Assassinating ASASSN

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I. IMMEDIATE

- How many cases of obs that overlap asn obj that we should have seen
- Stay within ±10 days of peak night
- how many observations dont have an entry in ddt file and why
- use log files
- column 12,13 are fitted RA and Dec
- if these and magzeropoint are 0 then theres no match due to failed observation
- if ra dec mzp do exist, then it should be in the ddt file

II. OBJECT CUTS

With a declination (Dec) limit of approximately $-30°$, 100 SN were not expected to be present in the ATLAS data. ASASSN reported another 165 SN before ATLAS began collecting data. These two sets do not exist independent of one another. After applying Dec and MJD based restrictions and accounting for overlaps between these groups, 161 SN remained from the initial 385 reported by ASASSN. Another 65 SN peaked before ATLAS was truly operational, leaving 96 as potential candidates. All 96 of these objects were found in the ATLAS data, resulting in a 100% completion rate. [CHECK VALIDITY OF THIS]

The 65 SN that peaked before ATLAS was truly operational can be further broken down as follows. Reported peak brightnesses occurring on or before 57364 accounts for 14 SN. During this time the ATLAS reduction process was still being refined, making any reduced data unreliable. Another 50 SN fell in regions that had no overlap with ATLAS observations due to the pattern in which data was collected. The final case was a Type II supernova (SNII). SNII are notoriously short lived; making it likely that ATLAS observed this region of the sky in the time surrounding the explosion, but not during the event.

III. WRITE IT ALL DOWN

- does ddt file exist
- does ddt exist but line isnt there
- use script we previously made but **record and quantify results**

A. general cases [integrate sections]

We expect to see 96 of the ASASSN SN in ATLAS observations. This presents us with 850 overlap opportunities, using a ±10 *day* window.

For the 96 SN that overlap in time and location, 850 total ATLAS observations are expected. A collective 694 observations were recorded and properly reduced.

No ddt files exist for any observations in the nights any single ddt wasn't generated; accounting for 15/850.

For 67 of the 850 possible observations, there exists a ddt file that lacks the correct line.

Need to better understand how diff and ddt files are created. Could it be pinging on negative flux (object that is dimmer since wallpaper)? Which requires subtraction, implied by the name difference; but, division is more likely.

B. No ddt file

C. No diff file

D. No ddt Match

- [A] 3 is at the edge and fuzzy, causing ATLAS to miss it
- [B] 26 Objects are in reduced image but not in difference image.
- [C] 3 Object fell on a portion of the image that wasn't differenced properly and is a white chunk.
- [D] 17 set of fits/diff images contains nothing at the indicated x,y coordinates

- [E] 6 bright host galaxy, faint in difference image...must have been missed by ATLAS during difference photometry
- [F] 3 unusable reduced and differenced data
- [G] 8 unusable differenced data
- [H] 1 not on image

Of the total 850 expected matches, 67 do not show up in existing ddt files.

Nature constantly plays a role, when collecting astronomical data. When observations are made at the beginning or end of a night, ambient light levels rise and sky background fluctuations. [F] of the 67 missing ddt lines can be attributed to poor observation conditions, brought on by clouds and increased levels of sky background.

Errors during the image differencing process led to the loss of [G] expected overlaps. Older differencing techniques caused entire portions of images to be lost, accounting for [C] matches.

The ATLAS pipeline failed to trigger on faint objects.
Outdated differencing procedures give rise to less uniform backgrounds,
making it harder to distinguish between faint objects and (residual noise?). Bight host galaxies cause SN to become extremely faint in difference images. Such occurrences caused the ATLAS pipeline to miss [E] matches while preforming photometry on the differenced images.

There are various reason why the PSF across an image may vary. Here, the major contributers are high levels of sky background and optical issues inherent to the ATLAS system. If not properly corrected for, such issues cause observed objects to become distorted. Distortion can cause sharp edges to become fuzzy, resulting in the ATLAS pipeline failing to trigger on such objects.This accounts for [A] of the missing matches. Objects that were only in reduced images, but not in differenced images, account for [B] of the matches missing from the ddt files.

There were [D] cases in which the SN was not detecting in either the reduced or differenced image. This indicates poor photometry or that the SN explosions occurred outside the nominal ± 10 *day* window.

The final match missing from the ddt files comes from an issue with the array dimensionality. Each image is saved as an [mxn] matrix. The software that determines the correspondence between x,y-pixel coordinates and the objects RA,Dec assumed the captured image fully extended to the edges of the [mxn] matrix.
(Due to the way the detectors are aligned,)? the edges of some collected data are not completely filled. When the frames overlap, the objects lie where they are expected. Looking at isolated images show that ever image does not fully extend to the intended edges. For the [H] particular case, the image data ends above the bottom edge of the array. Although the object is expected to be there, it does not exist on this particular image.

IV. INTRODUCTION

A. ASASSN Breakdown

The All-Sky Automated Survey for Supernovae (ASASSN) has been
data collected by two 14–cm telescopes
one at Haleakala, the other at the LCOGT Cerro Tololo station.
first guy started in December 2013...second came online in July 2015.
these two currently cover roughly 20,000 deg^2 a night
[NEED CITATIONS FOR ALL THESE]

ASASSN data[1]

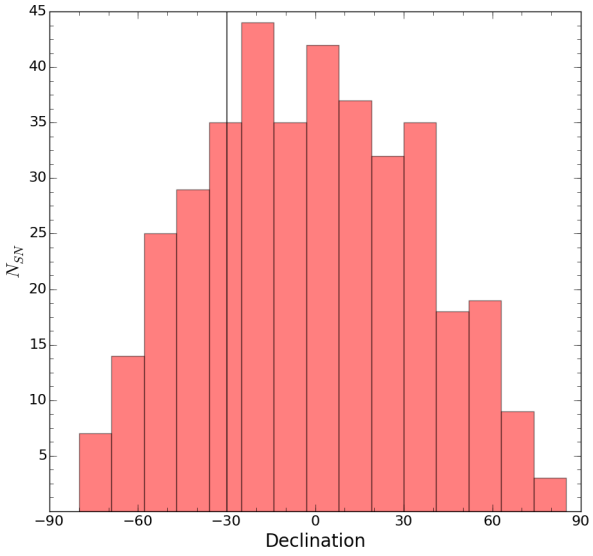

FIG. 1: *ASASSN SN sorted by their declination. The vertical line at −30° indicates the lower limit on ATLAS observations.*

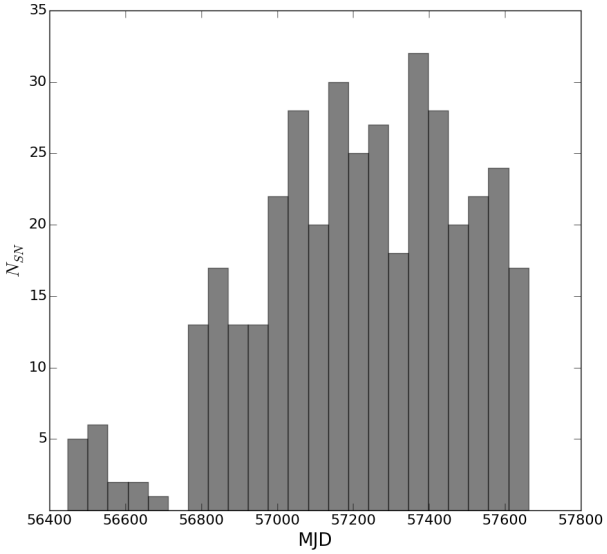

FIG. 2: *Discovery date of ASASSN SN.*

[MAKE THIS A DUAL FIGURE: (a) (b)] [REBIN MJD DATA FOR PEAK BRIGHTNESS DATE NOT DISCOVERY DATE]

V. GOALS

Using current data collection and reduction techniques, we plan to identify SN faster and fainter than the ASASSN team is able to.

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