X61a Spatially resolved early star formation in local extremely metal-poor galaxies

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Formation of the first galaxies is one of the most important topics in galaxy evolution. Due to observational limitations, the physical mechanism that cools the gas and triggers early star formation at high z still remains an open question. We investigate extremely metal poor galaxies (EMPGs) in the local universe that are analogs of the first galaxies. In the EMPRESS 3D project (PI: M. Ouchi), we have carried out deep optical spectroscopy so far for 25 EMPGs with Subaru/FOCAS-IFU to spatially resolve the star formation and the ionized gas.

In this presentation, we show the spatial distribution of the star formation rate (SFR), stellar age, and metallicity of EMPGs. We identify star formation clumps with high equivalent widths of H$\alpha > 1000$ Å that are well explained by young stellar population ($\lesssim 100$ Myr) with low metallicity. The locations of the star formation clumps are consistent with those of low metallicity and high SFR, which suggests the star formation may be a result of pristine gas inflow. We also investigate the dynamical relation between multiple star formation clumps, exploiting the high resolution data for 6 out of the 25 EMPGs. We measure the kinematic asymmetry of the ionized gas ($K_{\rm asym}$) by the harmonic expansion of velocity and velocity dispersion, which is called Kinemetry. We find high asymmetry of $K_{\rm asym} > 0.5$ that does not agree with the disk rotation, but can be explained by merger or fragmentation. The explanation of fragmentation agrees well with the inflow scenario and the numerical simulations of the first galaxies.