日本天文学会早川幸男基金渡航報告書

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職あるいは学年	M2
任期 (再任昇格条件)	
渡航目的	研究集会での口頭発表
講演・観測・研究題目	JWST and ALMA discern the assembly of structural and obscured components in high-redshift starburst galaxies
渡航先 (期間)	イタリア国 (2024 年 9 月 1 日〜9 月 7 日)

From Sep 2nd to Sep 6th, I attended the conference 'Astrophysics and Space Science in Marche I: AGN feedback and star formation across cosmic scales and time', held in Sirolo, a charming seaside small town on the west coast of the Adriatic Sea in Italy. The conference centered on recent advances in simulation and observation of AGN feedback and star formation across cosmic scales and time. These studies have been enhanced by new data from ALMA, JWST as well as XRISM , recently launched by JAXA.

On the first day, I presented a contributed talk entitled 'JWST and ALMA discern the assembly of structural and obscured components in high-redshift starburst galaxies' during the 'Star Formation Across Cosmic Time' section. My talk focused on the spatially resolved observation with JWST and ALMA on two starburst galaxies at cosmic noon. For both galaxies, we utilized high-resolution ALMA observations (CO 5-4 and its underlying dust continuum, ∼0.1 and 0.3 arcsec) along with data from JWST (from COSMOS-Web and PRIMER), allowing us to construct spatially resolved star formation rate (SFR), gas mass and stellar mass maps. The first part of my talk focused on PACS-819, a starburst that lies 11 times above the Main Sequence (MS). Spatially resolved modeling using ALMA and JWST/NIRCam+HST data revealed disk-dominated kinematics and a spiral-like morphology, indicating that starburst triggering at cosmic noon is not necessarily due to major mergers. This research is detailed in Liu et al. 2024, ApJ 968, 15. In the second part, I discussed PACS-830, a spiral-like starburst galaxy where a PAH deficit was identified in its starbursting core. In this study, CO 5–4 is used as a tracer for the total infrared luminosity (LIR), and MIRI/F1800W serves as a tracer for luminosity at rest-frame 8μm (L8, containing PAH 7.7μm emission). IR8 is inferred from the division of two maps after homogenizing the grid and spatial resolution using a convolutional kernel. The observed bump in IR8 at the starburst center can be interpreted as a PAH deficit, likely resulting from the destruction of PAHs by intense star-forming activity in the starburst core. Such a PAH deficit might be a new tracer for central starbursts occurring in the dusty centers of SFGs in the distant Universe. My work showcased excellent examples

of joint studies using JWST and ALMA on starbursts at cosmic noon. Combining these observations provides a more comprehensive view of SFGs concerning their ISM and obscured stellar populations in the distant Universe.

Following my talk, I received an inspiring question about whether similar high-resolution studies could be applied to AGN host galaxies at cosmic noon, focusing on internal physics, mass distribution, and PAH content. I explained that such studies are indeed challenging due to redshift constraints—especially the need for the PAH 7.7 μ m emission to remain within the MIRI wide-band filter in the absence of MIRI spectroscopy. Additionally, for AGN host galaxies, detailed PSF handling and subtraction of AGN contributions are necessary before estimating the mass distribution using pixel-based SED fitting.

The conference provided valuable insights into AGN outflows and galaxy quenching, notably from the Blue Jay collaboration, which utilized JWST/NIRSpec spectroscopy to observe cosmic noon AGNs. Their findings highlighted the importance of AGN-driven outflows in quenching massive galaxies at this epoch. Additionally, on the last day, Dr. Satoshi Yamada from RIKEN presented the remarkable sensitivity of XRISM spectra in detecting X-ray winds, showcasing the instrument's capabilities. As a student from a Japanese institute, I was delighted to see the astonishing outcome of XRISM.

I am sincerely grateful to the Hayakawa Foundation and the ASJ for their generous support of my trip.