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S20: Origins and impact of winds in astrophysical systems

High-z Gamma Ray Burst (GRB) host galaxies and metal poor local analogs as laboratories to probe gas kinematics and chemical enrichment.

Dwarf metal poor galaxies undergoing starburst episodes share physical properties with galaxies at higher redshifts. These systems are considered analogs of galaxies at the cosmic noon and in the era of reionization (EoR) in terms of size, stellar mass, SFR, metallicity, morphology and dynamics. They are the nearest laboratories to explore in detail chemical enrichment processes and the turbulent kinematics of the gas powered by the intensive star formation.

On the other hand, high-z galaxies are very difficult to study in detail since low mass star forming galaxies are very faint. Gamma ray bursts (GRB) are energetic events originated by the death of massive stars or the collision of black holes or neutron stars. The radiation released and shocks due to fast moving gas, ionize the interstellar medium (ISM) around producing a temporary (from hours to few days) bright source of light known as the afterglow. GRBs offer a unique opportunity to study the ISM of high star-forming galaxies in the far universe, but being transient events need a fast response to trigger the observations.

In this talk, I present a study on the chemical content and the kinematics of the ISM (stellar winds/outflows in SF regions), in both local high-z analogs and GRB host galaxies at $2<z<6$, derived from the analysis of spectroscopic observations of the UV and optical rest-frames. Regarding the local high-z analogs, I will describe the determination of neutral and ionized gas chemical abundances of a sample of 45 galaxies from the CLASSY (COS Legacy Archieve Spectroscopic SruveY), and co-spatial apertures of KCWI, MUSE and SDSS optical spectra. The GRB sample is composed of 44 GRBs, detected by satellites of fast response (Swift, Einstein prove, Fermi and SVOM) and with follow-up observations of the afterglow and later observations of the most luminous host galaxies by VLT X-shooter, VLT-UVES and JWST. I compare HI column densities, gas abundances for different ions sampling different elements (N, O, S, P, Ni, C, Fe, Zn and Si) and the kinematics structure by measuring gas outflows along the line of sight in both the neutral and ionized gas phases.

This is a pioneering study to characterize high-z GRB host galaxies, which also provides a careful comparison of its metal content and ISM structure with local high-z analogs. Whether local analogs are good representative of high-z systems remains a topic of debate; however, GRBs provide a unique opportunity to bridge the gap between the local and distant universe.