Abstract Submitted
for the APR11 Meeting of
The American Physical Society

Supernova Fallback onto Magnetars and Propeller-Powered Supernovae ANTHONY PIRO, CHRISTIAN OTT, Caltech — We explore fallback accretion onto newly born magnetars during the supernova of massive stars. Strong magnetic fields ($\sim 10^{15}$ G) and short spin periods ($\sim 1 - 10$ ms) have an important influence on how the magnetar interacts with the infalling material. When accretion can occur onto the magnetar's surface, it is spun up sufficiently to produce gravitational waves until it collapses to a black hole on a timescale of $\sim 50 - 200$ s. For other parts of parameter space, the magnetar is in the "propeller regime" and avoids becoming a black hole by magnetically flinging incoming material. This collides and shocks with outgoing supernova ejecta, creating an outburst of $\sim 10^9 L_\odot$. Unlike a typical supernova powered on long timescales by radioactive decay, this propeller-powered supernova has most of its energy injection during the first $\sim 10^2 - 10^3$ s. This causes a fast rise on the timescale of $\sim 20 - 70$ days and large ejecta velocities of $\sim (1 - 5) \times 10^4$ km s^{-1}.

Anthony Piro
Caltech

Date submitted: 14 Jan 2011 Electronic form version 1.4