Contribution ID: **34** Type: **Poster**

The ohmic decay of magnetic field in magnetars

Magnetars are a kind of pulsars powered by magnetic field energy. Part of the X-ray luminosities of magnetars in quiescence have a thermal origin and can be fitted by a blackbody with temperature about kT ˜ 0.3–1 keV, much higher than the typical values for rotation-powered pulsars. The observation and theoretical study of magnetars is one of hot topics in the field of pulsars. Combined with the equation of state, we first calculated the electric conductivity of the crust under strong magnetic field, and then calculated the toroidal magnetic field decay rates and magnetic energy decay rates by using an eigenvalue equation of toroidal magnetic field decay and considring the effect of general relativity for magnetars. We found that, for most of magnetars with high X-ray luminosity.

The Ohmic decay of toroidal magnetic field can provide their observed isotropic soft X-ray radiationss, while for transient magnetars with low X-ray luminosities, their soft X-ray radiations may be powered by rotational energy loss rates. We also discussed other possible anisotropy origins of magnetar soft X-ray emissions, such as the formation magnetic spots and thermoplastic flow wave heating in the polar cap. Although anisotropic heating mechanisms are different from Ohmic decay, all of them require theire exists strong toroidal magnetic fields in the interior of a magnetar. However, the anisotropic heating mechanisms require higher toroidal multipole fields inside a magnetar(such as magnetic quadrupole field and octupole field) and are related to complex Hall drift, these may be our focus in the future.

Authors: GAO, Zhifu (Xinjiang Astronomical Observatory, Chinese Academy of Sciences); WANG, Na (Xinjiang Astronomical Observatory, Chinese Academy of Sciences)

Presenter: GAO, Zhifu (Xinjiang Astronomical Observatory, Chinese Academy of Sciences)

Track Classification: STARS