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Simultaneous Multi-site, Multi-wavelength, and Multi-messenger Monitoring of the Nearby Red Dwarf GJ 3147

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We present a multi-site, multi-wavelength, and multi-messenger observing campaign of GJ 3147, a nearby (10 pc) red dwarf known for its frequent flaring activity. From November 11 to 17, 2021, the star was observed with photometry (Weihai, Xinglong, Lijiang, Nanshan, and Maidanak) and photopolarimetry (Lulin and ARIES). In about 100 data hours, three major flares and numerous minor ones were detected, including a major event on November 16 observed (1) by multiple telescopes all at R band, thereby with different sample functions, leading to the derivation of the underlined flare profile, e.g., the peak amplitude, impulse (energizing) and decay (cooling) timescales, which would have been otherwise unavailable with a single telescope alone, (2) with the same sampling function at g', r', and i'bands, allowing us to estimate the flare temperature of approximately 8000 K. Additionally, the star was found to have a quiescent polarization level of 5.8% in g', 2% in r', and 0.5% in i', suggesting scattering by an inhomogeneous atmosphere, likely due to dust condensation.

Section

Stars/Star Clusters

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