Accretion of planetary debris onto white dwarf stars

Many stars within our Galaxy host planets. Since the majority of stars end their lives as white dwarfs we want to know what happens to these planets as the star evolves and becomes a white dwarf. Up to now no planets have been found around white dwarfs however there is evidence that planets survive but as debris disks.

Elements heavier than helium are expected to sink and disappear below the atmosphere of a white dwarf, leaving either a pure hydrogen or helium atmosphere. However, a significant fraction of white dwarfs shows the presence of heavy elements such as calcium, magnesium and iron which means that they must have been accreted from material around the white dwarf. The discovery of polluted white dwarfs with large infrared excess tell us that this environment is a debris disk composed of asteroidal/planetary material.

The project will involve extracting, reducing and analysing mid- and high-resolution spectra of white dwarfs from the archives of the European Southern Observatory, which operates several 4m to 8m optical telescopes in the Chilean Atacama Desert. These spectra will be fitted with model spectra to determine the white dwarf atmospheric properties such as the effective temperature, surface gravity and abundance of heavy elements. Finally, the measured abundance pattern will be used to determine the likely source of the accreted material.

Figure 1: Artist’s impression of a debris disk around a white dwarf (Credit: NASA/JPL-Caltech)