Spatially-resolved dust and gas properties of the GRB 980425 host galaxy

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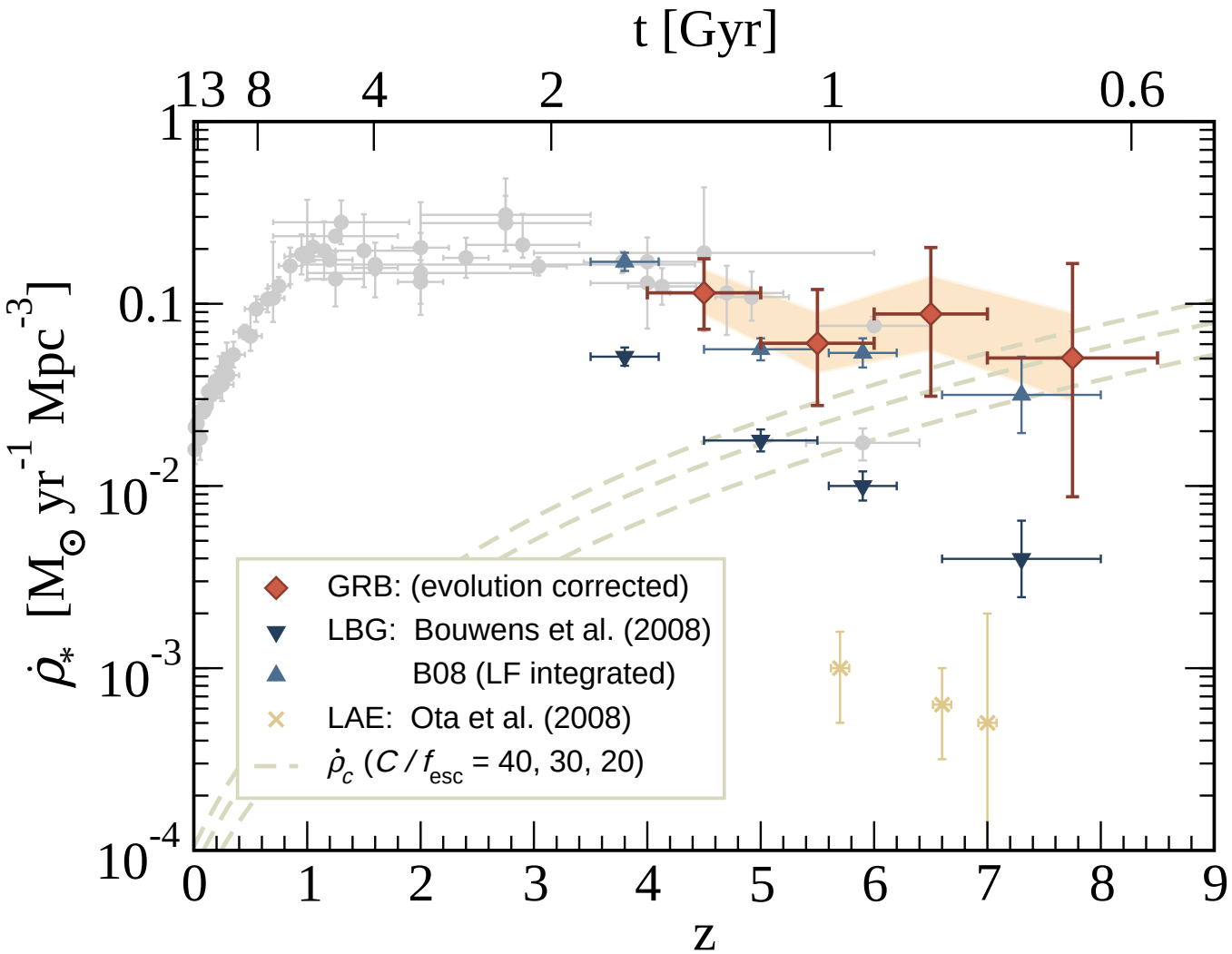
Outline

SFH from the gamma-ray burst (GRB) rate



Kistler et al. (2009, ApJ, 705, 104)

Are GRBs good tracers of cosmic star formation?

Unbiased tracers

- Michałowski et al. (2012, ApJ, 755, 85): radio
- Perley et al. (2013, ApJ, 778, 172; 2015, ApJ, 801, 102): radio
- Hunt et al. (2014, A&A, 565, 112): *Herschel*
- Kohn et al. (2015, MNRAS, 448, 1494): *Herschel*

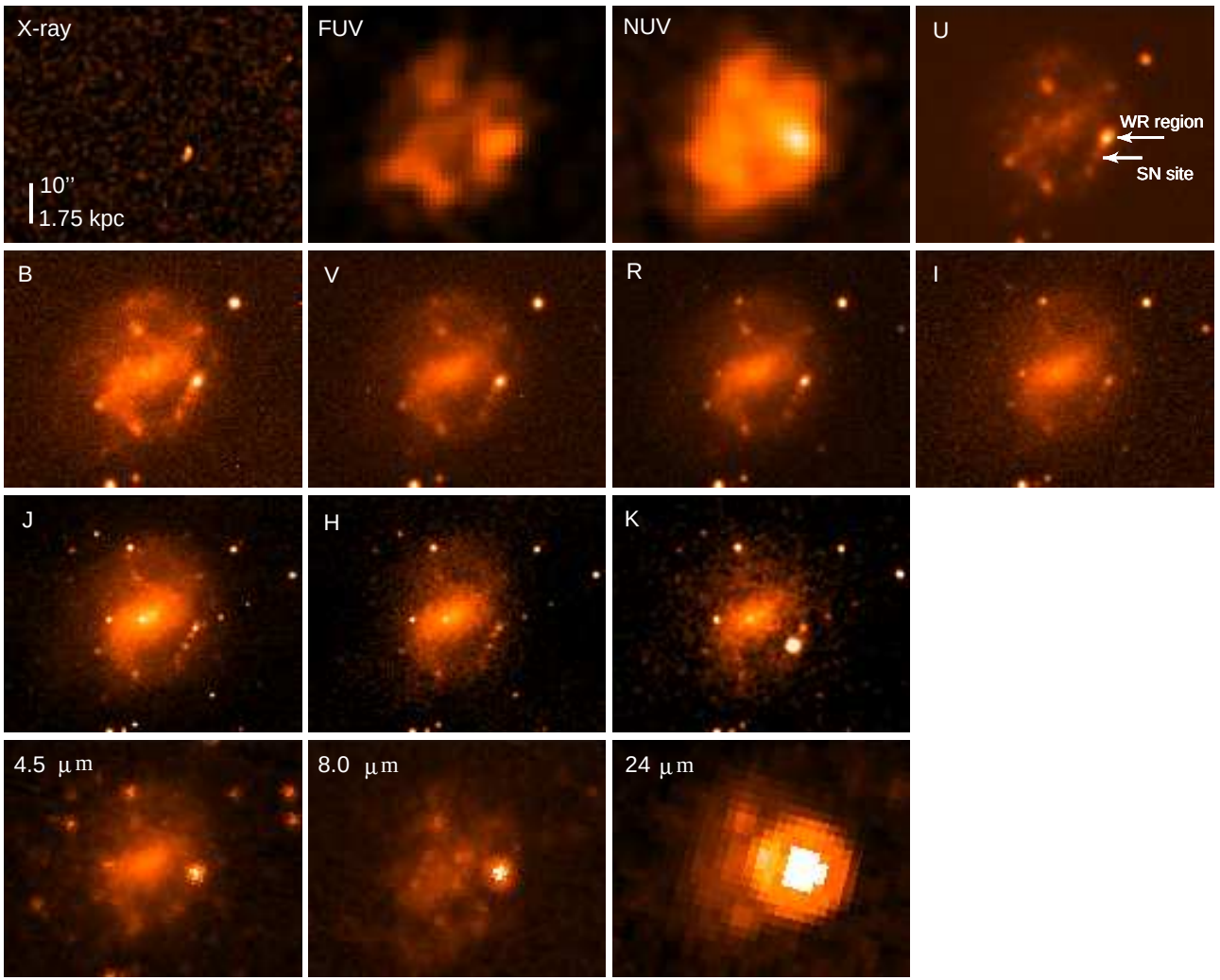
Biased tracers

- Perley et al. (2013, ApJ, 778, 128; 2015, ApJ, 801, 102): mass
- Boissier et al. (2013, A&A, 557, 34): mass
- Vergani et al. (2015, A&A, submitted, `arXiv:1409.7064`): mass
- Schulze et al. (2015, A&A, submitted, `arXiv:1503.04246`): metallicity

GRB 980425

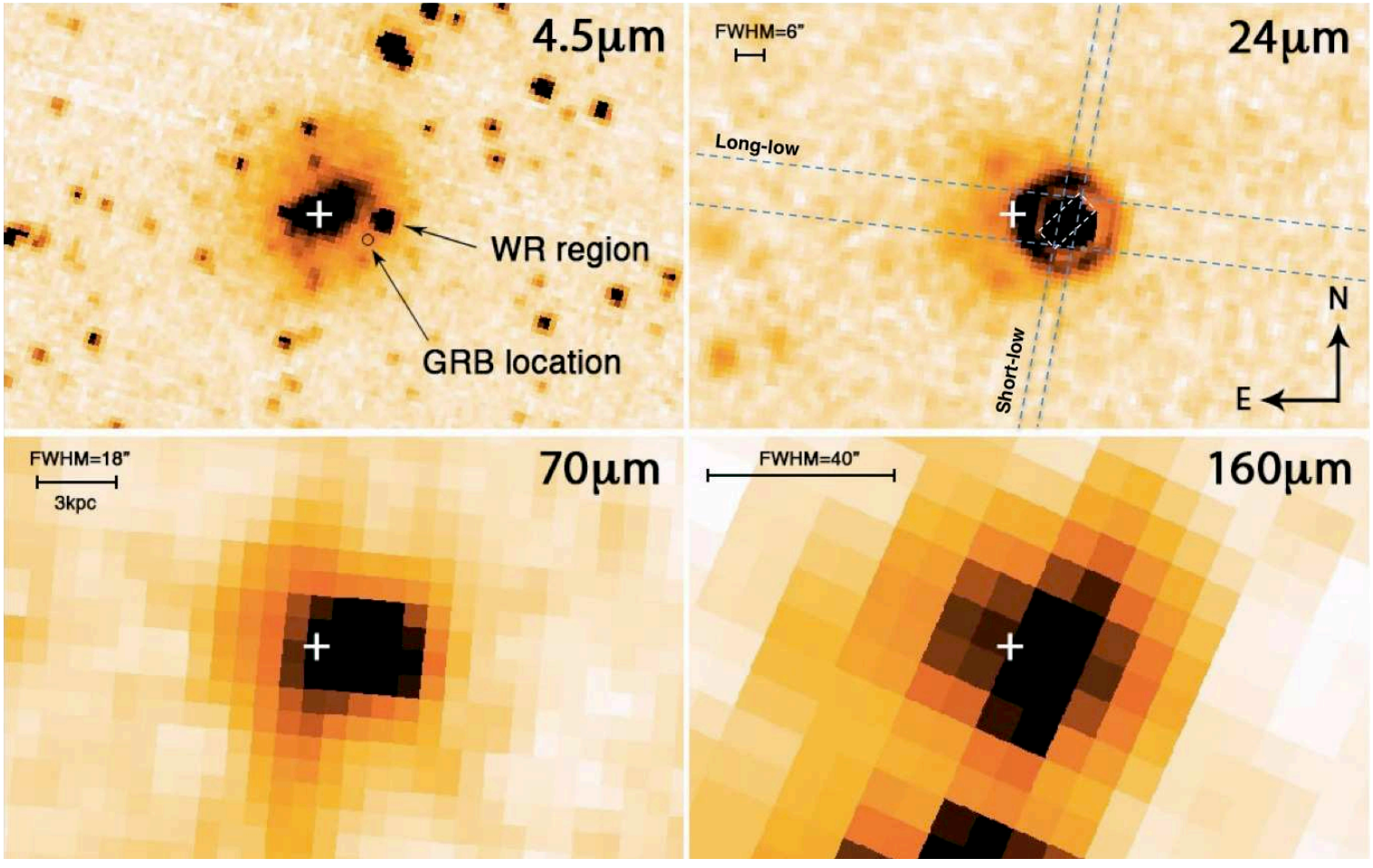
- $z = 0.0085$ (the closest GRB)
- the first confirmed SN association
- half-light diameter $= 22''$ (4 kpc)
- WR region dominating the 24 μm flux

Previous multi-wavelength data

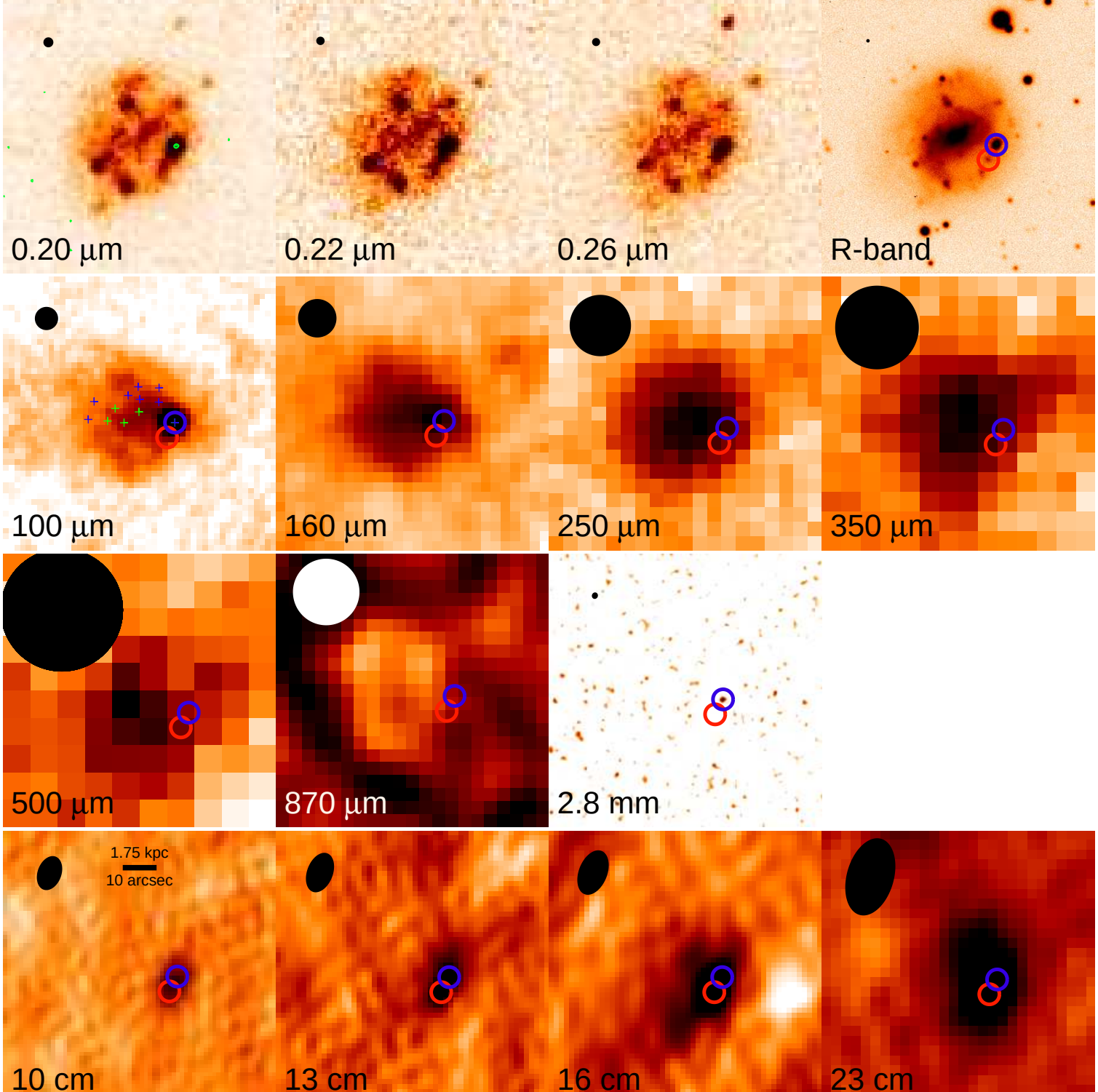


Michałowski et al. (2009, ApJ, 693, 347)

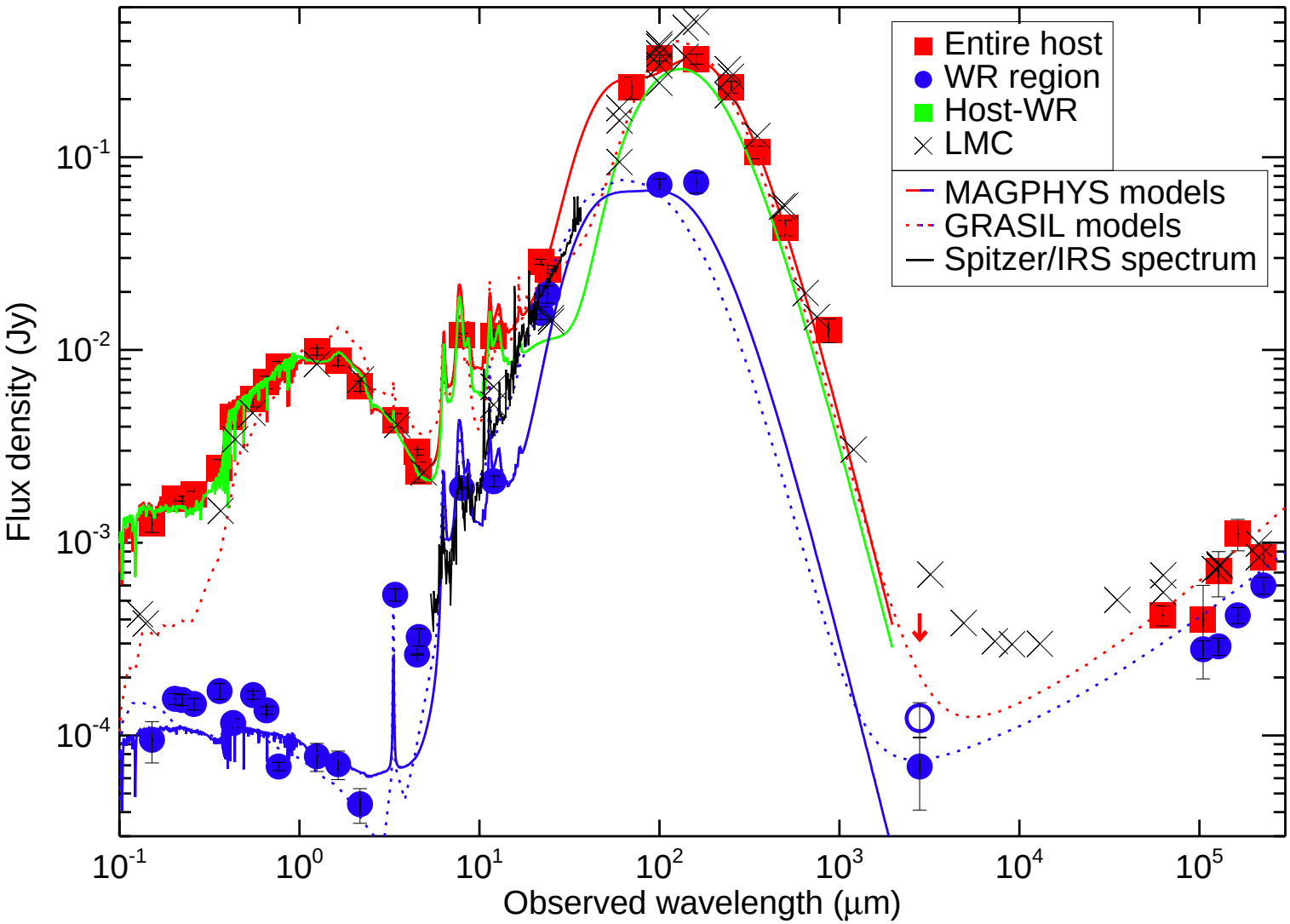
Spitzer 70–160 μm imaging



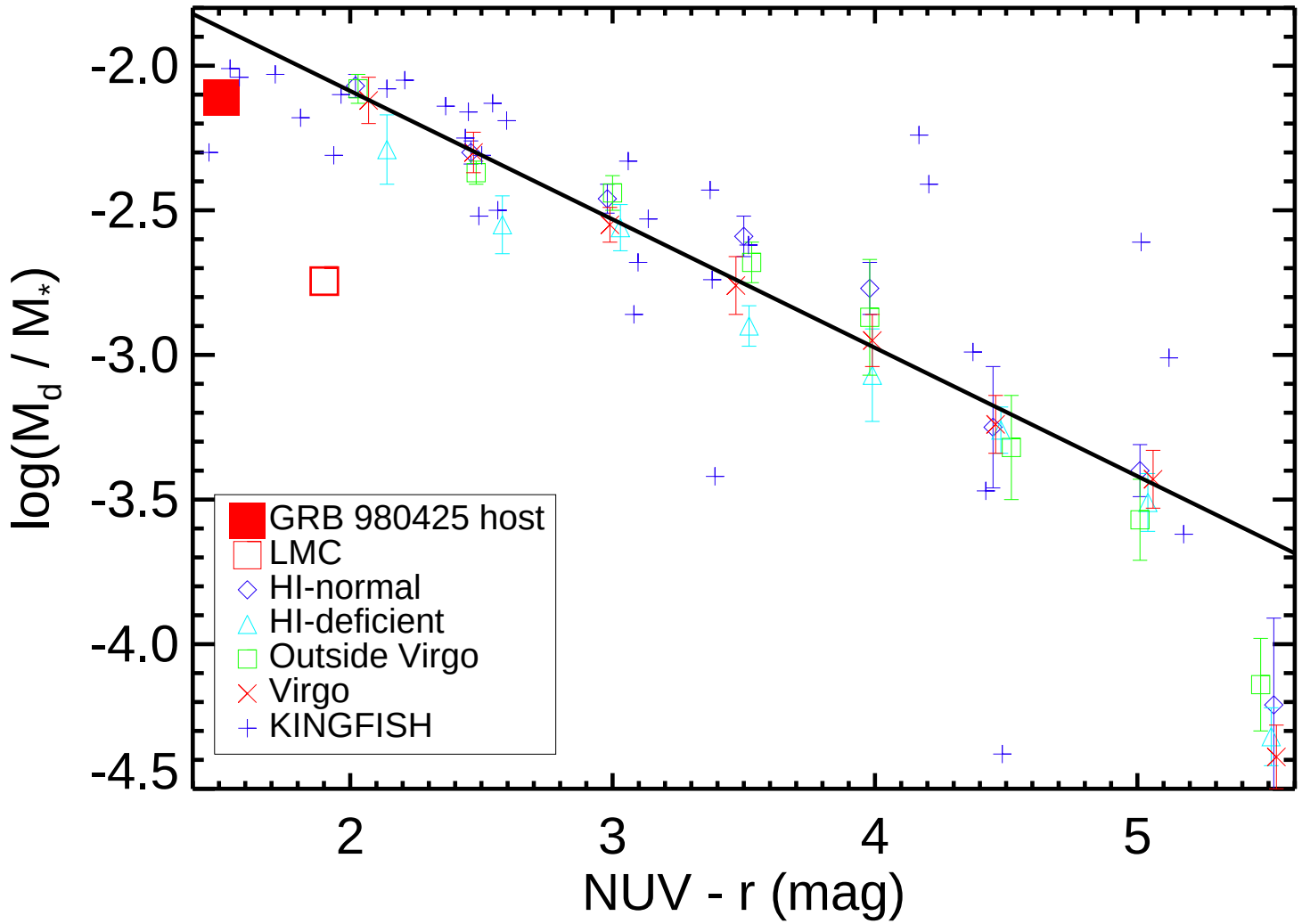
Le Floc'h et al. (2012, ApJ, 746, 7)


0.20 μm
0.22 μm
0.26 μm
R-band
100 μm
160 μm
250 μm
350 μm
500 μm
870 μm
2.8 mm
1.75 kpc
10 arcsec
10 cm
13 cm
16 cm
23 cm

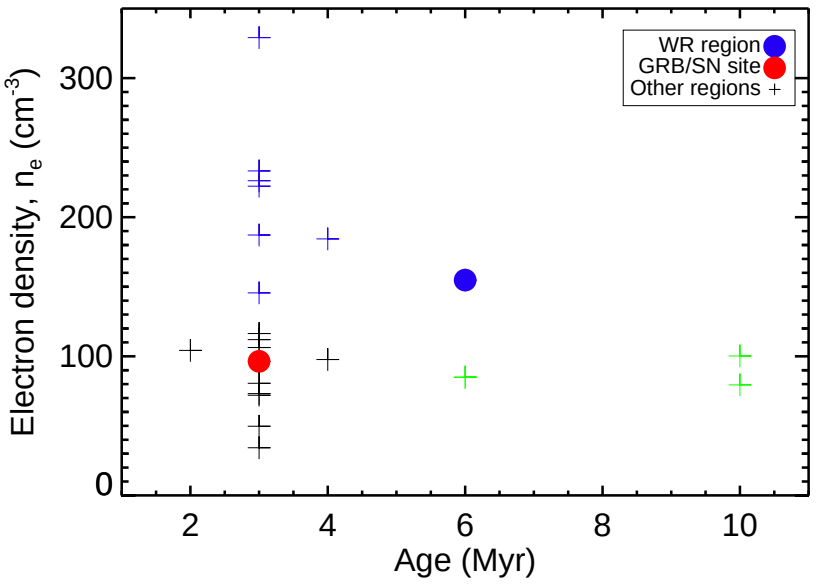
Spectral energy distribution



Low dust content: recent re-start of star-formation



WR region: dense ISM



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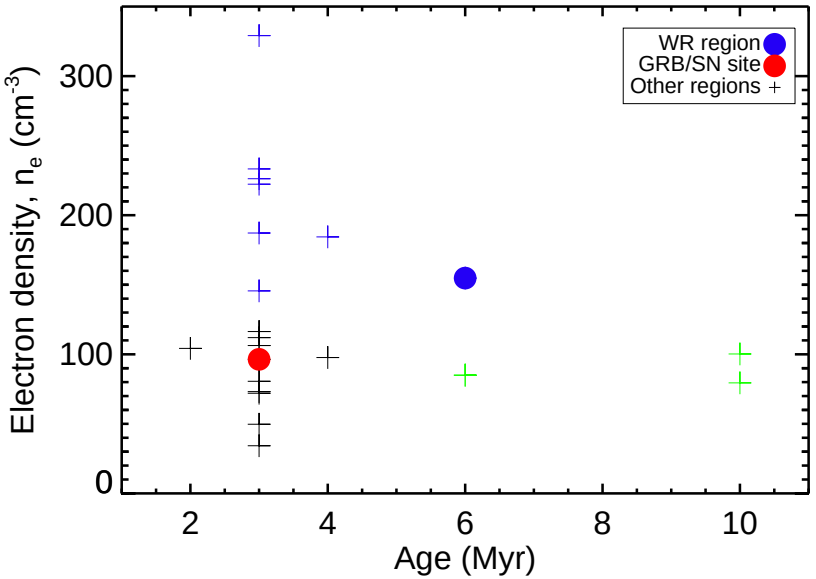

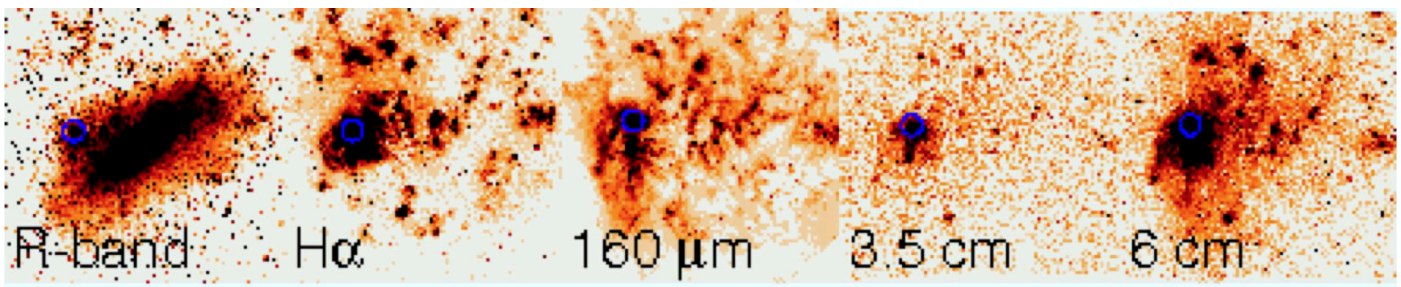

Submm excess

- 870 μm flux higher by a factor of two than the model prediction
- low 160 μm / 870 μm ~ 25
- either double the $M_{\rm dust}$ or shallow $\beta = 1$
- ALMA 2.8mm: the WR region is responsible?

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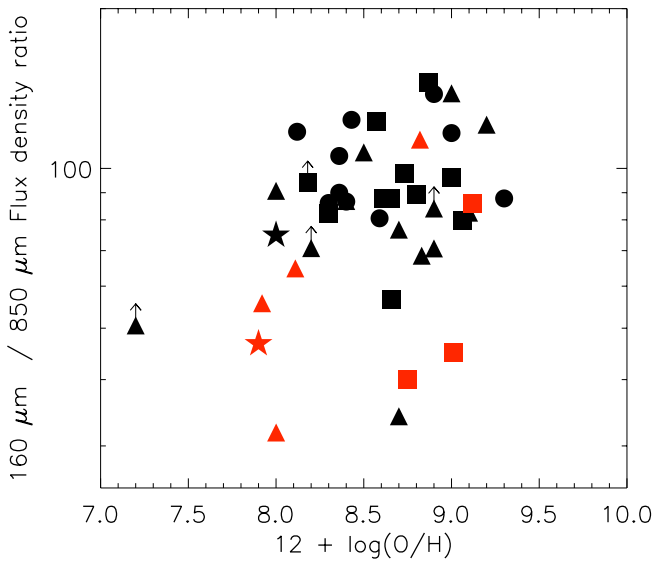

Galametz et al. (2011, A&A, 532, A56)

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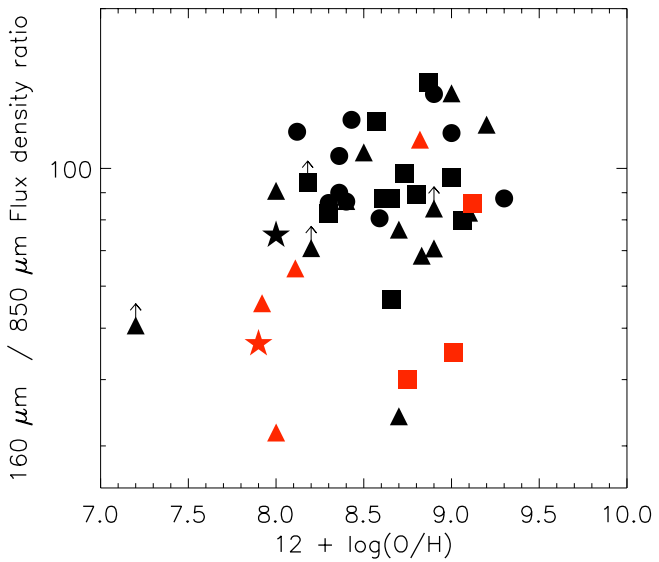

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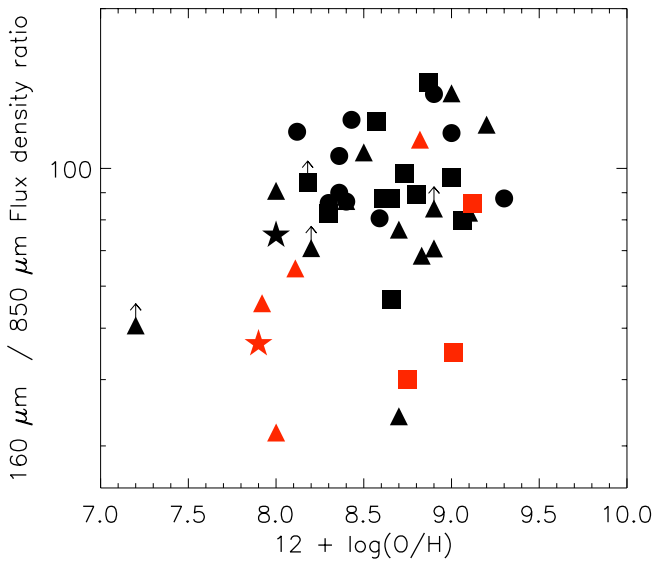

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Conclusions

- Low dust content: evidence for a recent re-start of star-formation
- Submm excess: very cold dust, or shallow β
- WR region: dominates at far-infrared and radio
- WR region: dense ISM
- Details in Michałowski et al (2014, A&A, 562, 70)