

Searching ZTF archive for Galaxy





Zwicky Transient Facility

- ZTF is a optical survey using the 48 inch Oschin Schmidt Telescope located at the Palomar Observatory.
- Scans the entire northern visible sky at rates of ~3760 square degrees/hour to median depths of g~20.8 and r~20.6 mag.

• A complete archive of Zwicky Transient Facility (ZTF) is maintained at the DESY Zeuthen computer center.



credit: Palomar Observatory/Caltech

From data to science

- Flexible tool for the selection and analysis of astrophysical transients.
- Framework for Findability, Accessibility, Interoperability, and Reusability (FAIR) of research data.

AMPEL

https://ampelproject.github.io/ampelastro/

Analysis and workflow framework for high throughput time-domain astronomy.

- Modular and scalable platform for processing large astronomical datasets in real-time and/or in archive.
- Built with a focus on scalability, reproducibility and provenance.



Searching ZTF archive for Galaxy Cluster SN Ia

Motivation

- Only a small fraction of transients from ZTF are spectroscopically classified.
- ZTF survey is complete until redshift ~ 0.06
- Understanding environmental dependance of SN Ia parameters is crucial to standardise them.
- Unique cluster environments to constraint la progenitor models.

Galaxy cluster catalogues

SDSS DR9 galaxy cluster catalogue

DESI cfsfdp galaxy cluster catalogue





AMPEL analysis workflow



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DÈŚY

Cluster-SN matching



- Custer SN la:
 - Spatially coincident within the radius of galaxy cluster
 - \circ Δz of 0.05 (redshift uncertainty of photometric catalogues)
- Noise added through this process should be *independent* of transverse cluster distance.
- Divide Cluster SN Ia:
 - \circ Core : Within the 50% radius of cluster (R₂₀₀/R₅₀₀)
 - Outer: > 50% radius of cluster

Result: SN width distribution - SDSS



Result: SN width distribution - DESI



Result: SN colour distribution - DESI



Conclusion

- Carried out a novel study, aimed at exploring the full potential of archival data from the ZTF survey.
- Extended studies of potential cluster SNe Ia to higher z, significantly increasing the sample size.
- x1 distribution of SNe Ia, within core of the cluster shows,
 - higher fraction of fast evolving transients
- c distribution does not show any evolution.
- The initial results are consistent with prior works.

Outlook

- Fit a two component model to the width distribution.
- Use simulation to study possible contaminants.
- Quantify trends, write up.

Backup



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OLDT-UN.

Results from previous works



Possible redshift evolution?





Exploring fit parameters at offset *z*

Fit parameters change if we assume the wrong redshift, but still look well behaved.



x1 and c distributions for simulated SNe at redshift z, fitted at z + α