

Analysis of an SGRB in an Old Galaxy Cluster

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Midwest Transient Workshop 2019

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Outline

Motivation for Project



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Method for Analyzing Host Galaxies



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Motivation for Project

Method for Analyzing Host Galaxies

Specific Example: SGRB in Galaxy
Cluster!

What makes SGRBs so fascinating?

- Found in both elliptical and star forming galaxies
- Probably coming from neutron star merger



Main Questions



Image from Ligo CalTech

1. Origins?

Main Questions

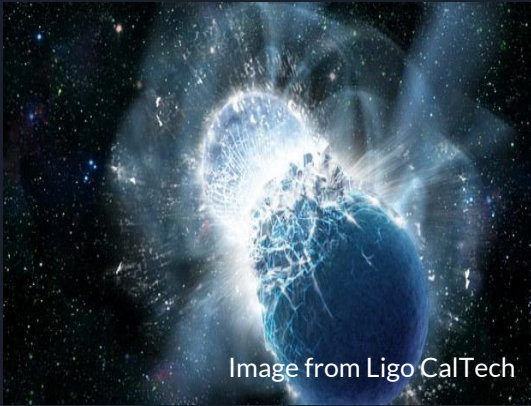


1. Origins?



2. Environments?

Main Questions



1. Origins?



2. Environments?



3. LIGO?



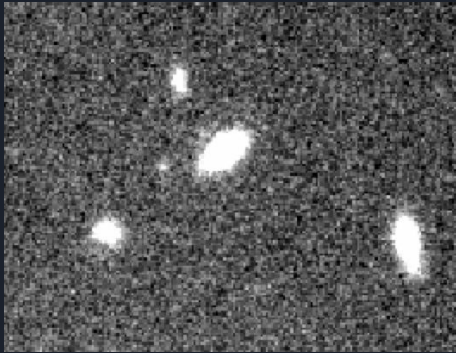
Host galaxies of
SGRBs hold crucial
information about
their origins!



Prospector: Stellar Population Code

Leja et al. 2017

Prospector

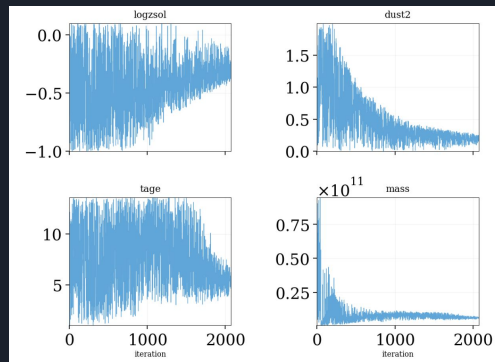


Magnitudes and/or Spectra

Prospector

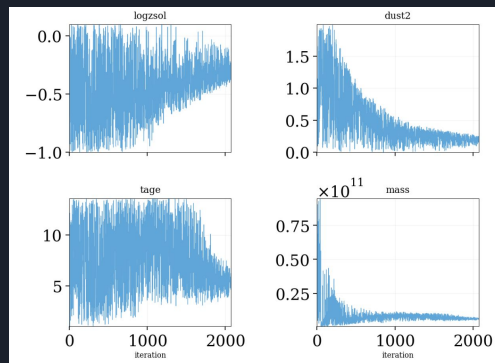


Magnitudes and/or Spectra



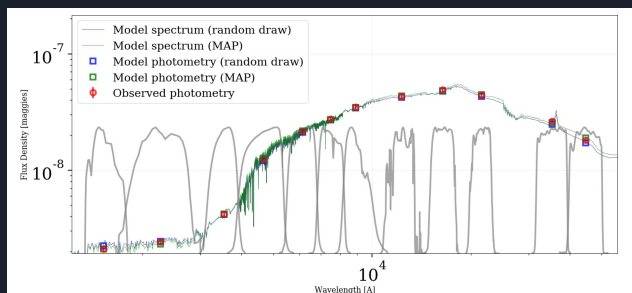
MCMC parameter fitting: Dynesty

Prospector



Magnitudes and/or Spectra

MCMC parameter fitting: Dynesty



SED plots and contour plots of morphology with 3σ confidence



Morphology Parameters

MASS

AGE

SFR

METALLICITY



Morphology Parameters

MASS

AGE

SFR

METALLICITY



Dust Attenuation: Milky Way Extinction Law

Star Formation History: Delayed tau: $te^{-t/\tau}$

Initial Mass Function: Chabrier



SGRB 161104a

t_{90} : 0.1 s, RA: 05:11:24.45, Dec: -51:27:36.4

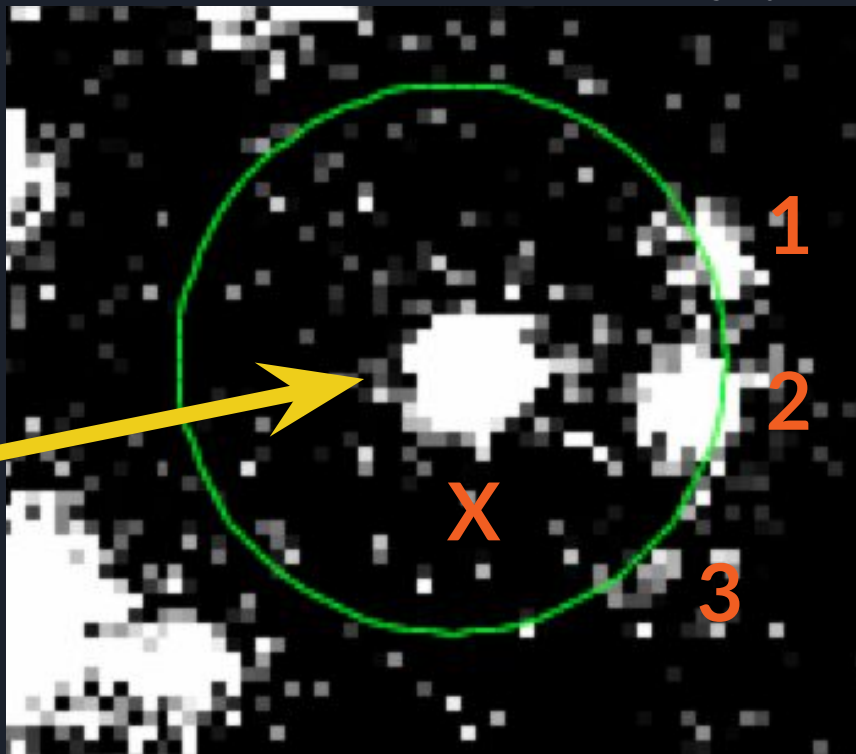
Telescope: Magellan Baade (6.5 m)



Image from Carnegie Observatories

SGRB 161104a

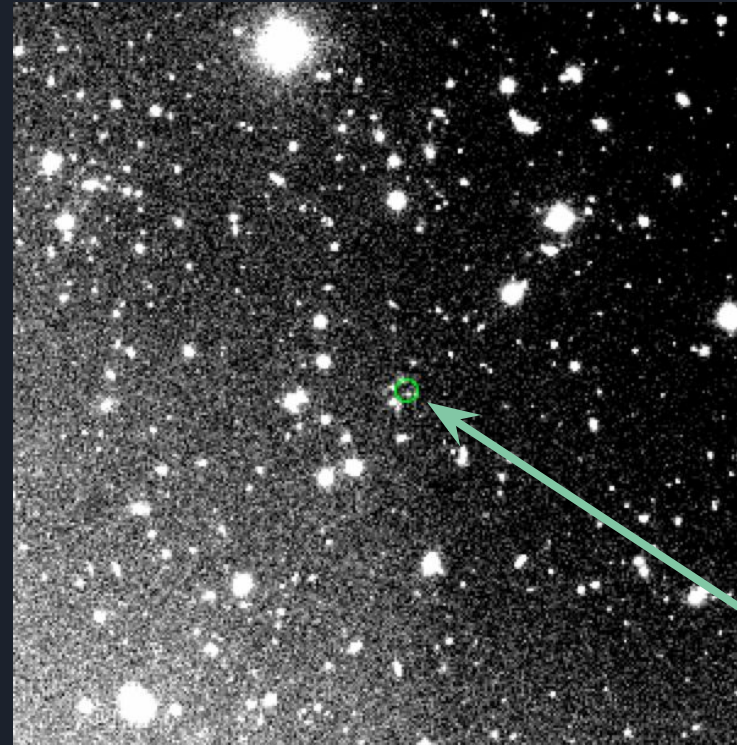
J-band



Brightest
potential host

Why is an old, red galaxy cluster interesting?

- Can give us better constraints on progenitor population (changes slowly)
- Merger timescales
- Rare to find SGRB in cluster that is so dense
 - ◆ ~ 5 - 20% chance (Berger 2007)



Photometry of Potential Hosts

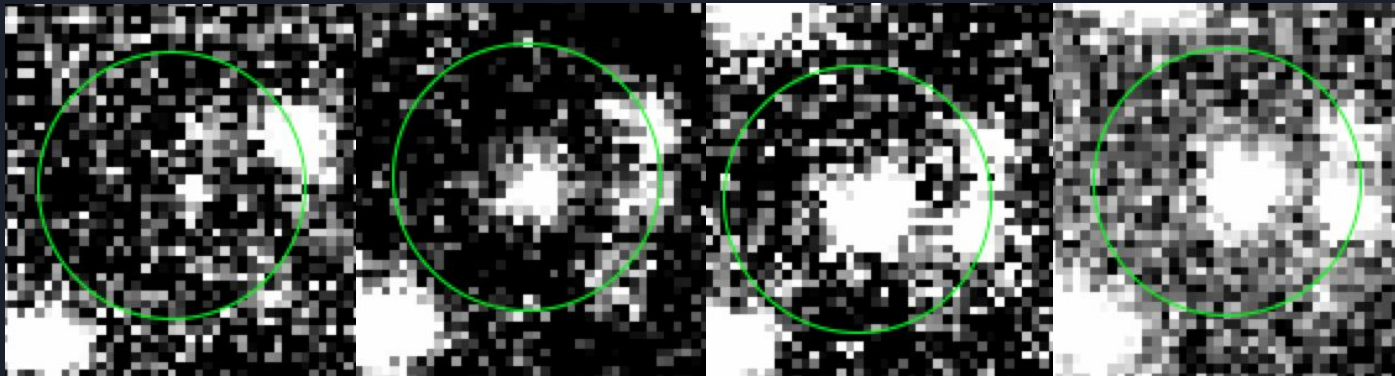
Magnitudes for Galaxy X ($z = 0.793$):

> 26

23.8

22.7

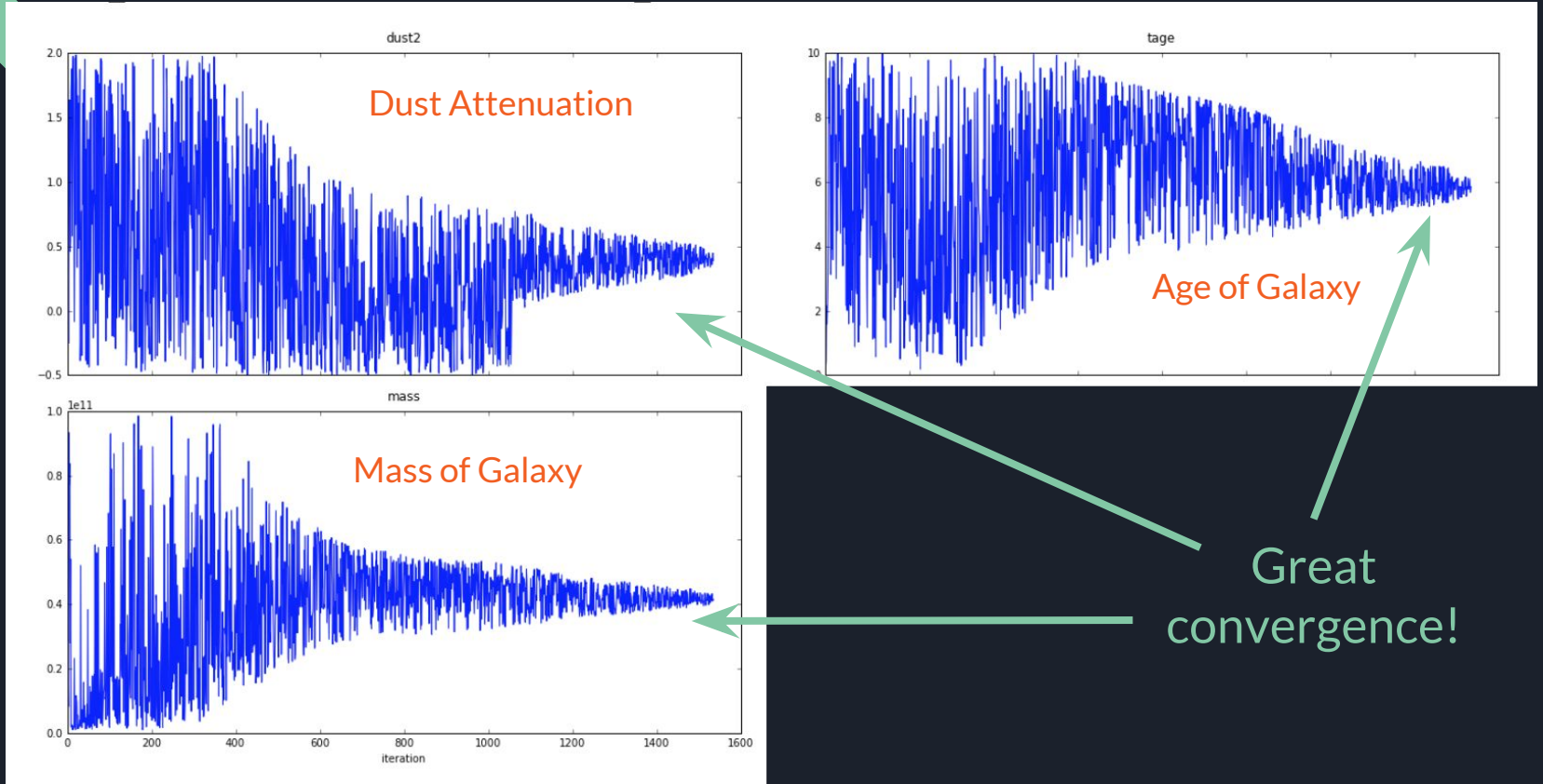
21.6



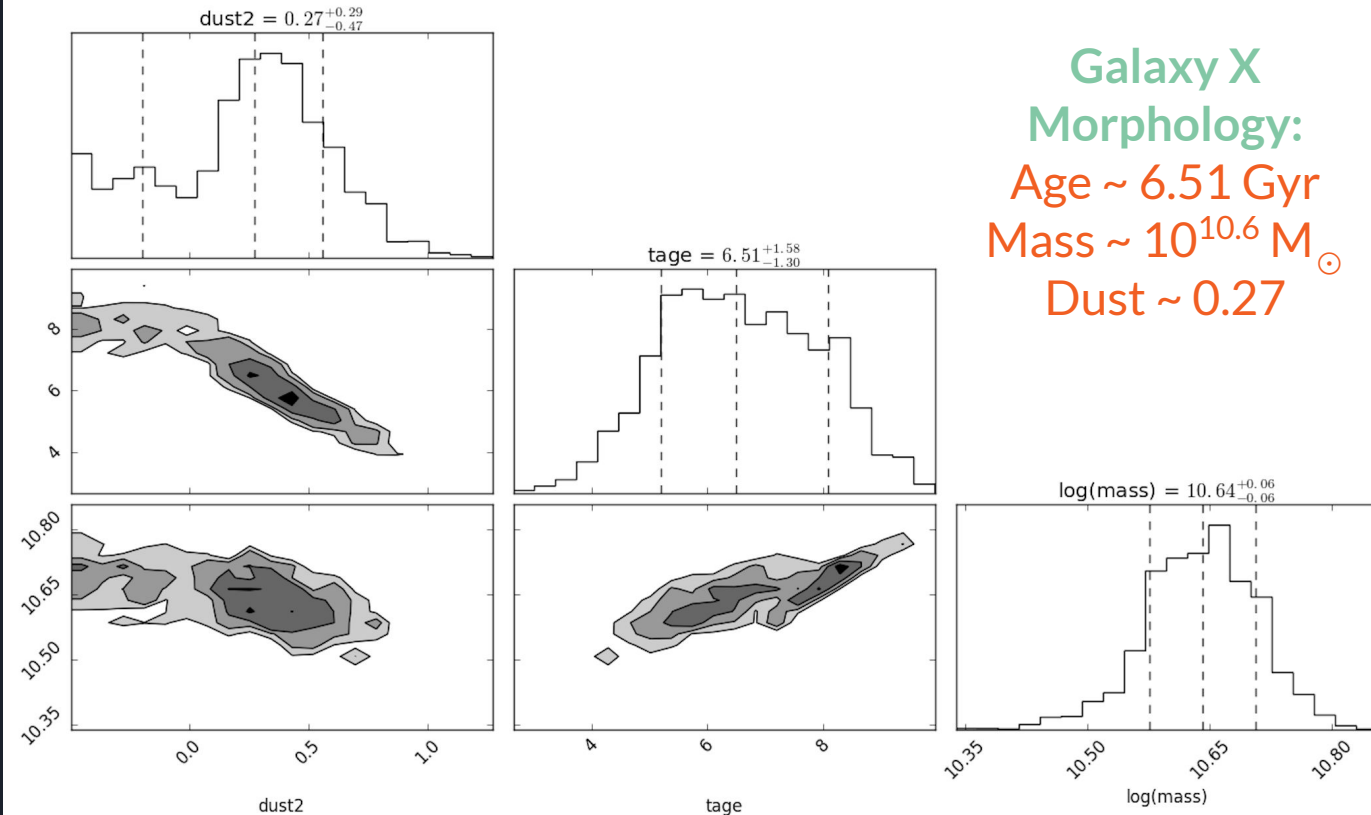


Results with Prospector

Prospector Results for Galaxy X

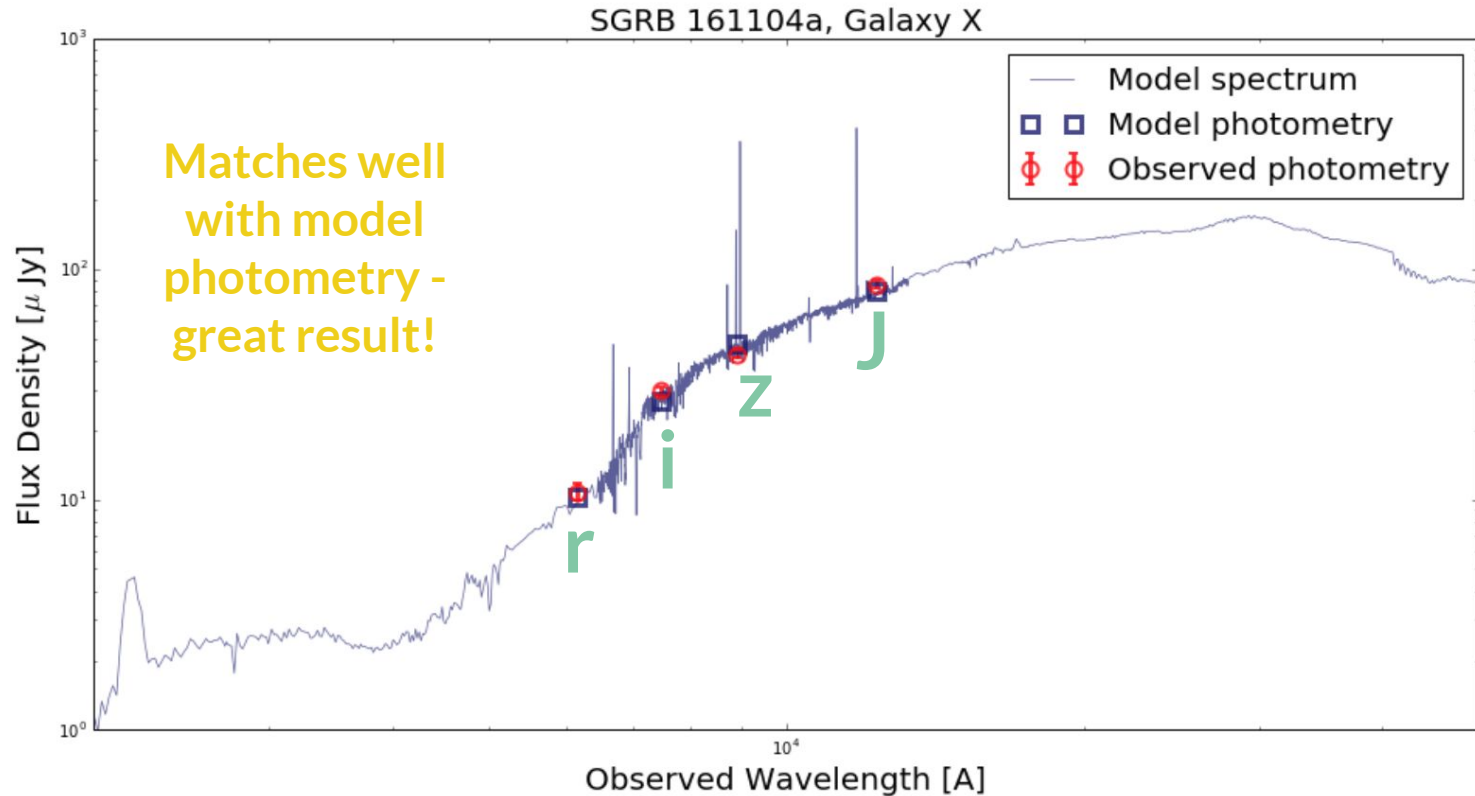


Prospector Results for Galaxy X



Galaxy X
Morphology:
Age ~ 6.51 Gyr
Mass ~ $10^{10.6} M_{\odot}$
Dust ~ 0.27

Prospector Results for Galaxy X





Future Work

- Spectroscopy with potential hosts of 161104a
- Run Prospector over spectra and magnitudes for hosts of 161104a
- Cluster membership for potential hosts
- Apply Prospector to many more host galaxy data for more complete understanding of SGRB environments



Questions?



If not a BNS merger, what could it be?

- Accretion induced collapse of white dwarf
- Merger of white dwarf binary

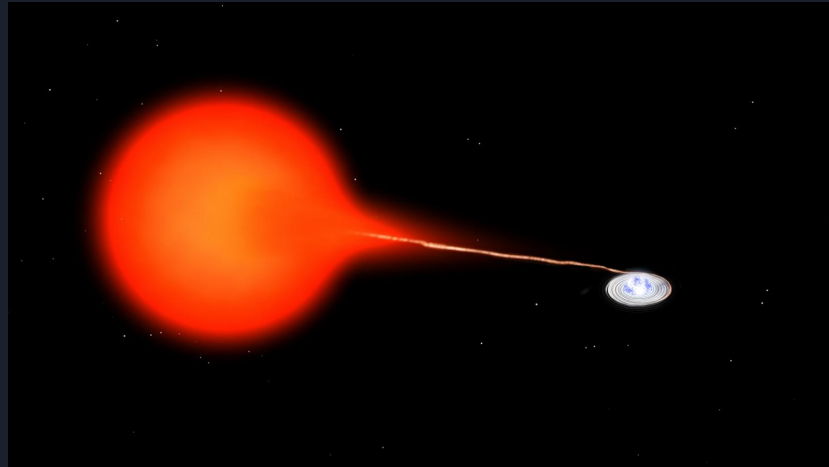


Image from: Beyond Earth Skies

Spectra: Galaxy X at $z = 0.793$

