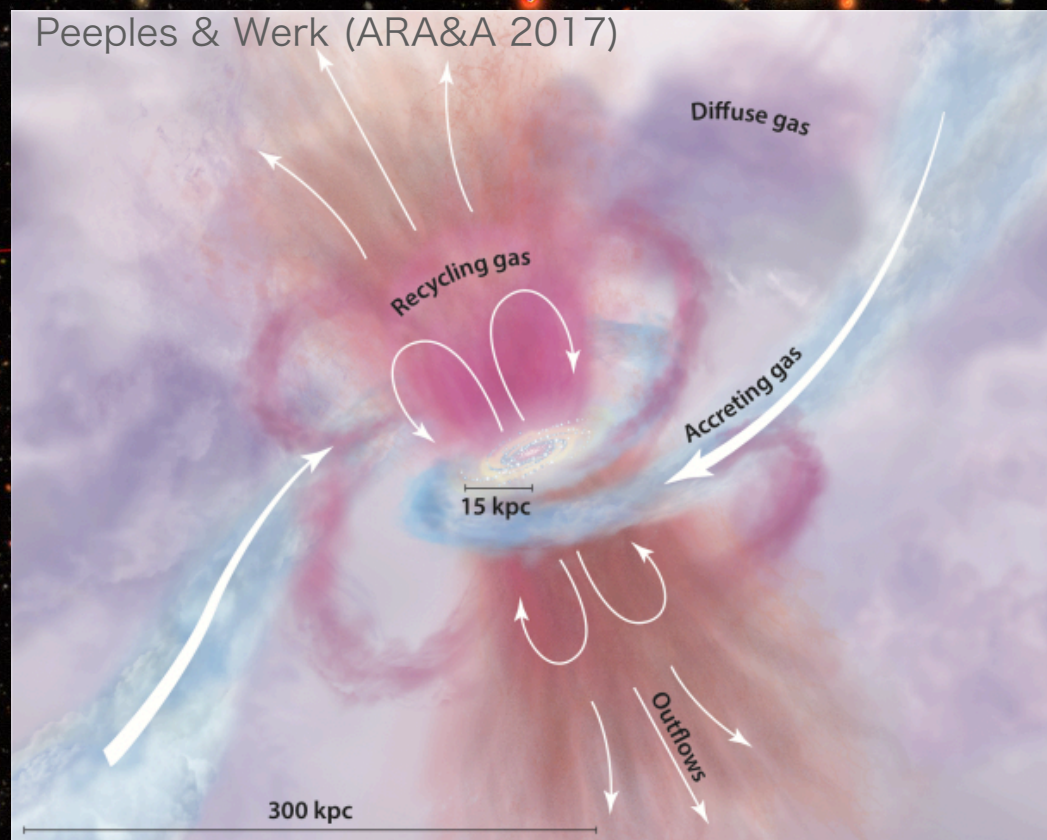


SMBH-host connection

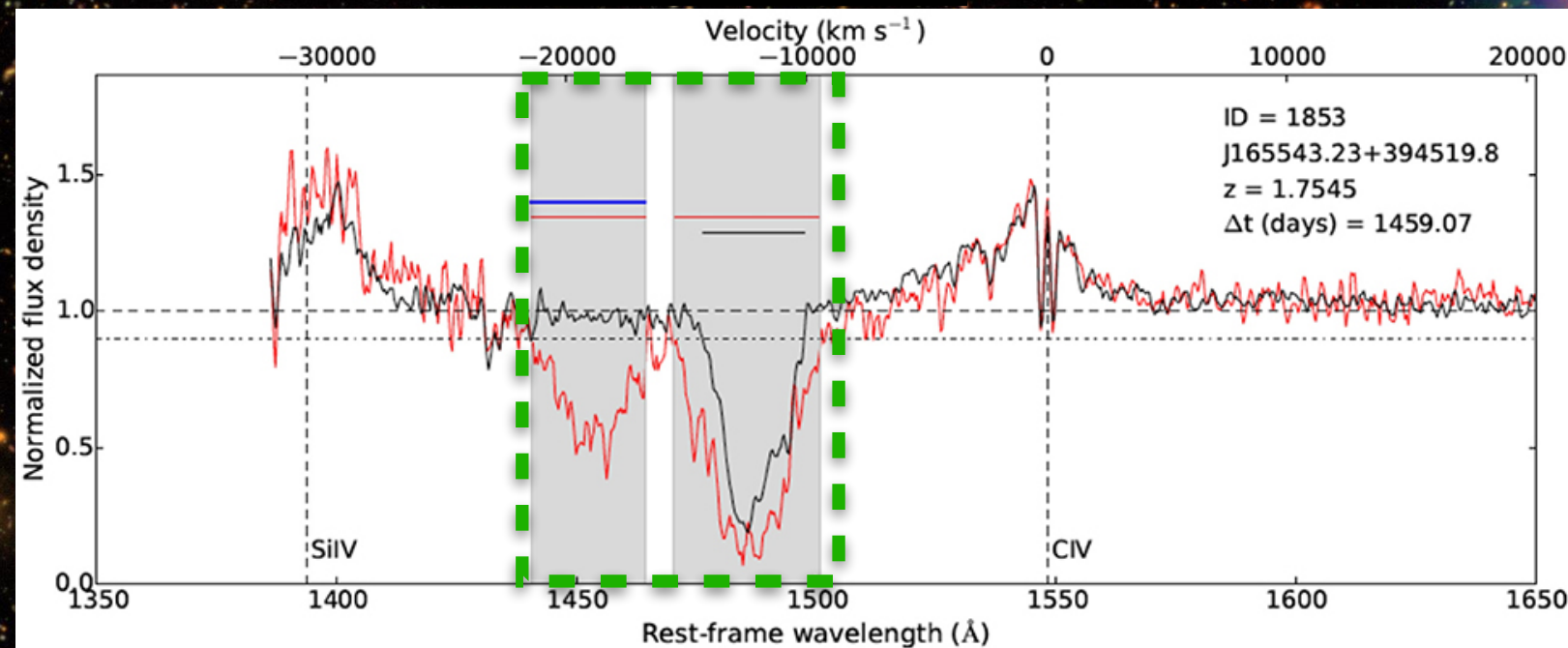


SMBH-host connection

Quasar Outflow gas has produced Broad Absorption Lines in quasar spectra



BAL trough

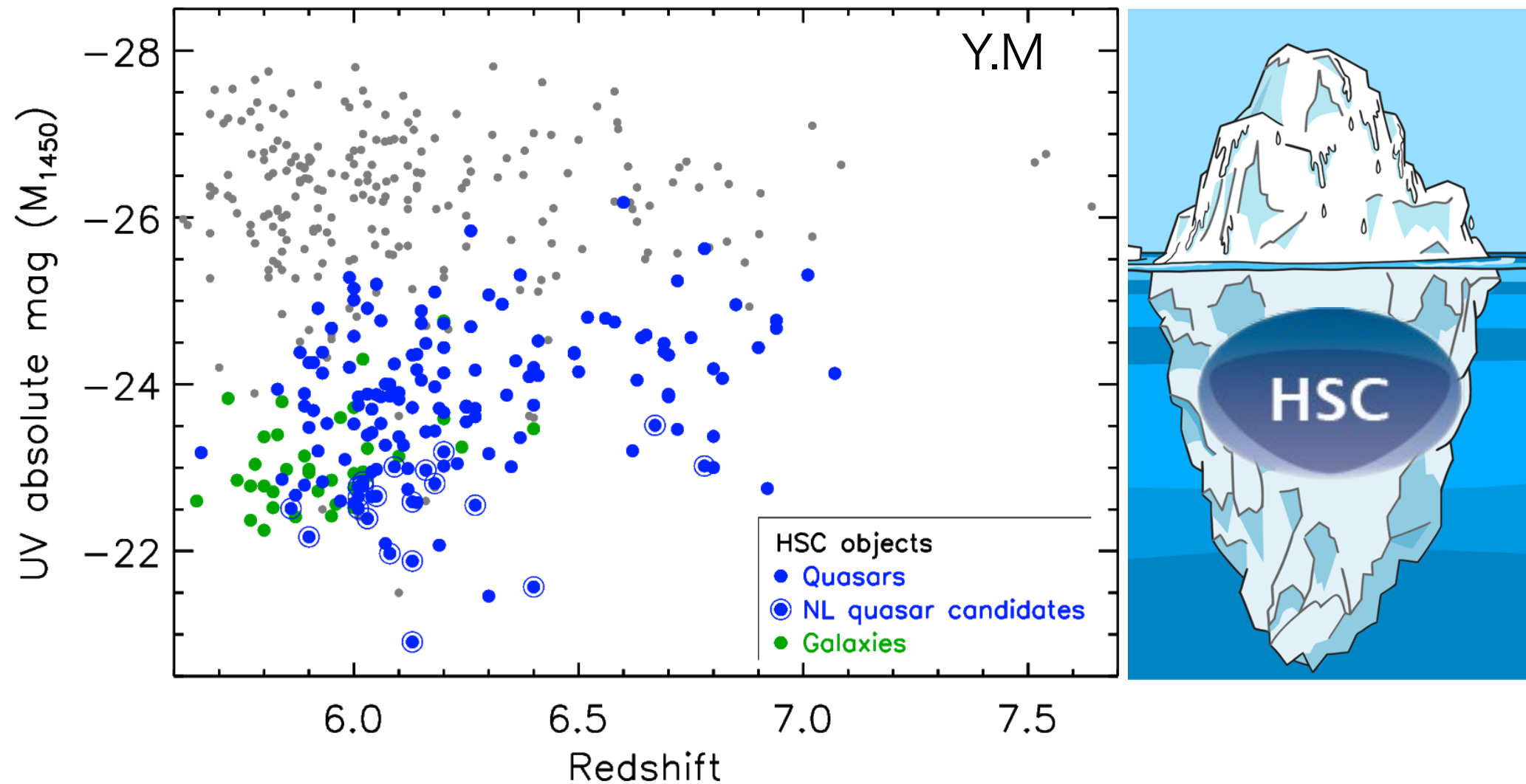


FWHM > 2000 km s⁻¹

Mass flow rate : $\dot{M} \simeq 4\pi\Omega N_H \mu m_p v$

Kinetic luminosity : $\dot{E} \simeq \dot{M} v^2 / 2$

Thanks to the HSC-SSP, more than ~200 low-luminosity quasars have been found at $z \sim 6-7$



What is the BAL fraction of high- z and low-luminosity quasars?

MOIRCS spectroscopic observations



Subaru Telescope
National Astronomical Observatory of Japan

Semester S23B
Proposal ID S23B0064N
Received 03/07/2023

Application Form for Telescope Time
(Normal+Intensive Programs)



Subaru Telescope
National Astronomical Observatory of Japan

Semester S24A
Proposal ID S24A0072N
Received 09/05/2023

Application Form for Telescope Time
(Normal+Intensive Programs)

1. Title of Proposal
The BAL fraction of high-z and low-luminosity quasars

2. Principal Investigator
Name: Takahashi Ayumi
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3. Scientific Category
AGN and QSO Activity

4. Abstract (approximately 200 words)
Galaxies are a significant constituent of the structure of the universe. Most galaxies host supermassive black holes (SMBHs) at the center and show tight correlations between the bulge stellar mass and BH mass, which have been observed even at high redshift ($z \sim 6$). How they formed and grew in such a short time from the Big Bang is still an open question. Quasar-driven massive outflows extending on galactic scales were detected in significant fractions of quasars. Recently, a large CIV BAL (Broad Absorption Line) fraction of 40-47 % was reported for 30 high-z luminous quasars, which is ~ 2.4 times higher than measured in the low-z universe. Here, we propose near-infrared spectroscopy of 11 HSC-based, high-z low-luminosity (SHELLQs) quasars using Subaru/MOIRCS. Our immediate goals are to measure the CIV BAL fraction and investigate their BAL properties (i.e., outflow velocities, kinetic energy, and spectral properties compared with low-z BAL quasars). The proposed systematic BAL observations will provide significant insight into whether BH outflows contribute to putative AGN feedback in the early universe and also to the evolutionary sequence of the galaxies hosting high- and low-luminosity quasars, which may be at least partially driven by the outflows.

5. Co-Investigators	
Name	Institute
Akatoki Noboriguchi	Shinshu Univ.
Toru Misawa	Shinshu Univ.
Yoshiki Matsuoka	Ehime Univ.
Kentaro Aoki	NAOJ
Nobunari Kashikawa	Univ. of Tokyo
Chien-Hsiu Lee	W.M.Keck Observatory
Masatoshi Imanishi	NAOJ
Kazushi Iwasawa	Universitat de Barcelona
Toshihiro Kawaguchi	Onomichi City Univ.

Observations were carried out over 10 runs

Observig date	Year	Full/half night
27 Aug	2023	Full
28 Aug	2023	Full
19 Mar	2024	Full
20 Mar	2024	Half
25 Apr	2024	Full
21 May	2024	Half
22 May	2024	Half
23 May	2024	Half
19 Jun	2024	Half
24 Jun	2024	Half

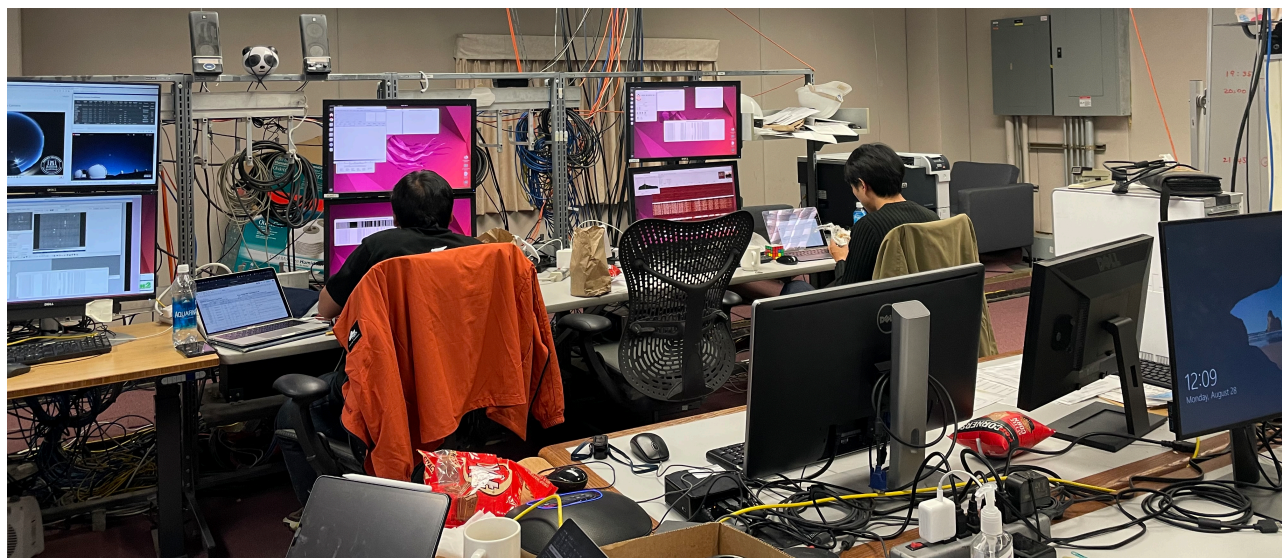
Among these, 3.5 nights were conducted on-site

On-site observation

BEFORE OBSERVATION: A final briefing with the observing team members, including the SA, just before the observations

DURING OBSERVATION: We are able to carry out the observations in close coordination with the SA. — It's easier to understand the situation of the SA and operator, enabling smooth execution for the observation

AFTER OBSERVATION: The dome tour provided an opportunity to deepen our understanding of the observing system.



We always try to understand “What does the raw data tell us?” in any instruments and observations

Directly seeing the observing system in person facilitates this understanding

Remote observation

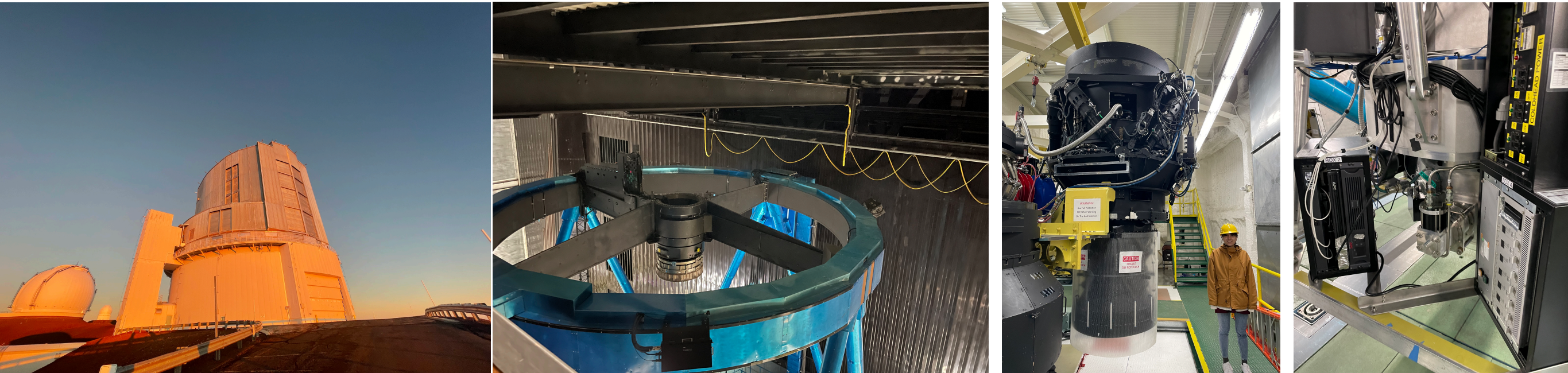


One can only monitor the summit conditions through a screen.

The situation and timing of the SA and operator can be a bit difficult to understand, particularly for early-career researchers who are not yet familiar with observing.

This would likely affect the execution of observations to some extent...

Through the on-site observing experience in the early-career phase



- ✓ Firsthand experience at Japan's leading facilities (e.g., Subaru)
- ✓ Discovering the excitement of observing
- ✓ Memories/experiences that shape your (our) career

In order to maintain and sustainably operate Subaru, it is important for those who carry this responsibility to have a strong attachment (愛着) to Subaru

(my personal opinion)

What is the impact of on-site observing experience on the early-career phase?

It builds passion and attachment to Subaru!

Ayumi Takahashi (Kanagawa Univ.)