X45a Feedback Efficiency at $z \sim 4-8$ Probed by JWST NIRSpec and NIRCam WFSS

Yi Xu (U. Tokyo), Masami Ouchi (NAOJ/U. Tokyo), Kimihiko Nakajima (NAOJ), Yuichi Harikane, Yoshiaki Ono, Yuki Isobe, Hiroya Umeda, Yechi Zhang (U. Tokyo)

Massive stars and supernovae heat and expel the surrounding gas that is launched as outflows. Theoretical models suggest that the outflows efficiently suppress the star formation in low-mass galaxies with shallow gravitational potential, especially for the galaxies that form in the first 1 billion years of cosmic history at $z > 6$. However, observational constraint of feedback efficiency is difficult due to the inconspicuousness of the outflow signatures. The latest James Webb Space Telescope offers the ability to observational constrain stellar feedback at high z. We use the NIRSpec data of 15 $z \sim 4-8$ galaxies taken by the GLASS program (Treu et al. 2022). We also reduce the NIRCam/WFSS data taken by the FRESCO program (Oesch et al. 2023) and include 14 $z \sim 7-8$ [OIII] emitters found in the GOODS-S/-N fields. We detection outflow signatures for 11 out of the 29 ($= 15 + 14$) galaxies. We conduct double Gaussian fitting to the [OIII]λ5007 emission lines to derive the outflow properties. We calculate the outflow velocity and find a tight correlation between outflow velocity and the circular velocity of the dark matter (DM) halo ($v_{\rm cir}$) consistent with previous findings. We estimate the mass outflow rate $\dot{M}_{\rm out}$ and the mass loading factor $\eta = \dot{M}_{\rm out}/{\rm SFR}$. We obtain $\eta \sim 0.1-1$ similar to those of $z \sim 2$ star forming galaxies although our galaxies have lower stellar masses and DM halo masses. One the other hand, our galaxies have similar $v_{\rm cir}$ to $z \sim 2$ galaxies due to the compactness of high-z galaxies. We thus propose $v_{\rm cir}$ as a major property that regulates the feedback efficiency.