GRBs as probes of cold gas and dust in the diffuse interstellar medium and the nature of high-redshift damped Lyman-α systems

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To understand the mass assembly of galaxies and their chemical enrichment from high to low redshift, it is necessary to study the processes of stellar nucleosynthesis, dust production, star formation, or feedback on the local scales where these are taking place. Especially at very high redshift, $z > 2$, this is only possible by using quasars (QSOs) or γ-ray bursts (GRBs) as background sources, to probe individual lines-of-sight through the ISM in absorption.

At the 15th International Symposium on Origin of Matter and Evolution of Galaxies I want to present recent results from the X-shooter GRB afterglow legacy sample [1], showing that GRBs are indeed important probes of the diffuse molecular gas in the ISM of galaxies in the early universe [2][3][4]. Furthermore, I want to comment on the nature of high-redshift damped Lyman-α systems (DLAs) in general, and also how GRB-DLAs compare to QSO-DLAs.

[1] Selsing, J., Malesani, D., Goldoni, P. et al. (2018, Feb). The X-shooter GRB afterglow legacy sample (XS-GRB). ArXiv e-prints, arXiv:1802.07727

[2] Bolmer, J., Ledoux, C., Wiseman, P. et al. (2019, Mar). Evidence for diffuse molecular gas and dust in the hearts of gamma-ray burst host galaxies: Unveiling the nature of high-redshift damped Lyman-α systems. A&A, 623, A43. doi: 10.1051/0004-6361/201834422

[3] Bolmer, J., Greiner, J., Krühler, T. et al. (2018, Jan). Dust reddening and extinction curves toward gamma-ray bursts at $z > 4$. A&A, 609, A62. doi: 10.1051/0004-6361/201731255

[4] Heintz, K. E., Bolmer, J., Ledoux, C. et al. (2019, in prep.). Physical conditions in the diffuse molecular gas-phase of high-redshift GRB host galaxies, submitted to A&A.