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Galactic magnetars as transient ultra high energy cosmic ray sources

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Search for sources of ultra high energy cosmic rays (UHECRs, $E > 10^{18}$ eV) remains one of the main unsolved problems in modern astrophysics. Galactic magnetars are potential candidates for the UHECR accelerators due to their ability to generate relativistic plasma flows and shock waves during magnetar giant flares. Favorable conditions for UHECR acceleration also occur during a Supernova ejecta energisation and a magnetar wind nebula (MWN) formation by newborn millisecond magnetars. In both cases, typical signatures of hadronic and leptonic CR acceleration are neutrino and broad-band (from the radio to gamma-ray) non-thermal emission. In this work we show that Galactic magnetar SGR1900+14 is a potential transient source of UHECRs. Detected by Auger and Telescope Array positionally coincident triplet of UHECRs with $E > 10^{20}$ eV can be accelerated in the giant flare of the SGR1900+14. Moreover, high-energy and very high-energy gamma-ray emission from magnetar SGR1900+14 outskirts (Fermi-LAT 4FGL J1908.6+0915e, H.E.S.S. HESS J1907+089, and HAWC 3HWC J1907+085 sources) can be explained by the acceleration of CRs in a magnetar-connected Supernova remnant and/or MWN. Necessary energy reserve of the SGR1900+14 progenitor can be provided by the newborn millisecond magnetar with initial rotational energy $W_{rot} \sim 10^{52}$ erg.

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