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Torsional Oscillations Of A Magnetar With A Tangled Magnetic Field ANTHONY VAN EYSDEN, Montana State Univ — Motivated by stability considerations and observational evidence, we argue that magnetars possess highly-tangled internal magnetic fields. We propose that the quasi-periodic oscillations (QPOs) seen to accompany giant flares can be explained as torsional modes supported by a tangled magnetic field, and we present a simple model that supports this hypothesis for SGR 1900+14. Taking the strength of the tangle as a free parameter, we find that the magnetic energy in the tangle must dominate that in the dipolar component by a factor of ~ 14 to accommodate the observed 28 Hz QPO. Our simple model provides useful scaling relations for how the QPO spectrum depends on the bulk properties of the neutron star and the tangle strength. The energy density in the tangled field inferred for SGR 1900+14 renders the crust nearly dynamically irrelevant, a significant simplification for study of the QPO problem. The predicted spectrum is about three times denser than observed, which could be explained by preferential mode excitation or beamed emission. We emphasize that field tangling is needed to stabilize the magnetic field, so should not be ignored in treatment of the QPO problem.

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