

What we can learn from gas in host galaxies of gamma-ray bursts and supernovae

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/me-how me-how-off-skee/

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Ioffe Workshop on GRBs and other transient sources:
25 Years of Konus-Wind Experiment

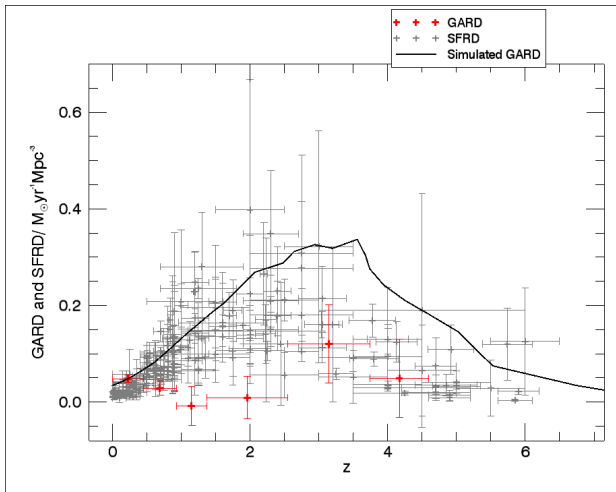
Outline

- 1 Gas inflow
- 2 Gamma-ray bursts (GRBs) and relativistic supernovae

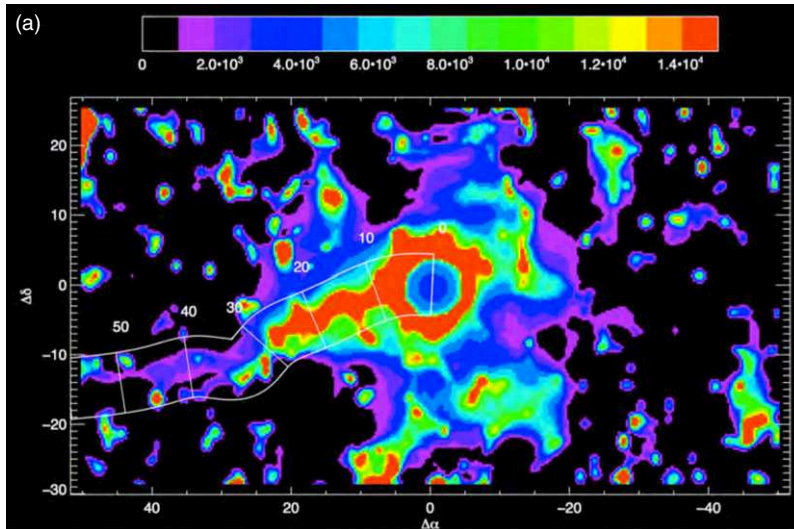
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Gas accretion rate density is constant!

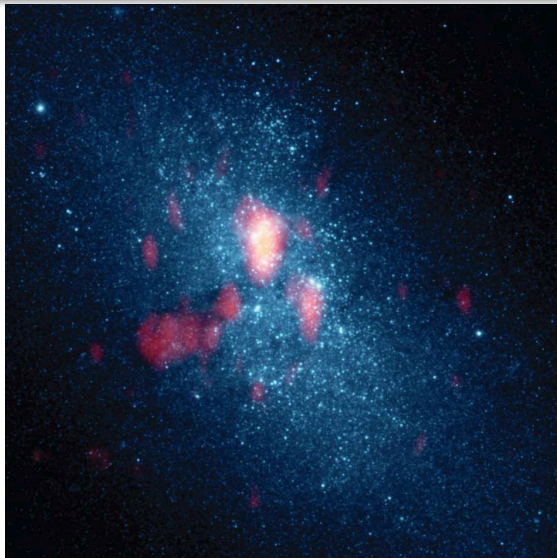


Direct observational evidence



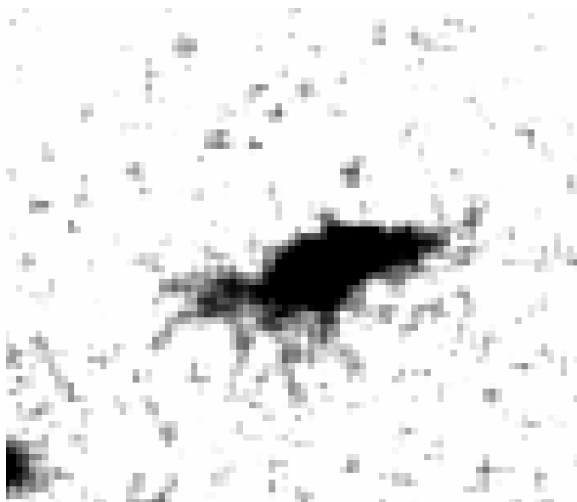
QSO 1549+19 (Martin et al. 2014, ApJ, 786, 106)

Direct observational evidence



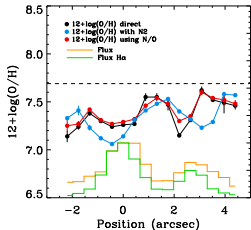
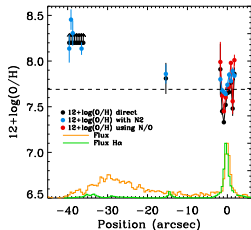
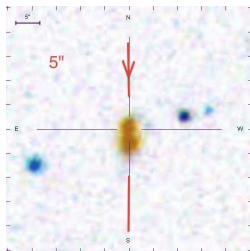
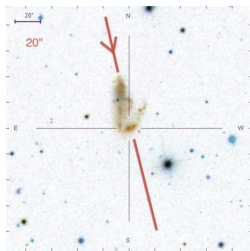
dwarf NGC 5253 (Turner et al. 2015, Nature, 519, 331)

Direct observational evidence



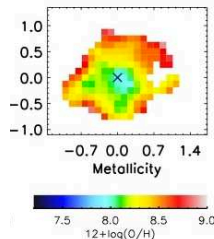
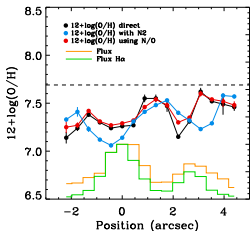
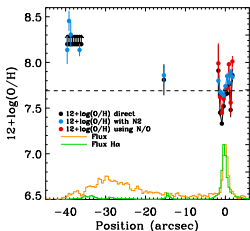
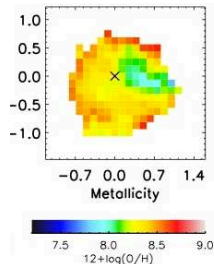
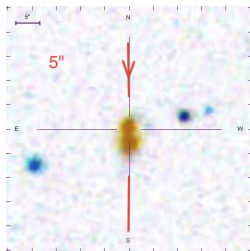
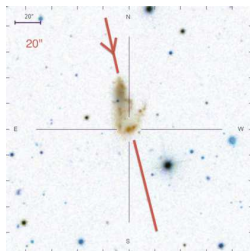
$z = 3.344$ Lyman alpha emitter (Rauch et al. 2016, MNRAS, 455, 3991)

Metal-poor regions in galaxies: recent gas accretion



Sánchez Almeida et al. (2014, ApJ, 783, 45)

Metal-poor regions in galaxies: recent gas accretion

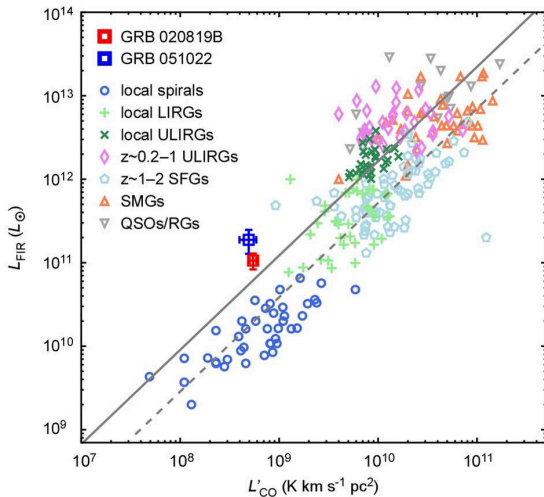


Outline

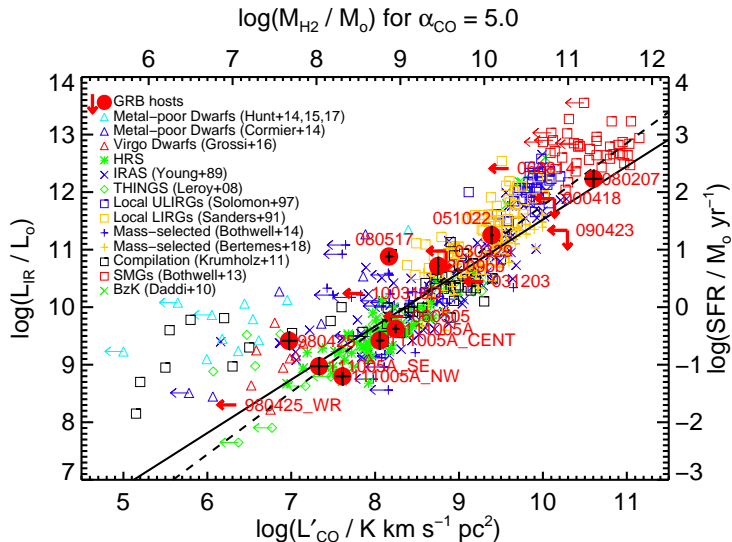
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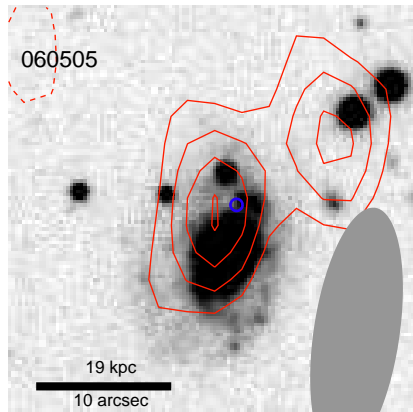
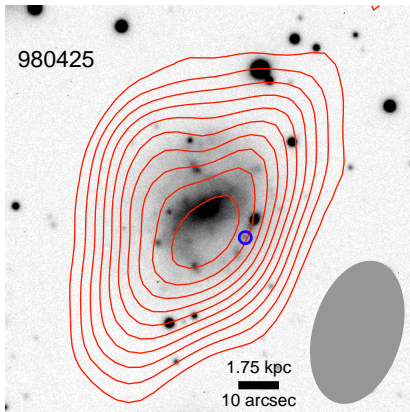
Molecular gas deficiency?



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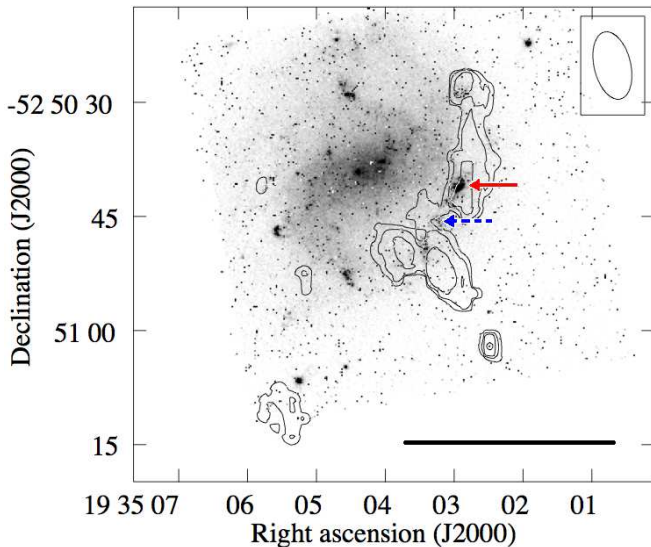


Atomic gas distribution in GRB host galaxies

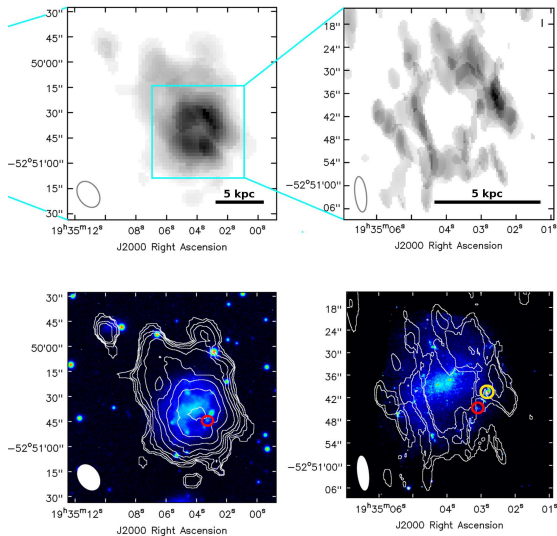


Michałowski et al. (2015, A&A, 582, 78)

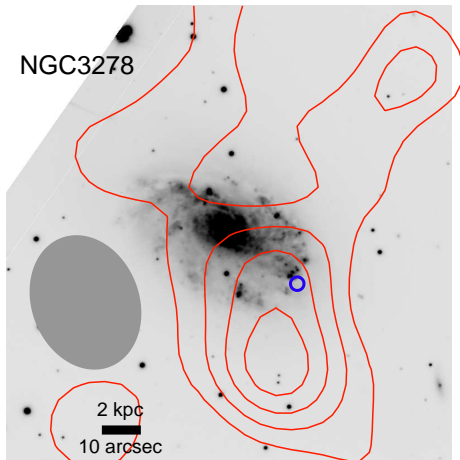
Follow-up high-resolution H I observations



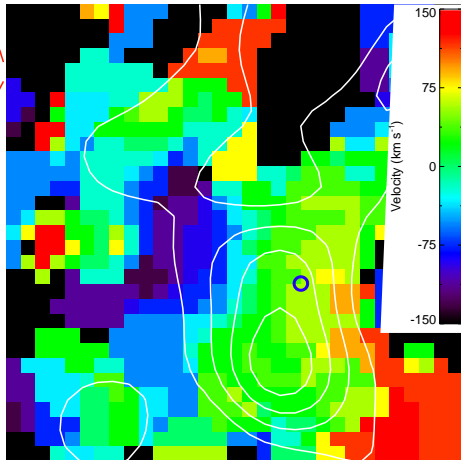
Follow-up high-resolution H I observations



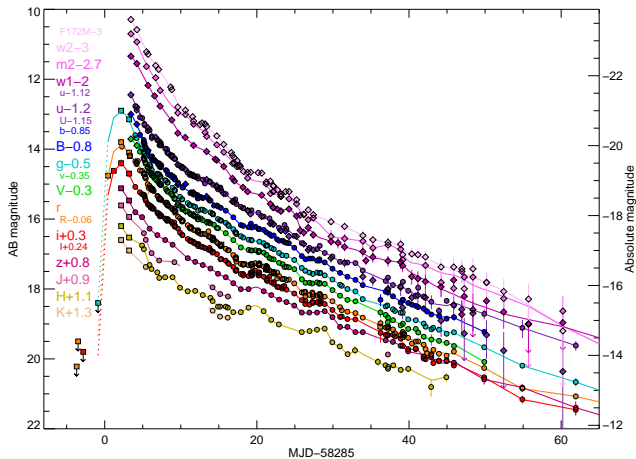
HI in the relativistic supernova 2009bb host



Michałowski et al. (2018, A&A, 618, 104)

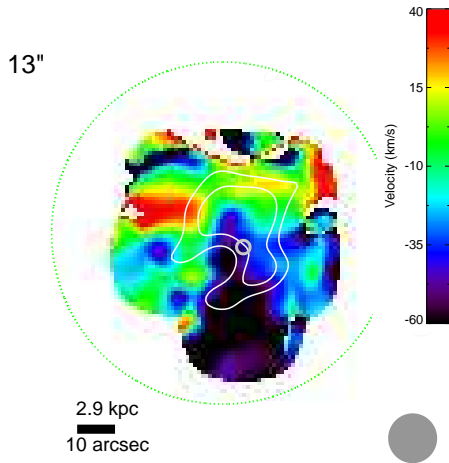
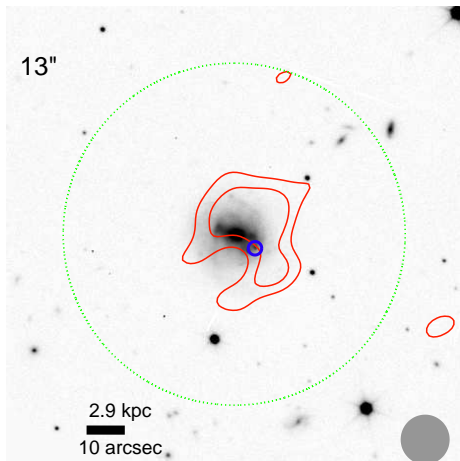


Unusual fast-rising transient AT 2018cow



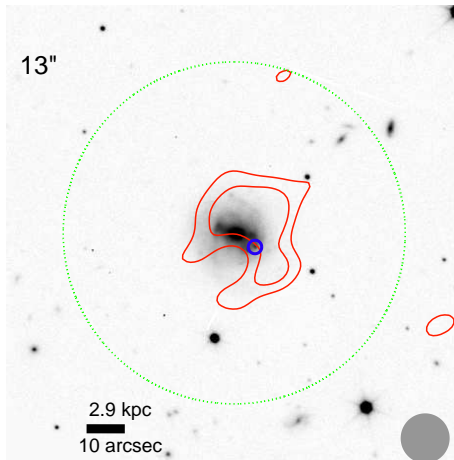
Perley et al. (2019, MNRAS, 484, 1031)

HI in the host of an unusual transient AT 2018cow

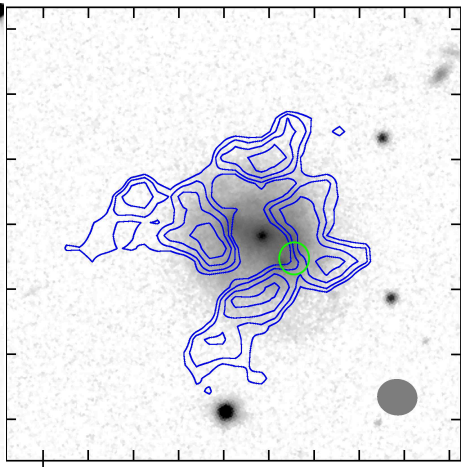


Michałowski et al. (2019, A&A, 627, 106)

HI in the host of an unusual transient AT 2018cow

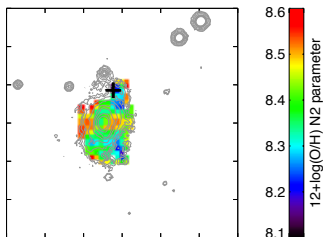
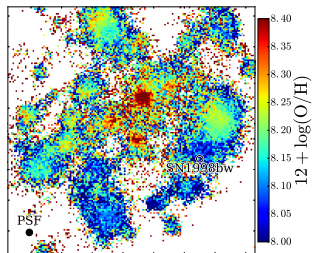


Michałowski et al. (2019, A&A, 627, 106)



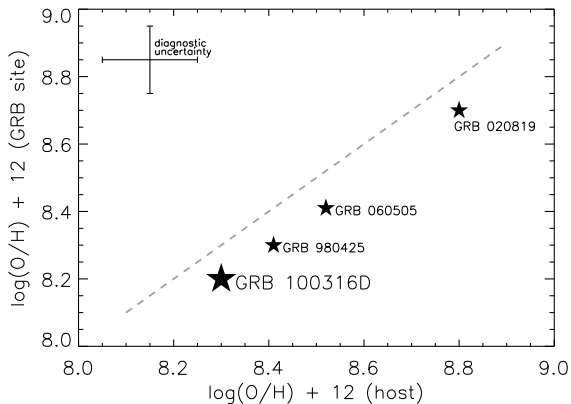
Roychowdhury et al. (2019, MNRAS, 485, L93)

GRBs explode in the metal-poor regions of their hosts



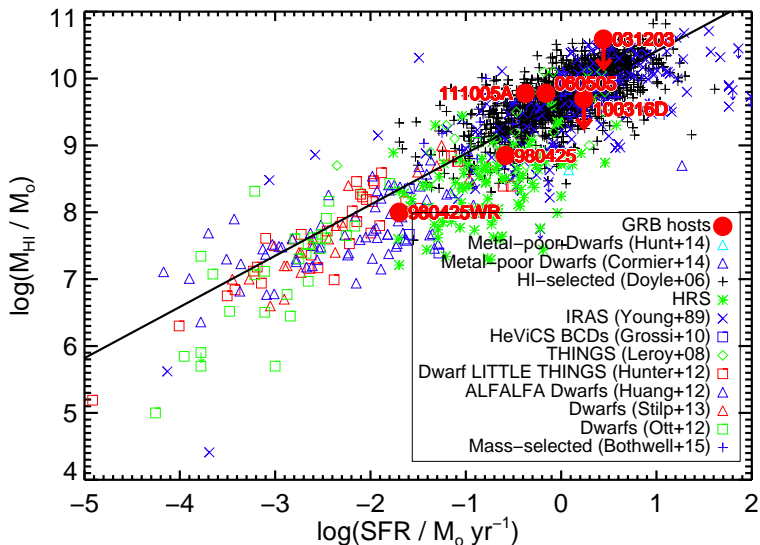
Krühler et al. (2017, A&A., 602, 85)

Thöne et al. (2014, MNRAS, 441, 2034)

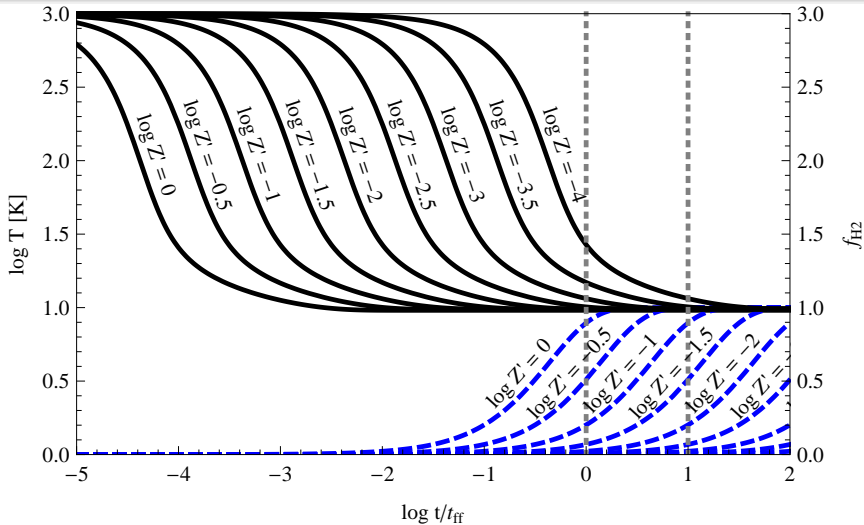


Levesque et al. (2011, ApJ, 739, 23)

Star formation rate vs atomic gas mass



Star-formation fuelled directly in atomic gas



Conclusions

- Inflow of gas is required to fuel star formation, and should be ubiquitous
- However, it is difficult to detect the inflowing gas
- GRB hosts at early stages of a star formation episode (which implies low metallicity)
- HI-fuelled star-formation? Accretion of metal-poor atomic gas?
- Strong connection between star-formation and atomic gas