ID de Contribution: **39** Type: **Oral presentation**

Dissecting the interstellar medium of extremely distant galaxies with Gamma-ray bursts

mercredi 2 novembre 2022 12:00 (15 minutes)

Gamma-ray bursts (GRBs) are an amazing class of transient phenomena in the Universe. GRBs are detected from space by satellites thanks to the flash of gamma-ray photons released within an ultra-relativistic jet. The jet is thought to be produced by a new-born accreting black hole formed after the collapse of a massive star, Long-GRBs (LGRBs), or the merger of two compact objects, Short-GRBs (SGRBs). The gamma-ray prompt emission is followed by an afterglow, detectable from the X-ray to the radio wavelengths. The afterglow emission is believed to be caused by the shock of the jet with the external medium (composed by dust and gas) surrounding the GRB progenitor.

LGRBs are unique tools to probe distant galaxies. Their bright afterglows can be used as powerful background sources capable of unveiling the gas along their line-of-sight that absorbs their light, like shadow puppetry. This includes also the gas of the host galaxy of the GRB, independently of the galaxy luminosity.

In this talk, I will show the results obtained with the extremely powerful spectrograph X-shooter installed on one of the larger telescope on Earth, the Very Large Telescope (VLT) of the European Southern Observatory (ESO) located in Chile. This observation allowed us to dissect a galaxy when the Universe was only 0.9 Gyr old in an unprecedented fashion. Such studies give unique informations to understand the first galaxies and their chemical enrichment.

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Classification de Session: Oral Presentations (second in the morning)