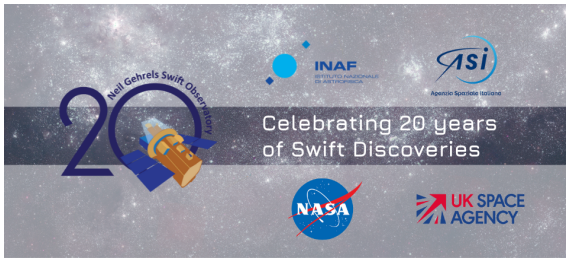

Contribution ID: **165** Type: **Poster**

Direct metallicity measurement of the host galaxy of GRB 050505 at z=4.28 using JWST/NIRSpec

Tuesday 25 March 2025 14:29 (1 minute)

Metallicity plays a key role in the evolution of stars, and obtaining accurate gas-phase metallicity measurements are therefore also important when studying the progenitors of stellar explosions, such as supernovae and gamma ray bursts (GRBs). However, there are well known limitations in how well the metallicity of galaxies can be measured, predominantly related to the quality of the generally indirect diagnostics that are employed.

The metallicity of the ionised gas within star forming regions can be measured from emission line spectra, ideally using weak and temperature-sensitive auroral lines, but more generally using indirect and model dependent relations between strong line ratios and metallicity. On the other hand, GRBs offer a direct probe of the metallicity of the host galaxy neutral interstellar gas from absorption lines imprinted on afterglow spectra. However, absorption and strong emission line metallicities often disagree by up to a factor of three for the same galaxy, and it is unclear whether this is due to intrinsic differences in the metallicity of the neutral and ionised gas, or due to inaccuracies in the diagnostics. We need to understand the origin of these discrepancies in order to optimise on the use of GRBs as probes of the interstellar medium of distant galaxies.

In this talk we present the first GRB host galaxy with a measured absorption line and direct emission line metallicity, using the temperature sensitive [OIII]λ4363 auroral line detected in the JWST/NIRSpec spectrum of the host of GRB 050505 at z=4.28. We find that the absorption line metallicity is in good agreement with the temperature-based emission line metallicity, both of which are ~0.2 dex lower than the strong emission line metallicity, even when using the strong line relations calibrated to high redshift galaxies. Our results imply that, at least at high redshift, GRB afterglow absorption lines trace more accurately the metallicity of star forming regions than strong emission line diagnostics, although this will need to be confirmed with larger samples.

Primary author: INKENHAAG, Anne (University of Bath, United Kingdom)

Co-authors: Dr SCHADY, Patricia (University of Bath, United Kingdom); Dr WISEMAN, Philip (University of Southampton, United Kingdom)

Presenter: INKENHAAG, Anne (University of Bath, United Kingdom)

Session Classification: Poster Session