Dusty WDs in the *WISE* All Sky Survey ∩ SDSS

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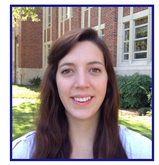

AAS Extras

Background

- Some WDs exhibit excess emission in the IR due to re-processed light from circumstellar dust.
  - Dust disks result from tidal disruption of asteroids that pass within WD's Roche lobe.
  - Origin of asteroids is dynamical instability initiated by post-main sequence stellar mass loss.
  - Debris produced by disruption eventually embodies a circular disk geometry.
- Disks serve as tracers for planets at WDs.
  - Abundance analysis of dusty WDs shows that accreted metals are similar in composition to bulk Earth (Zuckerman et al. 2007).

Observations

- Cross-correlation of ∼18,000 WDs between SDSS DR7 and WISE finds 52 candidate WD+disk systems (Debes et al. 2011).
- Most excesses are likely due to contaminating sources in WISE 6″ beam.
- We present follow up near-IR J- and H-band photometry using the 6.5 m MMT with SWIRC (0.5-1.5″ PSF) of 16 candidate WD+disk systems detected by *WISE*.

Methods

- Fit optical data with DA WD atmosphere models (Tremblay & Bergeron 2009; Tremblay et al. 2010).
- Fit IR excesses with geometrically thin, optically thick disk models (Jura 2003).
  - Find contaminants in WISE PSF for 12 candidates.
  - Confirm four WD+disk candidates as dusty WDs w/ SWIRC data.
  - Find two dusty WDs in UKIDSS LAS data.

Results

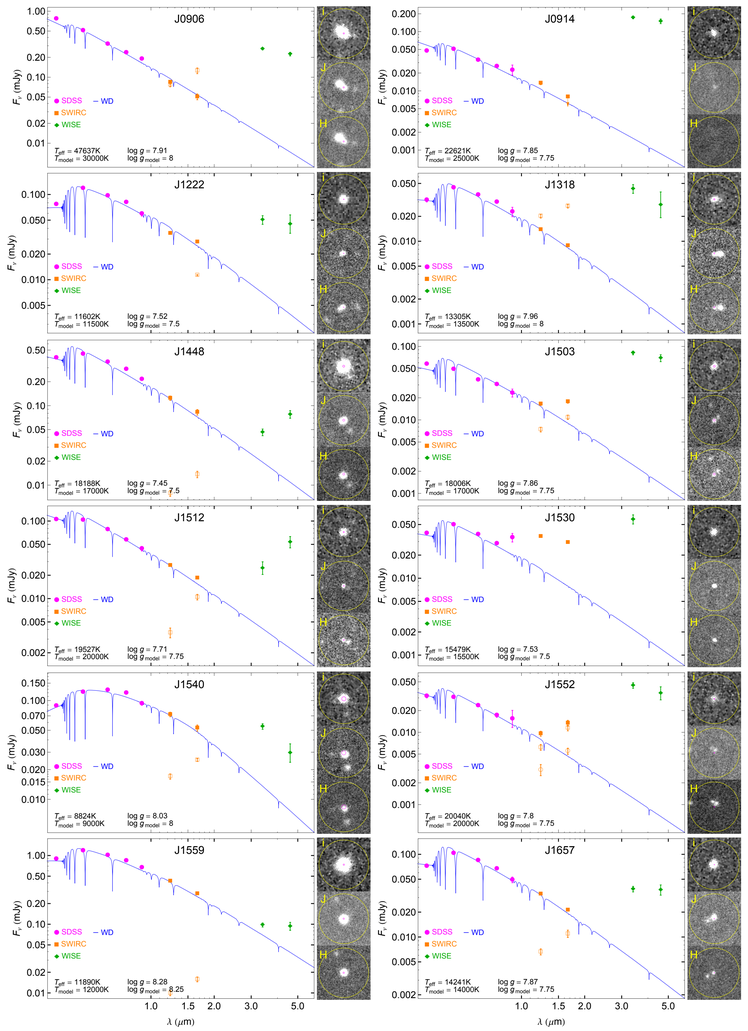

Figure 1: The SED of 12 WDs with nearby contaminating sources. SWIRC photometry of the WD (nearby contaminate) are shown as solid (empty) orange squares. Pure H atmosphere models (Tremblay & Bergeron 2009; Tremblay et al. 2010), shown in blue, are normalized to the SDSS $griz$-bands. The SDSS i-band 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.

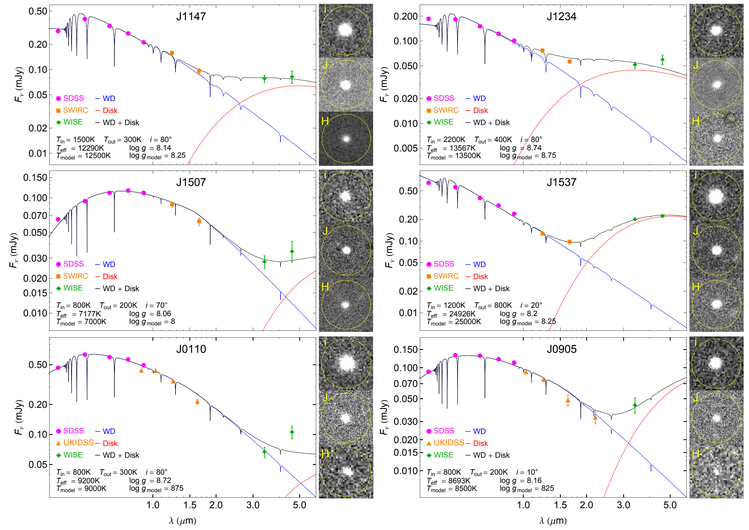

Figure 2: The SEDs of six WD+dust disk systems identified using SDSS+SWIRC(UKIDSS)+WISE photometry.

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 + two dusty WDs with UKIDSS data increases the total number of confirmed WD+disk systems from 29 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

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