

大型光赤外線望遠鏡で探る 宇宙再電離と銀河形成

大内 正己
宇宙線研究所

共同利用研究課題

- 令和5年度

代表:大内正己

参加研究者：小野宜昭、播金優一、馬渡健、矢島秀伸、他（東京大学、筑波大学、Copenhagen大学, Chalmers大学など）。計32名

予算：物件費5万円（レンタルサーバー等、オンライン共同研究対応）
旅費3万円

論文(令和5年度中)

論文(査読論文、及び査読中/出版中の論文): 30編

- Fukushima, "Probing Chemical Enrichment in Extremely Metal-Poor Galaxies and First Galaxies", arXiv e-prints, 2024
- Ma, "MAMMOTH-Subaru. V. Effects of Cosmic Variance on Ly α Luminosity Functions at $z = 2.2-2.3$ ", The Astrophysical Journal, 961, 2024
- Zhang, "MAMMOTH-Subaru. III. Ly α Halo Identified by Stacking 3300 Ly α Emitters at $z = 2.2-2.3$ ", The Astrophysical Journal, 961, 2024
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など。→ このうち Kikuta et al. (2023) と Harikane et al. (2023)、Nakajima et al. (2023) の結果を報告。

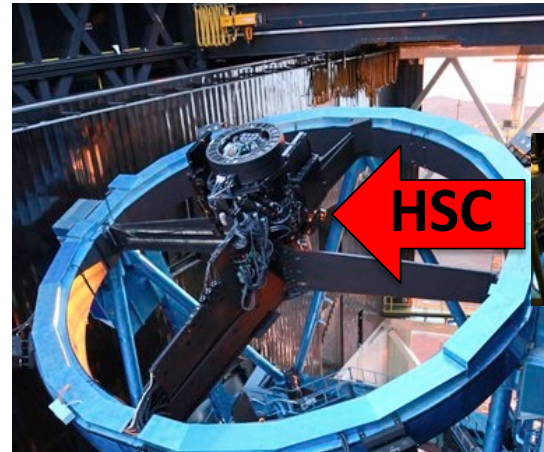
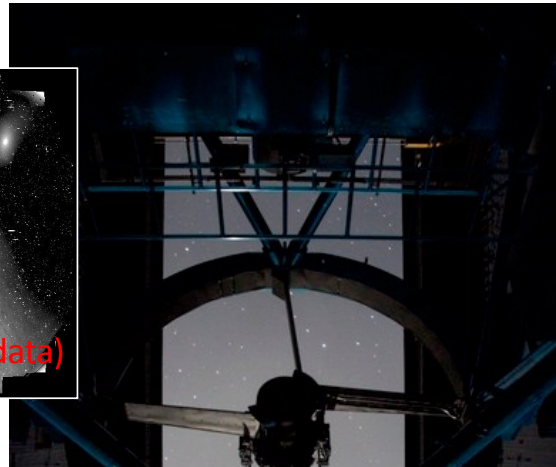
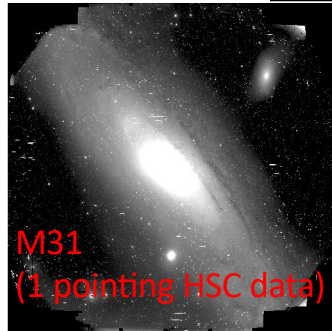
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Subaru/Hyper Suprime-Cam (HSC)



Suprime-Cam



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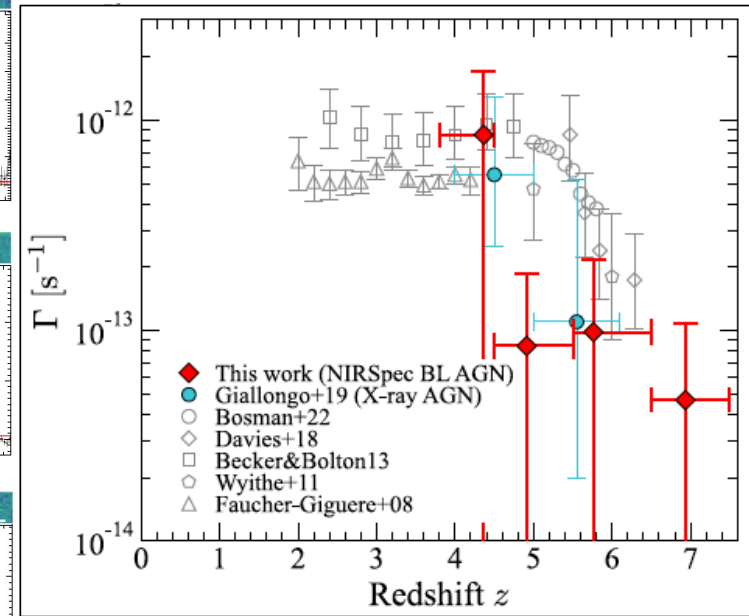
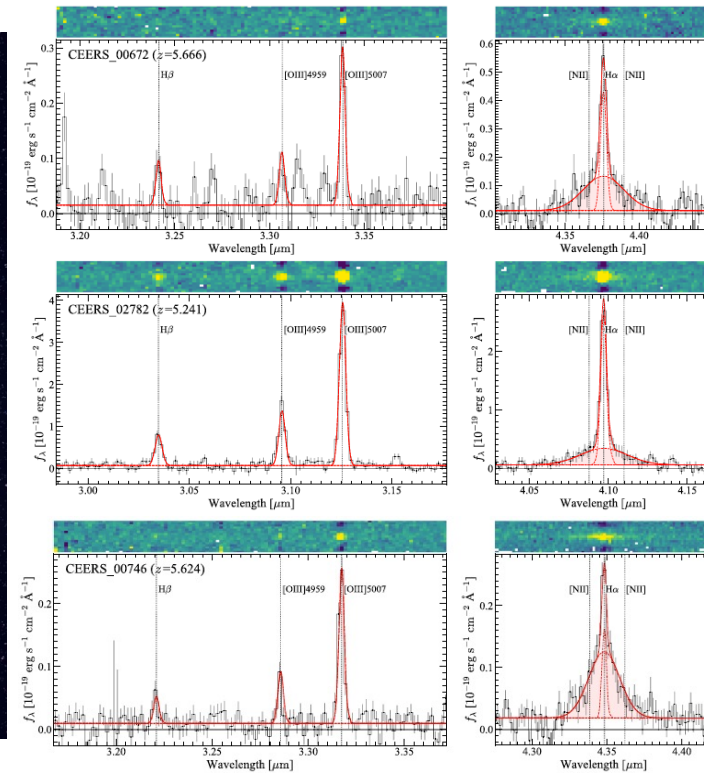
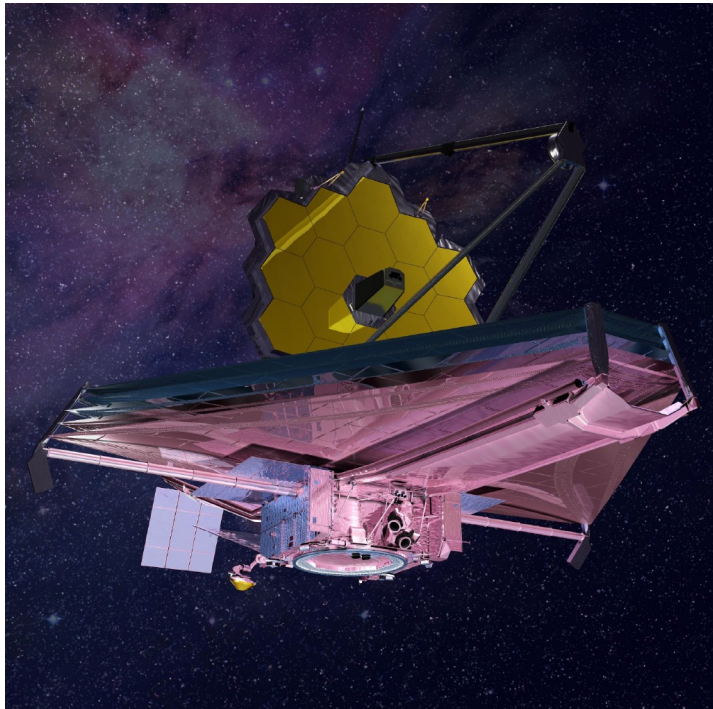
SILVERRUSH. XIII. A Catalog of 20,567 Ly α Emitters at $z=2-7$ Identified in the Full-depth Data of the Subaru/HSC-SSP and CHORUS Surveys

Satoshi Kikuta¹, Masami Ouchi^{1,2,3,4}, Takatoshi Shibuya⁵, Yongming Liang^{2,1}, Hiroya Umeda^{2,6}, Akinori Matsumoto^{2,6}, Kazuhiro Shimasaku^{7,8}, Yuichi Harikane², Yoshiaki Ono², Akio K. Inoue^{9,10}, Satoshi Yamanaka¹¹, Haruka Kusakabe^{1,12}, Rieko Momose^{13,7}, Nobunari Kashikawa^{7,8}, Yuichi Matsuda^{1,3,14}, and Chien-Hsiu Lee¹⁵

c) HSC Builder's blog

- HSC: すばる可視光超広視野撮像装置
- 2014年から観測スタート。観測完了(2021年)
 - Kikuta, Ouchi et al. 2023, ApJS, 268, 24のデータ論文を出版
 - 宇宙再電離に関する最終解析をUmeda et al. in prep.で報告して完了予定。

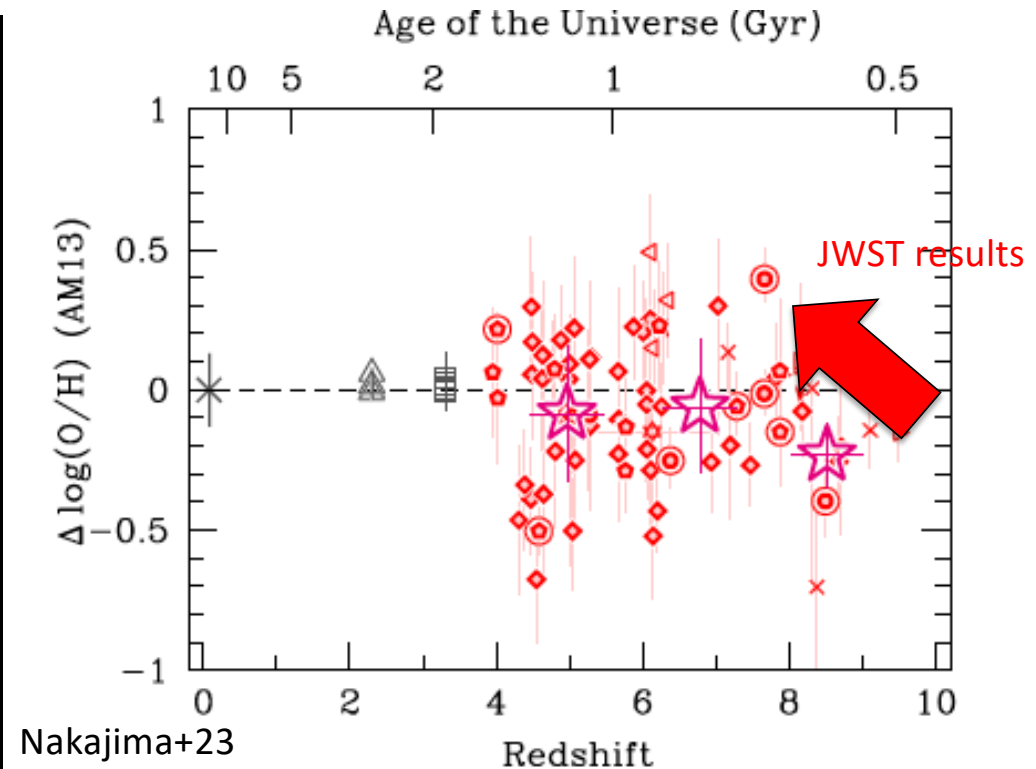
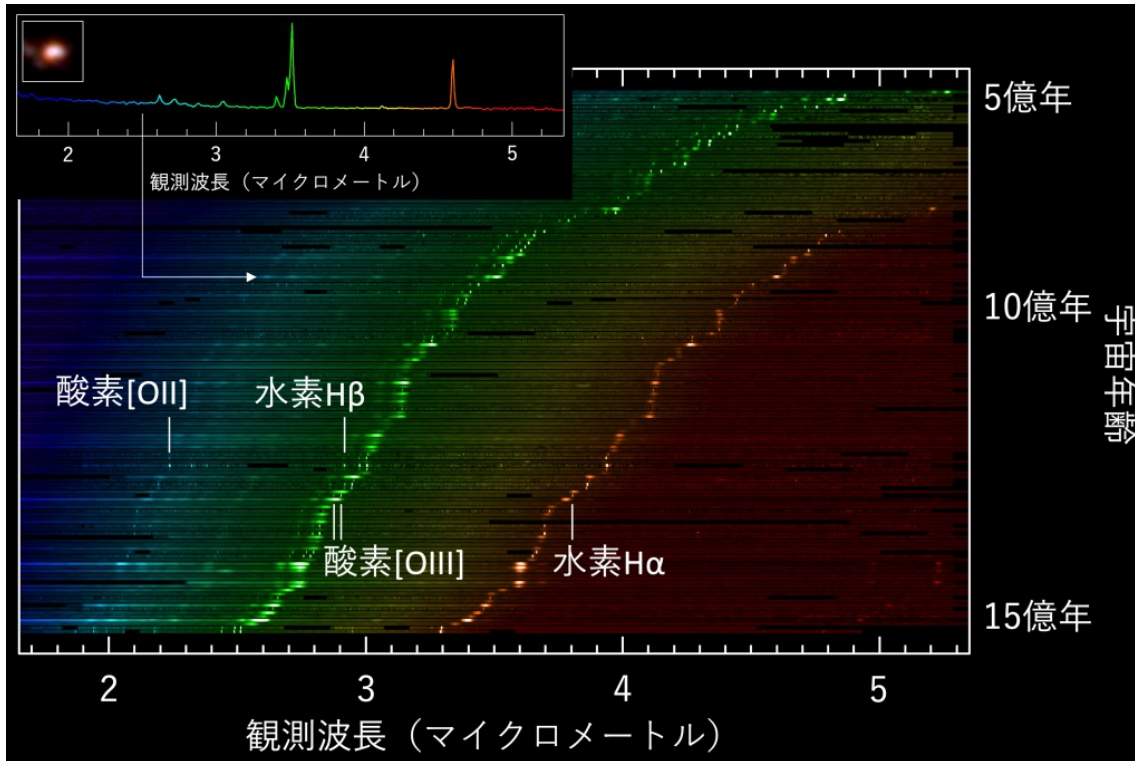
予想以上に多かったAGN



Harikane+23

- 相補的なJames Webb宇宙望遠鏡(JWST)観測による再電離研究
- 通常の $z=4-7$ 星形成銀河? \rightarrow Broad line (Type 1)AGN: 予想以上に多い(5%程度)
 - ただし、宇宙再電離への寄与は限定的(全体の50%未満)

$z=8-10$ で急増する酸素？



- JWST観測データ→ $z=4-10$ の138個の銀河の酸素組成比O/H
- $z=8-10$ で有意に増加するO/H (M^* -SFR関係に対して)
 - 重元素組成比の平衡の破れ (SFR-inflow/outflow) の兆候を捉えたか？

まとめ

大型光赤外線望遠鏡で行った宇宙再電離と銀河形成研究

1) すばるHSCによる観測の完了に伴う、データ論文の出版

2) JWST観測に基づくAGNの検出

- 遠方宇宙($z=4-7$)での予想以上に多いAGNの存在($\sim 5\%$)
- ただし、宇宙再電離への寄与は限定的 (全体の50%未満)

3) 初期の宇宙で急増する酸素

- $z=4-10$ の138個の銀河の酸素組成比O/H
- $z=8-10$ で有意に増加するO/H (M^* -SFR関係に対して)
- 重元素組成比の平衡の破れ?