Shredded Asteroids Orbiting Dead Stars

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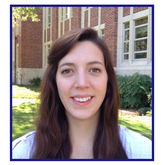
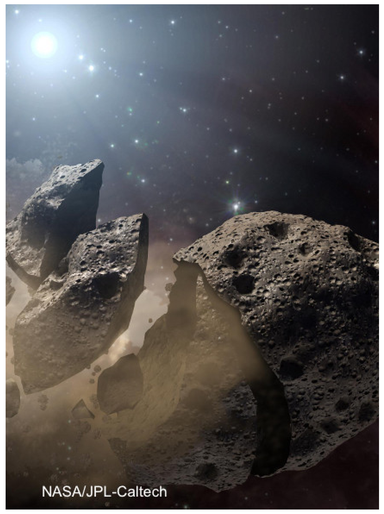
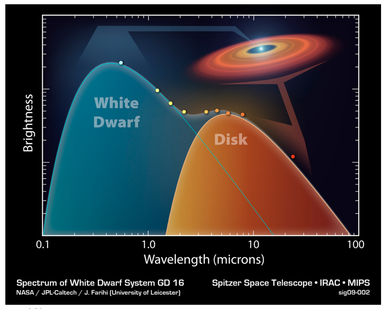
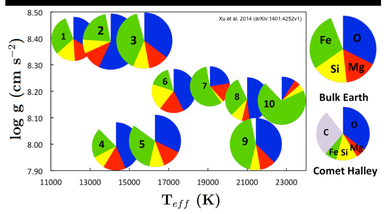


Author Webpage

Background







Observations

- Debes et al. (2011) find 52 candidate white dwarf+disk systems in the SDSS ∩ WISE sample.
  - Most excesses are likely due to contaminating sources in the large (6″) WISE beam.
- We present higher resolution (0.5-1.5″ PSF) J- and H-band photometry using the 6.5 m MMT with SWIRC of 16 of these candidates.

Methods

- Fit optical data with white dwarf atmosphere models (Tremblay & Bergeron 2009; Tremblay et al. 2010).
- Fit infrared excesses with geometrically thin, optically thick disk models (Jura 2003).
  - Find contaminants in WISE PSF for 12 candidates.
  - Confirm four white dwarf+disk candidates as dusty white dwarfs w/ SWIRC data.

Results

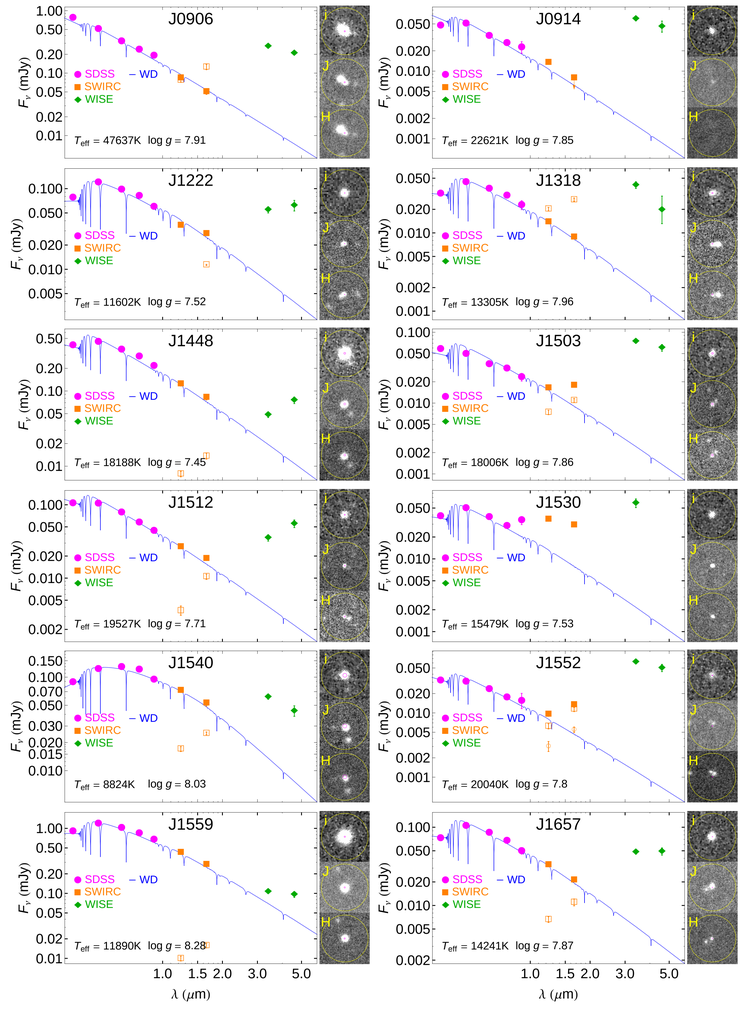
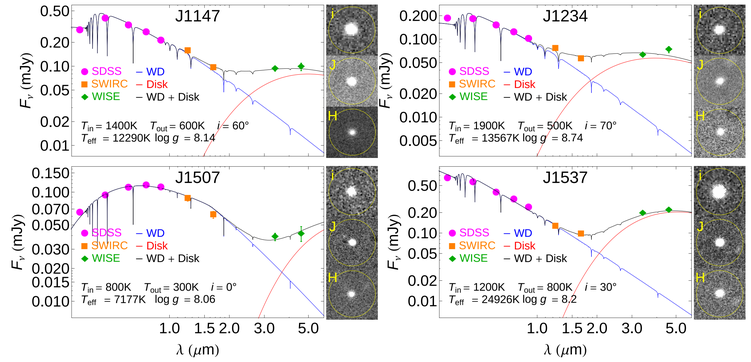


Figure 1: The SED of 12 WDs with nearby contaminating sources. SWIRC photometry of the WD (nearby contaminate) are shown as solid (empty) orange squares. Pure H atmosphere models (Tremblay & Bergeron 2009; Tremblay et al. 2010), shown in blue, are normalized to the SDSS $griz$-bands. The SDSS i-band and SWIRC J- and H-band science images are shown to the right. The yellow circle indicates the 6″ *WISE* beam. The small magenta circle is centered on the WD's SDSS J2000 coordinates and is used to identify the WD.



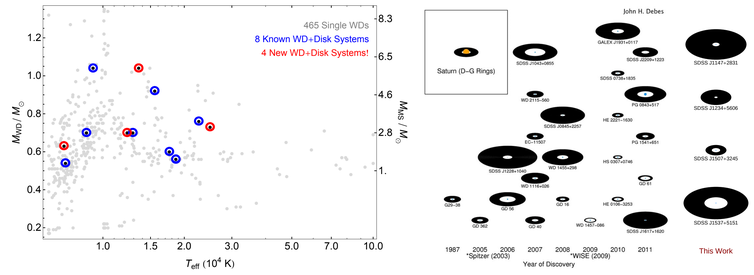


Figure 2: *Top:* The SEDs of four WD+dust disk systems identified using SDSS+SWIRC+WISE photometry. *Bottom-Left:* WD+disk masses and temperatures. *Bottom-Right:* Comparison of WD disk geometries.

Discussion

- We find 12 disks in a sample of 465 single WDs in WISE
  - At least 2.6% of single WDs in the WISE sample host dust disks.
- These four new dusty WDs brings the total number of confirmed WD+disk systems to 35.
- These new debris disks enrich the confirmed dusty WD population with one of the coolest (J1507), the hottest (J1537), and the most massive (J1234) WDs known to host circumstellar dust.

References

Barber et al. 2012, ApJ, 760, 26
Debes et al. 2011, ApJS, 197, 38
Farihi et al. 2009, ApJ, 694, 805
Jura 2003, ApJL, 584, L91
Tremblay & Bergeron 2009, ApJ, 696, 1755
Tremblay et al. 2010, ApJ, 712, 1345
Xu et al. 2014, arXiv:1401.4252
Zuckerman et al. 2007, ApJ, 671, 872