

## The ages and evolution of field M dwarfs from rotation, activity and kinematics

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The ages of M dwarfs in the field of the galaxy are challenging to determine. Consequently, the evolution of rotation and magnetism at field ages is difficult to investigate observationally. Here, we present 200 new rotation period measurements for fully convective M dwarfs in the Southern hemisphere, about half of which are longer than 70 days. We make use of this sample and of our compilation of H-alpha emission for nearby M dwarfs to explore two questions: 1) How does the active lifetime of M dwarfs change with stellar mass? And 2) Do M dwarfs undergo an era of rapid angular momentum evolution? We confirm that the activity lifetime increases with decreasing stellar mass, basing our age estimates on the W component of the space velocity. We show that the lack of M dwarfs with intermediate rotation periods that we previously identified is astrophysical in origin, supporting our hypothesis that M dwarfs rapidly spin down from 10-day to 100-day periods.

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