

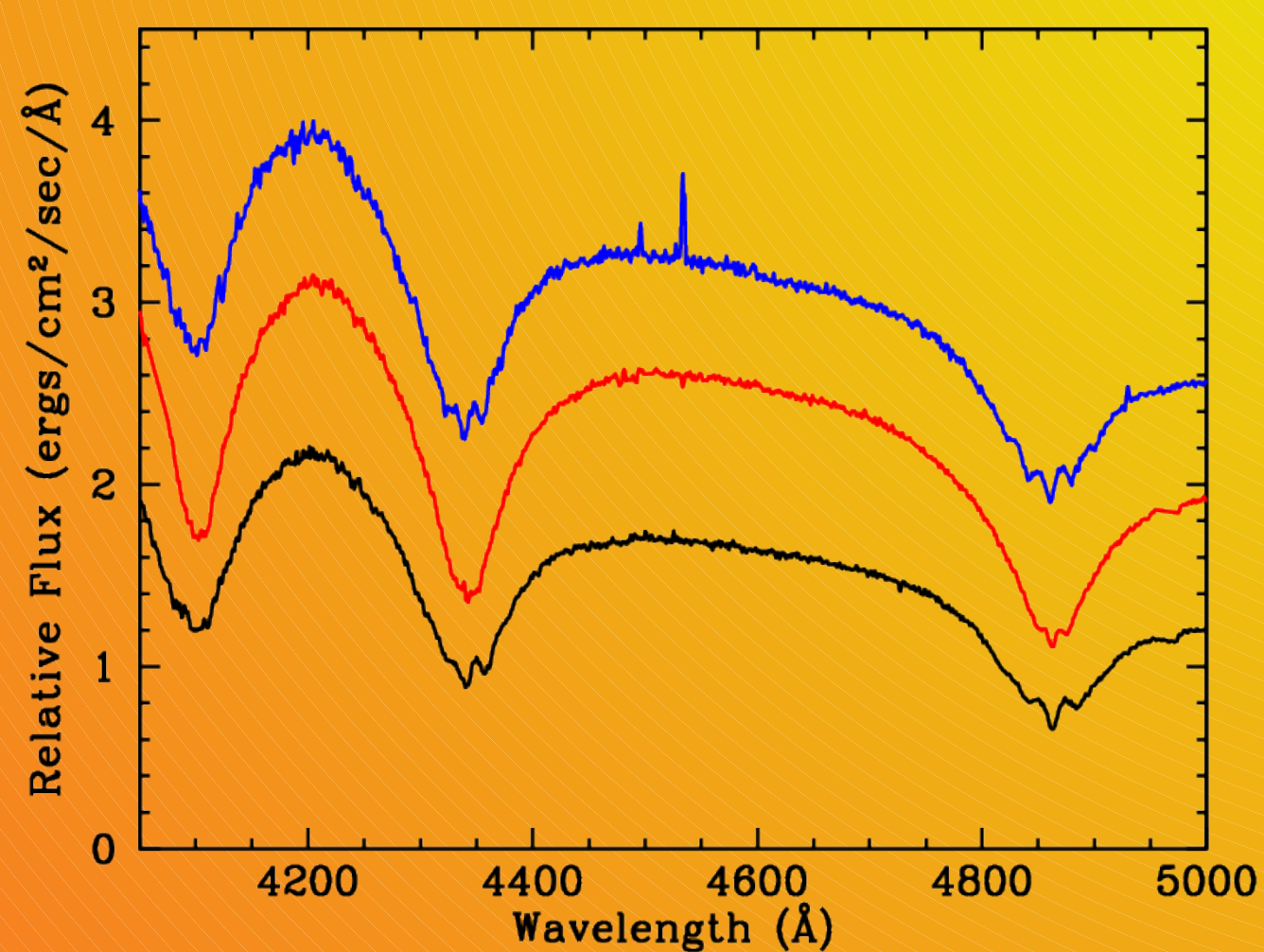
Are All Magnetic White Dwarf Stars Massive?

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Our goal is to address the mystery of the origin of magnetic fields in white dwarf stars. One telling clue in this mystery is that spectroscopic mass determinations for magnetic white dwarf stars are consistently higher (averaging $\sim 0.93 M_{\text{sun}}$) than for non-magnetic white dwarf stars (approximately $0.6 M_{\text{sun}}$). Through our new white dwarf catalog from Data Release 7 of the Sloan Digital Sky Survey (SDSS), we have, for the first time ever, a statistically significant estimate of the distribution of over 1000 magnetic white dwarf stars of different field strengths versus mass and temperature. The low S/N SDSS spectra, however, leave some uncertainty in our identifications of magnetic fields and hamper our ability to simultaneously measure both the Zeeman-splitting and the Stark pressure broadening in these stars, meaning we cannot reliably measure both B and $\log(g)$. Obtaining $S/N > 70$ spectra at Gemini for a sample of low field massive magnetic white dwarf stars, we will test our low S/N determinations of magnetic fields, search for ways to measure B and $\log(g)$ simultaneously, and ultimately determine if these magnetic fields are likely developed through the star's own surface convection zone, or inherited from massive Ap/Bp progenitors.

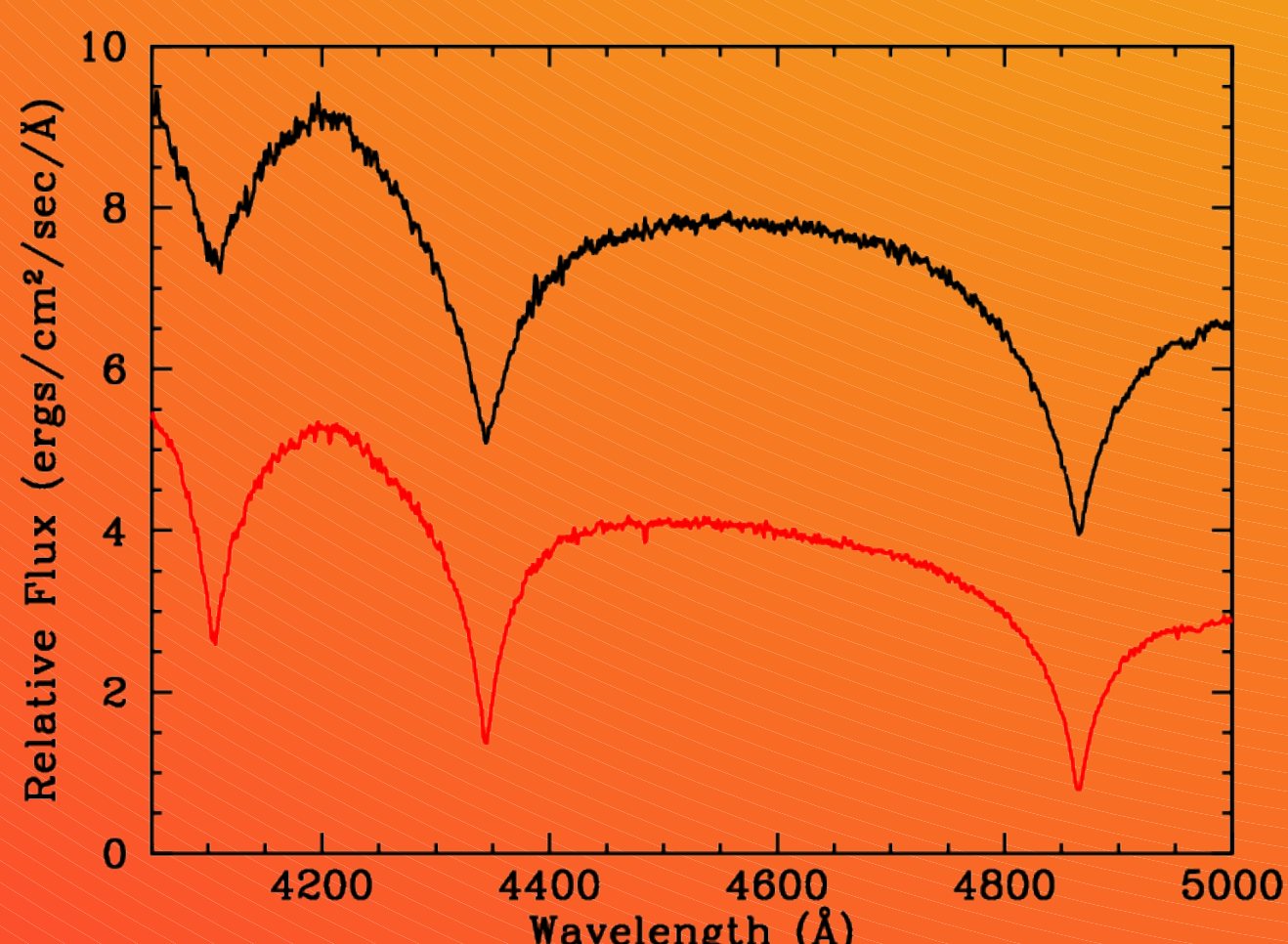
Gemini Spectra of New Magnetic WDs



We were awarded GMOS-N time in 2012A semester for this program. We observed a total of seven magnetic white dwarf candidates. The figures to the left show the spectra of five of them. The remaining two spectra have not yet been fully analyzed.

The top left figure shows the new Gemini spectra of three white dwarf stars with a detected magnetic field, as shown by the Zeeman splitting shown in the hydrogen absorption spectral lines.

Gemini Spectra of Non-Magnetic WDs



The bottom left figure shows the Gemini spectra of two white dwarf stars that did not show signs of magnetic fields.

When fully analyzed, the new Gemini spectra will help us provide realistic limits on the number of magnetic field stars (vs. field strength) we can accurately identify with the more noisy SDSS spectra. We can then explore the full SDSS sample with an accurate statistical understanding of our ability to detect magnetic fields (particularly low strength) in the SDSS spectra.