Chen, HW, Perley, DA, Wilson, CD, Bradley Cenko, S, Levan, AJ, Bloom, JS, Prochaska, JX, Tanvir, NR, Dessauges-Zavadsky, M and Pettini, M

A mature dusty star-forming galaxy hosting GRB 080607 at z = 3.036

The Astrophysical Journal Letters, 727:L53 (2pp), 2011 February 1 doi:10.1088/2041-8205/727/2/L53

ERRATUM: "A MATURE DUSTY STAR-FORMING GALAXY HOSTING GRB 080607 AT $z = 3.036$" (2010, ApJ, 723, L218)

Hsiao-Wen Chen[1], Daniel A. Perley[2], Christine D. Wilson[3], S. Bradley Cenko[2], Andrew J. Levan[4], Joshua S. Bloom[2], Jason X. Prochaska[5], Nial R. Tanvir[6], Miroslava Dessauges-Zavadsky[7], and Max Pettini[8]

[1] Department of Astronomy & Astrophysics and Kavli Institute for Cosmological Physics, University of Chicago, Chicago, IL 60637, USA; hchen@oddjob.uchicago.edu

[2] Department of Astronomy, 601 Campbell Hall, University of California, Berkeley, CA 94720, USA

[3] Department of Physics & Astronomy, McMaster University, Hamilton, Ontario L8S 4M1, Canada

[4] Department of Physics, University of Warwick, Coventry CV4 7AL, UK

[5] UCO/Lick Observatory, University of California, Santa Cruz, CA 95064, USA

[6] Department of Physics and Astronomy, University of Leicester, University Road, Leicester LE1 7RH, UK

[7] Observatoire de Genève, 51 Ch. des Maillettes, 1290 Sauverny, Switzerland

[8] Institute of Astronomy, Madingley Road, Cambridge CB3 0HA, UK

Received 2010 December 9; published 2011 January 13

Online-only material: color figure

We have discovered an error in the photometric measurements of the host galaxy in our *Spitzer* IRAC images. The host is detected in the IRAC 3.5 μm and 4.5 μm channels with $\mathrm{AB}(3.5\mu) = 22.9 \pm 0.2$ and $\mathrm{AB}(4.5\mu) = 22.7 \pm 0.2$ mag. The photometric measurements of the host galaxy in other bandpasses remain unchanged. Adopting the revised *Spitzer* IRAC photometry and the original optical and near-IR photometric measurements, we estimate the total stellar mass (M_*) and on-going star formation rate (SFR) of the host galaxy based on the stellar population synthesis analysis described in Chen et al. (2010). Given the uncertainties in the global dust content of the host galaxy, we allow the metallicity, A_V, and dust extinction law to differ from what were found in the afterglow light (e.g., Prochaska et al. 2009; Perley et al. 2011). The likelihood analysis described in Equation (1) of Chen et al. (2010) yields an extinction-corrected SFR of (8–12) $h^{-2}\,M_\odot\,\mathrm{yr}^{-1}$, a mean ISM radiation field $I_0 \approx (2.3\text{–}3.5) \times 10^{-5}$ photons cm^{-2} s^{-2} Hz^{-1}, and $M_* = (0.5\text{–}1.4) \times 10^{10}\,h^{-2}\,M_\odot$ for the host galaxy. These are about an order of magnitude lower than those originally published. We note that the uncertainties in the derived M_*, I_0, and SFR are driven by the uncertainties in the global dust extinction law of the host galaxy. The galaxy is still fairly massive, but not as extreme as previously thought. The observed spectral energy distribution (SED) of the host galaxy is presented in the revised figure below, together with the best-fit synthetic model of super-solar metallicity and a Milky-Way type dust extinction law of $A_V = 1.25$. A Fitzpatrick & Massa (FM) law described in Perley et al. (2011) with $A_V = 1.8$ and super-solar metallicity produces a similarly good fit to the observed SED.

Adopting the priors from the best-fit dust obscuration, the FM law from Perley et al. (2011) with $R_V = 4.2$ and $A_V = 3.3$ at $z = 3$ and solar metallicity from Prochaska et al. (2009) leads to a similar estimate of M_* ($\sim 5 \times 10^9\,h^{-2}\,M_\odot$) but significantly higher SFR ($\sim 230\,h^{-2}\,M_\odot\,\mathrm{yr}^{-1}$). However, this model also predicts an observed optical brightness that is $\Delta\mathrm{AB} = 1$ mag brighter than the observed 2σ upper limits in the r and I bands. We therefore consider this model unlikely to represent the global extinction property of the host galaxy. The result indicates a large spatial variation in the dust content across the host galaxy.

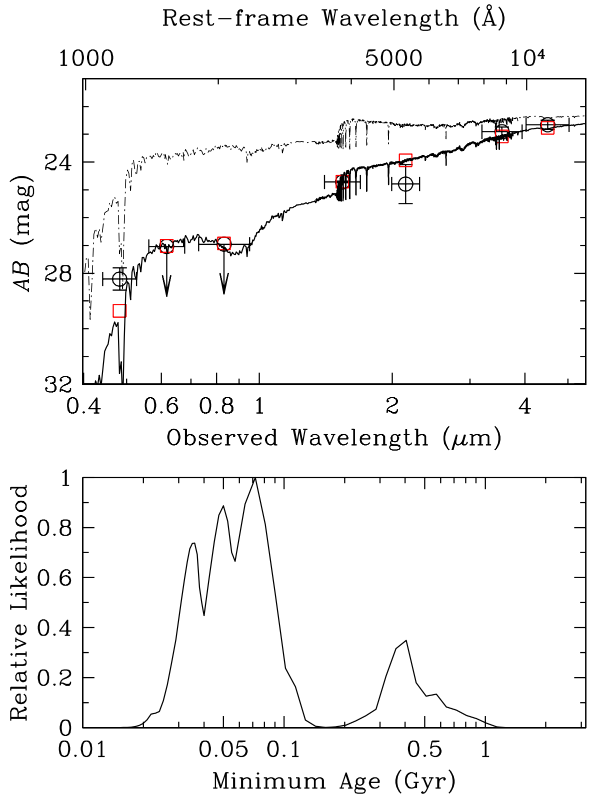

Figure 1. Top: comparison of the observed SED of the dusty host of GRB 080607 at $z_{\rm GRB} = 3.036$ and the best-fit stellar population synthesis models. Optical and infrared photometric measurements are shown in open circles with error bars. We place a 2σ upper limit to the observed brightness, when the galaxy is not detected. The horizontal error bars indicate the FWHM of each bandpass. The solid curve represents the best-fit synthetic model of super-solar metallicity and a Milky-Way type dust extinction law of $A_V = 1.25$. The open squares represent the predicted brightness from this best-fit model. The thin dash-dotted spectrum at the top shows the intrinsic spectrum prior to the application of dust obscuration. Bottom: the likelihood functions of the minimum age of the underlying stellar population as described by the broadband SED.

(A color version of this figure is available in the online journal.)

REFERENCES

Chen, H.-W., et al. 2010, ApJ, 723, L218
Perley, D. A., et al. 2011, AJ, 141, 36
Prochaska, J. X., et al. 2009, ApJ, 691, L27