The All-Sky Automated-Search for Supernovae Going Global

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ASAS-SN Approach

- Aim is to monitor the entire sky every night in real-time
- Use commercially available 400mm f/2.8G Nikon Telephoto lenses and CCDs
- Limiting V-band magnitude of 17 (2 units), and 18 (3 units) in g band
- Find supernovae in a minimally biased search
- Announce discoveries *publicly*

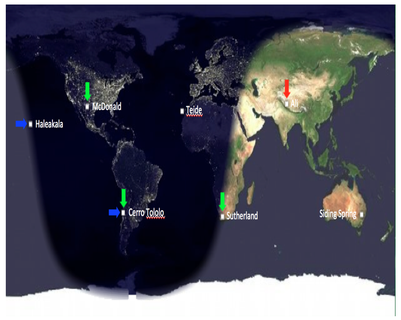

Figure 1: Location of ASAS-SN units. Blue indicate the first units, green indicates current expansion and red indicates future expansion.

Figure 2: "Payne-Gaposchkin" telescope located at the Las Cumbres Observatory's South African site. Each unit consists of 4x400 mm Nikon lenses accompanied with 2k×2k Finger Lake CCDs, providing a pixel scale of 7.8″ per pixel.

ASAS-SN Nuts & Bolts

- 5 units deployed: Hawaii, Chile×2, Texas, South Africa
- Today taking 5000+ images per night → 32,000 square degrees (weather permitting)
- Fully automated data reduction pipeline
- Detections dominated by false positives (millions per night)
- After (machine learning) cuts 300-500 candidates scanned by eye per day
- Follow up initiated, new transients announced typically in hours to a day

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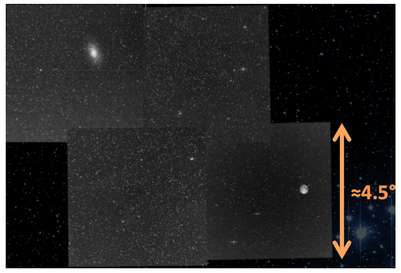

Figure 3: A single ASAS-SN pointing.

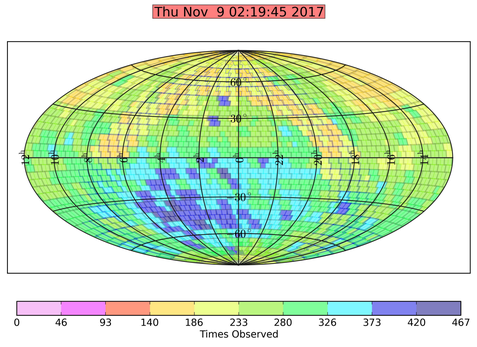

Figure 4: Number of visits per pointing over the past year.

Results

- As ASAS-SN expands its success improves (see Fig. 5); now leader in bright SN discoveries (see Fig. 6)
- 600+ ATels, also discovered 1000+ CV, New Novae search, Numerous M-dwarf flares. Yearly results are being published
- ∼40 publications, Variable AGNs (Shappee et al. 2014), young SN, e.g. ASASSN-14lp (Shappee et al. 2016), TDE (Holoien et al. 2014, 2016), SLSN (Bose et al. 2017)
- Additional science: census of local LSB galaxies, light echoes, overlap with TESS, high-energy neutrinos and multi-messenger Astronomy, a comet, and a micro-lensing event or two

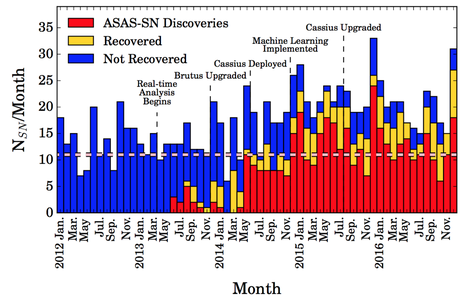

Figure 5: Histogram of bright supernova discoveries in each month from 2012 through 2016. Adapted from Holoien et al. (2016).

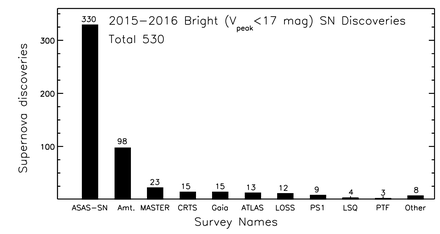

Figure 6: Breakdown in number of bright SNe discovered between 2015-2016.

Future

- Expansion is expected in 2018 wth an additional *northern* unit
- A fully public database consisting of real-time photometry for ∼50 million objects

Acknowledgements

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