

Temporal Evolution of Small-Scale Magnetic Fields in M Dwarfs from high-resolution spectroscopy

Stellar magnetic fields play a major role in the formation and evolution of stars and planets. In addition, surface magnetic fields introduce spurious signals in radial velocity curves, affecting the detection and characterization of exoplanets. Understanding the processes responsible for generating magnetic fields is therefore crucial for the study of exoplanetary systems. In this talk, I present results from a study of the small-scale magnetic fields of M dwarfs using high-resolution spectra obtained with SPIRou. Our method was applied to both fully and partially convective stars, providing valuable insights into the puzzling results that have accumulated over the past decade. We detect clear rotational modulation in the time series of magnetic field measurements for several stars. Furthermore, we find evidence of longer-term (~ 3 years) evolution in small-scale magnetic fields, which appears largely uncorrelated with variations in large-scale magnetic fields, but strongly correlated with surface temperature variations. These results provide important constraints on the formation and evolution of stellar magnetic fields, and their application to larger datasets will help guide the development of future dynamo theories.