

Magnetic Evolution of Sun-like Activity Cycles

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After decades of effort, the solar magnetic cycle is exceptionally well characterized, but it remains poorly understood. Pioneering work at the Mount Wilson Observatory demonstrated that other Sun-like stars also show regular activity cycles, and identified two distinct relationships between the rotation rate and the length of the cycle. The solar cycle appears to be an outlier, falling between the two stellar relationships, potentially threatening the very foundation of the solar-stellar connection. Recent discoveries emerging from NASA's Kepler space telescope have started to shed light on this perplexing result, suggesting that the Sun's rotation rate and magnetic field are currently in a transitional phase that occurs in all middle-aged stars. We have recently identified the manifestation of this magnetic transition in the best available data on stellar cycles. These observations suggest that the solar cycle is currently growing longer on stellar evolutionary timescales, and that the global dynamo will shut down entirely sometime in the next 0.8-2.4 Gyr. I will review four lines evidence for this unexpected result and discuss future observational tests, both solar and stellar.